ABSTRACT

AN EXPERIMENTAL STUDY OF ORAL FEEDBACK IN A PSYCHOLOGY COURSE TAUGHT BY CLOSED-CIRCUIT TELEVISION AND BY CONVENTIONAL METHODS

by Melvin P. Smagorinsky

The purpose of the study was to investigate certain aspects of oral feedback in the television teaching-learning situation. Specifically, it was the intent of the study to discover whether the oral feedback of students in a television class using an electronic feedback system was significantly different, in terms of frequency and nature, from that of students in a conventional face-to-face class. Additionally, it was theorized that certain characteristics of the students themselves might affect their oral feedback. As a subproblem, personal contacts between students and the instructor that occurred outside of formal classes were studied in the belief that students might use these opportunities to satisfy their feedback needs.

The frequency and the nature of feedback were the criterion variables, frequency being the number of responses and the nature being determined by whether a response was teacher-initiated or

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student-initiated. The independent variables were: (1) the two feedback conditions, (2) ability level as measured by the Selective Admissions Test of the State University of New York, (3) preference for instructor as measured by the Preferred Instructor Characteristics Scale, and (4) the introversion-extroversion personality trait as measured by the Personality Inventory.

The experiment was conducted in a psychology course at the State University College at Brockport, New York. The subjects were ninety-five freshmen. Seventy-five subjects were assigned to the experimental television group and the balance to the conventionally taught control group. Both groups were taught by the same instructor, and virtually all class meetings were included.

It was hypothesized that the frequency and nature of feedback in the conventionally taught class would be significantly greater than that in the television class for each independent variable and, when compared on each independent variable, students in the television group would not be affected in a significant manner as a result of the electronic feedback situation. In addition, it was hypothesized that the television students would initiate significantly more personal contacts with the instructor than the conventionally taught students.

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Evaluation of the results was accomplished by means of the *t* test in all instances except for the personal-contacts hypothesis where chi-square was used. Tabular comparisons were used in a subjective analysis of the feedback. Significant differences between the two groups were found for each independent variable related to frequency of feedback, teacher-initiated feedback, and student-initiated feedback, except for responses initiated by "high-ability" and "received-instructor-preferred" students. No significant differences were obtained in the analysis of the frequency and nature of feedback within the television group itself. The personal-contacts-with-the-instructor hypothesis was significant in favor of the conventionally taught students.

Conclusions based upon the study were:

1. College students in a television learning situation requiring the use of an electronic feedback system tend to respond significantly less than conventionally taught students for both teacher-initiated and student-initiated feedback. The mode of feedback is apparently a factor.

2. When compared with each other on the basis of certain student characteristics, students in a television learning situation do not differ significantly in the frequency and nature of their

feedback. Apparently the types of students under study are being affected in the same way as a result of the electronic feedback situation.

3. Television students do not make personal contacts with the instructor outside the formal class session at the same rate as conventionally taught students.

4. For both modes of feedback, a major portion of the responses is teacher-initiated and a preponderance of student-initiated feedback is in the form of questions; there are few statements.

5. A smaller proportion of television students participate in oral feedback than do conventionally taught students.

6. Television students initiate more oral feedback pertaining to course procedures and personal matters than do conventionally taught students.

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By

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To the memory of my father, whose inspiration and guidance were, from my earliest recollections, the genesis of my hope to be an educated man.

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CHAPTER I

THE PROBLEM

Introduction

The application of technology to education is a highly controversial subject for contemporary educators. There has been much discussion, both oral and written, about the implications which the technological explosion holds for education. Of particular interest is the potential effect of technology on the teaching-learning process. Only very recently have we observed the growing belief that there is interest in technology as a potentially powerful educational force.[1] Hoban observes that we accept technology in other aspects of our lives, but fear it in education.[2] The slowness with which education has accepted technology is in sharp contrast to industry and business where technology has been utilized to assist in solving the many problems which have plagued those human endeavors.

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[1]Gene C. Fusco, "Technology in the Classroom--Challenges to the School Administrator," School Life, March, 1960 (Reprint, U.S. Department of Health, Education, and Welfare), p. 6.

[2]Charles F. Hoban, "The New Media and the School," Audio Visual Communication Review, X, No. 6 (November-December, 1962), 354.

According to Finn, educators have been slow in taking a position on technology in education.[1] He reports that, during the Depression, Counts and Rugg, among others, attempted to develop such a viewpoint. But Finn relates:

> An examination of their work shows that almost the entire focus was on the economic efforts of the increasing technology and the kind of education for economic reorganization and survival. Other aspects were either slighted or missed entirely.[2]

In a 1962 article, Van Til acknowledges that the "Industrial Revolution" has finally reached education.[3] He lists technology as one of three major emphases in present-day American educational thought.

How do educators define technology? Finn says, ". . . technology is more than invention--more than machines. It is a process --a way of thinking."[4] Beard saw it as far more than laboratories or machines. Beard wrote, in part:

> . . . technology has a philosophy of nature and a method--an attitude toward materials and work--and hence is a subjective

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[1]James D. Finn, "Technology and the Instructional Process," Audio Visual Communication Review, VIII, No. 1 (1960), 8.

[2]Ibid.

[3]William Van Til, "Is Progressive Education Obsolete?" Saturday Review, XLV, No. 7 (February 17, 1962), 56.

[4]Finn, Audio Visual Communication Review, VIII, No. 1, 6.

> force of high tension. It embraces with its scope great constellations of ideas, some explored to apparent limits and others in the form of posed problems and emergent issues dimly understood.[1]

Technology in education is more than a matter of hardware--machines. The resistance to technology by educators is probably the result of the inherent belief that machines cannot be successfully integrated into a profession so intimately enmeshed with human beings and human minds.[2] During the era when the potential of radio in education was being heatedly discussed, some educators warned there was danger in introducing a technical device such as radio into the teacher-student relationship because radio, they feared, would make the teacher-student relationship less personal.[3]

From the onset of a major educational change to the time of general acceptance by educators is a slow process, taking some fifty years.[4] At this point in time, education has begun to relinquish

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[1]Charles Beard, quoted ibid., p. 10.

[2]Kenneth D. Norberg, "Growth of the Use of Mass Media in American Education," Communication Media and the School, The Yearbook of Education, ed. George Bereday and Joseph Lauwerys (Tarrytown, N.Y.: World Book Company, 1960), p. 274.

[3]J. Lloyd Trump, "Have We Learned Our Lesson?" National Association of Educational Broadcasters Journal, XIX, No. 6 (November-December, 1960), 42.

[4]James D. Finn, "A Revolutionary Season," Phi Delta Kappan, XLV, No. 7 (April, 1964), 349.

its long stand against the large-scale influx of technology into American education.[1] Educators, forced to search for solutions to the increasing problems of education in America, have turned to technology.

The advent of instructional technology comes at a time when the pressures of important societal forces are being felt on education. Foremost among these forces is the steadily rising school enrollments at all levels of instruction. This explosion in enrollment can be traced to the unprecedented number of births which have occurred since the end of World War II. Births have risen more than 50 per cent since World War II, and for the past several years they have averaged some four million annually--a number which is one and one-half times the level of the Depression decade of the thirties.[2]

While school enrollments have been growing, there has not been a commensurate increase in the supply of well-qualified teachers.[3] The result has been that many schools have been forced to

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[1]Education Policies Commission, Mass Communications and Education (Washington: National Education Association and American Association of School Administrators, 1958), p. 128.

[2]Ford Foundation, Teaching by Television (New York: Ford Foundation, 1961), p. 1.

[3]Ibid.

compromise the quality of their instruction by accepting teachers who are less than qualified. With the employment of inadequately prepared teachers, the quality of instruction in most instances has been adversely affected.

Furthermore, there has been another kind of explosion: the explosion of knowledge. New information is being uncovered and created at a rate previously unknown in the history of mankind. In order to live the life of an informed man and an effective citizen in this new era, it will be necessary to acquire a range of knowledge which preceding generations would have found inconceivable. Moreover, the knowledge to be learned has become increasingly complex.

Finally, the American people have become highly mobile since the end of the second world war. Population mobility engenders the problem of curriculum standards and quality of instruction. Students moving from one geographical area to another may be affected by differences in standards and quality.

As a result of these changing conditions in America, the significance of technology to education has been more quickly brought into focus. The changing forces explain to a certain extent the reason educators, looking for solutions to the mounting

problems resulting from these recent and dramatic changes, have steadily turned to technology.[1]

Following the introduction of such audio-visual media as motion pictures, filmstrips, slides, and recordings, the next significant medium that was to make its presence felt on education arrived in the early fifties. When commercial television burgeoned in the United States after World War II, many people confidently predicted that television had tremendous potential in the field of education. Many enthusiastic persons foresaw television as the greatest single invention since the printing press in terms of its impact on education.[2] But there were those who balanced this enthusiasm by taking a dim view of television's potential in education.

Almost with the first application of television as an instructional tool, strong feelings developed against the new medium. Opposition to educational television came from teachers who saw "the electronic gadget" as a threat to their jobs, and from curriculum workers and educational psychologists who considered televised instruction to be incompatible with the laws of learning. Individual

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[1]James D. Finn, "Technological Innovation in Education," Audiovisual Instruction, V, No. 7 (September, 1960), 222.

[2]The Uses of Television in Education (North Central Association of Colleges and Secondary Schools, March, 1961), p. 4.

student differences in learning rate, and the lack of teacher-student interaction in television's fixed, one-way flow of communication, were especially questioned where television was used.[1] Campion notes that for television teaching to be curriculum-centered it must necessarily result in the classroom teacher losing control over the content.[2] This leads to the objection that the television curriculum may not meet the needs of local school districts and that the school curriculum may not be as flexible as it should be to accommodate the more rigidly scheduled television lessons. Simpson listed automation, the extra problems created by television for teachers and administrators, and the fear by the teacher of a lesser role in the classrooms as other resentments engendered by television's introduction into the educational scene.[3] Teachers have proceeded slowly in accepting television as a tool of learning.[4] Siepmann,

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[1]Finette P. Foshay (ed.), Interaction in Learning: Implication for Television (Washington: National Education Association, 1959), p. 9.

[2]Lee Campion, quoted in Lester Asheim, "A Survey of Informed Opinion on Television's Future Place in Education," Educational Television--The Next Ten Years (Stanford, Calif.: The Institute for Communications Research, 1962), p. 19.

[3]Garry Simpson, "Why Doesn't Your School Use TV?" National Association of Educational Broadcasters Journal, XXI, No. 5 (September-October, 1962), 6-10.

[4]Asa A. Knowles, "TV and Science," The High School Journal, XLI, No. 5 (February, 1958), 181.

however, noted that, despite fears and skepticism, there have been pioneers who have pushed forward with hope and confidence into this unknown territory, convinced that they are headed toward new horizons of educational opportunity.[1]

An indication that television has had some measure of acceptance by educators is found in the events of a conference held at Turkey Run Park in Marshall, Indiana, in 1962.[2] Improved utilization and evaluation of educational television were discussed at the conference attended by 115 educators with a wide range of experience and interests in education. At the start of the conference the usual review of research to demonstrate that television could be used in instruction was not given, for no one at the conference questioned television's value as an instructional tool. Further evidence may be seen in the 1962 plan for state-wide development of educational television in New York State. Perhaps the strongest evidence is found in Starlin's conclusion that "there is no longer any doubt that television can be used effectively as a teaching tool

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[1]Charles A. Siepmann, Television and Education in the United States (Paris: United Nations Educational, Scientific, and Cultural Organization, 1952).

[2]A. J. Perrelli, "Focus on Utilization and Evaluation," Audiovisual Instruction, VII, No. 10 (December, 1962), 689.

if teachers will accept it as just another aid to instruction and adjust to both its advantages and limitations."[1]

The history of educational television in the United States is clearly revealed in a succinct statement by Hudson:

> Seven years . . . later no one can claim a "renaissance," but perhaps more importantly and by every applicable measure educational television has shown a remarkable capacity to reach, to interest, to teach, to enlighten.[2]

Background of the Problem

During the past decade, evidence has developed to indicate that television has had increasing acceptance as an educational medium. Since 1953, nearly one hundred educational broadcast stations and even more closed-circuit installations in learning institutions have sprouted in every section of the nation. To be sure, the rate of growth across the nation has been anything but uniform. For instance, television has spread rapidly in Michigan,[3] while in New

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[1]Glenn Starlin, Television and Higher Education: A Plan for Statewide Development in New York (New York: New York State Education Department, 1962).

[2]Robert Hudson, quoted in Wilbur Schramm (ed.), The Impact of Educational Television (Urbana: University of Illinois Press, 1960), p. v.

[3]James B. Tintera, A Report of the State of Michigan Educational Television Study (1960-61), p. 6.

York State only three educational television stations are presently operating. An important segment of the programming of these stations and installations is devoted to instructional purposes.

Secretary of Health, Education, and Welfare Celabreze, in an August, 1962, report based on a nationwide survey, declared that more than three times the 309 channels allocated for educational television would be needed in the next decade.[1] The same report revealed that more than 95 per cent of the public schools reported serious curriculum or teaching needs. A large proportion of these schools said that the problems could be met or helped by broadcast television.

A 1962 compendium of telecourses prepared by Michigan State University showed that a total of 30,148 courses were offered by 12,659 educational institutions in the United States in 1961.[2] Credit enrollments in these courses amounted to 2,776,984 students, with informal enrollments totaling slightly more than eleven million. One institution of higher learning, Ohio State University, estimated the

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[1] "ETV Channels," New York Times, August 24, 1962, Education Section.

[2] Telecourses for Credit, IX (East Lansing: Continuing Education Service, Michigan State University, September 1, 1962).

1962-63 academic year enrollment in television classes for credit would number 17,500 students, an increase of 2,000 over the previous year.[1]

The period since 1953 has been marked by a great profusion of television research. The majority of these research projects concentrated on the problem of whether television is an effective medium of instruction. The preponderance of evidence demonstrated that learning by television was as effective as by conventional methods at all levels of education, in terms of acquisition of factual knowledge.[2]

Other research attempts in television were largely aimed at discovering ways of improving television teaching techniques and also at assessing the uniqueness of television as a medium of instruction.

Critics have long argued that television's most serious limitation as a medium of instruction is that it does not allow for the interaction between teacher and student considered to be so necessary for learning to be clear and meaningful. An important aspect

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[1] National Association of Educational Broadcasters Newsletter, XXVIII, No. 1 (January, 1963), 3.

[2] Egen Guba, "Ten Years of Research in ITV," The North Central Association Quarterly, XXXV, No. 4 (April, 1961), 303.

of interaction in the teaching-learning process is feedback, which may be defined as being that information, either verbal or visual, transmitted from the student to the teacher offering cues to the teacher relative to the learning behavior of the student. Feedback can also be information from the teacher to the student resulting from an action initiated by the student which reinforces learning by providing knowledge of results and reward. The television critics usually see the lack of the former type of feedback as the foremost disadvantage of instructional television.

For feedback to take place when broadcast television is used for teaching poses enormous technological problems. Consequently, little or nothing has been done to facilitate feedback, although occasional attempts have been made to offer students written and telephonic communication channels. Neither avenue has proved to be adequate for the task, chiefly because of the length of the delay between question and answer. However, in closed-circuit television the technical problem incurred in making provisions for feedback has been solved by including additional cable and other electronic devices in the system. This modified system offers two-way audio communication between the studio and viewing rooms. More elaborate instrumentation has been devised, some even providing two-way visual communication. Since the advent of video tape,

there has been a trend toward prerecording lessons for both broadcast and closed-circuit television. Under this condition no feedback is possible at all.

Until very recently, findings related to feedback in television usually have been reported as a by-product of the major study. These tangential studies have revealed that college students taking courses by closed-circuit television often preferred having a feedback system. Many instructors commented that their teaching was affected adversely when there was no opportunity for student feedback. Yet, the same research indicated that students were reluctant to utilize the system to initiate responses in the form of questions and comments. Despite this reluctance, research has also shown that most students achieved as well by television instruction as students achieved by conventional methods in terms of factual knowledge. Moreover, there is evidence that there is no measurable difference in learning with or without feedback systems.[1]

The evidence that exists with regard to learning with minimum feedback in closed-circuit television, the widespread reliance of broadcast instructional television (no feedback or delayed

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[1]C. R. Carpenter, "Approaches to Promising Areas of Research in the Field of Instructional TV," New Teaching Aids for the American Classroom (Stanford, Calif., 1960), p. 80.

feedback), and the current trend toward video recorded lessons (no feedback) raised a question as to the purpose feedback serves in television instruction. Kilbourne notes that recent technology has made conventional frameworks of teaching and learning seem inadequate.[1] Fletcher goes even further and claims that "there is no concrete, specific, scientific, objective research to confirm or to deny the significance of personal contact in teaching."[2] He qualifies this statement by saying that personal contact seems important for certain subjects, certain students, and certain teachers. Solving the problem of feedback in television instruction is not only important to obtaining a greater understanding of television teaching and learning, but is also a significant consideration for school and college administrators who plan the use of television in new instructional programs. Their decision concerning the use of television to meet educational needs will be based in part on which combination of television systems is most effective for facilitating learning and on the cost of purchase and operation of the equipment.

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[1]Robert W. Kilbourne, "Midwest Airborne Television and the Technology of Education," Audio Visual Communication Review, IX, No. 4 (July-August, 1961), 205.

[2]Leon C. Fletcher, "It's Time to Blast-Off on ETV," The High School Journal, XLI, No. 5 (February, 1958), 188.

Provision for feedback in the television learning situation is a factor in both cases.

Statement of the Problem

The general problem studied was concerned with feedback in the teaching-learning process as it is found in instructional television. The present study was designed as an attempt to investigate certain aspects of the general problem.

Specifically, the investigation was to determine if an electronic system used for feedback in instructional television has an effect on student responses, and if there is an effect how this compares with what occurs to student responses in the face-to-face feedback situation of the classroom.

The effect on student responses (feedback) was to be determined by statistically analyzing the frequency and the nature of the feedback in both the experimental (television) and control (conventional) groups taught by the same instructor.

Further, the frequency and nature of the student responses were to be analyzed to discover whether students of certain characteristics are affected differently by an electronic feedback situation than by a face-to-face feedback situation.

The selected characteristics are: (1) personality trait (extroversion-introversion), (2) ability level, and (3) preference for type of instructor (having or not having the type preferred).

Subproblem

Because the principal problem of the study is limited to student responses during the formal class meeting, it was believed that students might meet their need for interaction with the instructor outside of the formal setting. Personal contacts at any time other than the formal class session were also considered as evidence of oral feedback between the student and instructor.

Hypotheses

Four experimental hypotheses were stated in the belief that there would be differences between the feedback of students who were in the televised sections (electronic feedback) and those of students who were in the conventionally taught section (face-to-face feedback) as evidenced by the oral responses of the students. Hypotheses were stated as follows:

Hypothesis 1: The frequency of feedback of students in the conventional class will be signficantly greater than those in the

television class, regardless of their personality type, their ability level, or their preference for instructor.

Hypothesis 2: Teacher-initiated or student-initiated feedback (nature of feedback) of students will be significantly greater in the conventional class than in the television class, regardless of their personality type, their ability level, or their preference for instructor.

Hypothesis 3: Within the television class, for students of both personality types, both ability levels, and both preferences for instructor, the frequency and nature of feedback will not be affected in a significant manner as a result of the electronic feedback situation.

Hypothesis 4: Students who are in the television class will initiate significantly more personal contacts with the instructor than those who are in the conventional class.

Definition of Terms

The following definitions are relative and pertinent to this study:

Interaction: A two-way flow of stimulus and responses (and of communication) between teacher and students wherein subsequent

responses are adjusted on the basis of a previous stimulus. Feedback is the stimulus causing the adjustment.

Oral feedback: The spoken communication from the learner to the teacher, which is the second part of the two-way flow of communication, the first part being the utterances of the teacher to the learners. It acts as a cue for the teacher regarding the learning behavior of the students.

Student response: The same as oral feedback.

Frequency of feedback or response: The number of times a student responds in the formal class session.

Nature of feedback or response: The content of the feedback according to the following criteria: (a) whether it is teacher-initiated or student-initiated; (b) whether it is concerned with the objectives of particular lesson, an administrative or procedural matter in the course, or a matter personal to the student and not relative to the course; (c) whether it is relevant or irrelevant to the purposes of the course.

Formal class session: The period of time from the opening of the lesson by the teacher to the dismissal of the class, not including the informal talk time after the conclusion of the lesson.

Contact (personal): Person-to-person meeting of student with teacher at any time other than the formal class session, including informal talk after the conclusion of the lesson.

Instructional television: Telecasts transmitted for the purpose of total or supplementary teaching or for enrichment of a curriculum.

Psychology course: An introductory course in the teacher-education program, required of all freshmen, entitled "Human Growth and Development (Psychology 100A)."

Students: Freshmen entering the State University College at Brockport, New York, in the fall, 1962, semester.

Conventional methods: Students receiving instruction in a classroom with an instructor who uses the lecture techniques, the chalkboard, and an occasional motion-picture film.

Scope and Limitations

This study was limited to the investigation of: (1) oral feedback in one college course, Psychology 100A, offered to freshmen in the fall, 1962, semester at the State University College at Brockport; (2) those students assigned to the three television instruction sections and to the one conventional instruction section taught by the television instructor; (3) the class meetings between

the second week and the next to the last week of the course (class meetings in which examinations were administered were not included).

Another limitation was the randomizing procedure. It was not possible to assign the students to the two groups according to randomization procedures generally suggested by statisticians. Entering first-year students at Brockport are given their schedules for the first semester during registration. Students are assigned to the sections of the freshman courses by the office of the associate dean. In the fall of 1962 there were twenty-five sections of Psychology 100A, the course involved in the present study. To a great extent, each student in the freshman class had an equally likely chance of being assigned to the groups used in this investigation.

The results of the experiment must be interpreted and tempered with these limitations in mind.

Assumptions

Underlying each investigation are certain assumptions which must be stated, since they are factors that could influence the results of the experiment. For the hypotheses established for this study, the following assumptions are made:

1. It was assumed that the same lesson content would be presented to both groups of students on the same day.

2. It was assumed that within the boundaries of human control the instructor would not alter his presentation to the second group due to the feedback from the students in the first presentation.

3. It was assumed that, by using the same instructor to teach both groups, the instructor variable would be controlled.

4. It was assumed that all students had an equally likely chance to respond.

5. It was assumed that among the significant variables which may affect student feedback were those of personality trait, preference for instructor, and ability.

Unique Aspects of the Study

The majority of research in educational television, particularly in instructional television, has been concerned with determining whether television is an effective medium for learning as measured by student achievement. Some investigations studied teaching techniques, but there would seem to be a paucity of research in the important area of the learner in the television situation.

A unique feature of the present study is that it intended to study a single aspect of the learner's behavior in television situations--feedback or student response. In the past few years there

have appeared some studies that have investigated feedback directly. These projects have been primarily involved with studying feedback techniques and modes. A review of the literature (see Chapter II) reveals that there have been few investigations which have concentrated mainly on the student and his responses. Although there have been investigations which reported observations of student response behavior and the students' evaluations and opinions of the electronic talkback system, often these were reported as an aside to the main objective of the investigation.

CHAPTER II

REVIEW OF LITERATURE

The literature of educational television, and particularly that related to instructional television, has been characterized by two traits: profusion and duplication. Meany observed in 1962: "Television is already probably one of the most extensively tested instructional devices ever offered to education."[1] Recently there have been attempts by scholars to consolidate both the writings of a multitude of authors and the research findings of seemingly countless experimenters.

In the review which follows, the literature appropriate to this study will be discussed under the following headings: (1) the general findings related to the effectiveness of instructional television, (2) feedback in learning and communication theory, and (3) specific studies and information related to feedback in instructional television.

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[1]John W. Meany, Televised College Courses (The Fund for the Advancement of Education, October, 1962), p. 31.

General Review of Findings Related to Instructional Television

The purpose in reviewing the general findings of television's effectiveness in the teaching-learning process is to set the background for the present study. Nearly all institutions utilizing television as an instructional medium have undertaken research, rigorous or otherwise, to determine whether students learn as well by television instruction as by conventional modes. The preponderance of these studies measured achievement and retention in terms of factual knowledge gain. Information was also collected with regard to teacher and student opinions and attitudes concerning television as an instructional medium.

Foshay saw instructional television research as developing in three clearly marked stages.[1] First is the "Exhortatory Stage" (1945-50) in which educators and broadcasters professed "the importance of television, the possibilities of the medium, the necessity for careful inquiry, and the need for fitting it into the existing educational scheme."[2] The period in which researchers attempted to

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[1] Arthur W. Foshay, "New Media--Research Findings in the U.S.A.," Communication Media and the School, The Year Book of Education, ed. George Bereday and Joseph Lauwerys (Tarrytown, N.Y.: World Book Company, 1960), p. 233.

[2] Ibid., p. 234.

demonstrate the effectiveness of television as an instructional medium was called the "Promotional Stage" by Foshay. After examining some of the research, he concluded that "research in this field will not come of age until the special characteristics of this medium are examined closely."[1] Finally, the third stage is described as one where research and communication theory (Wiener's, Shannon and Weaver's, and Korszybski's) are being applied to the problems being investigated by television researchers. However, Foshay noted, this kind of research is only beginning to emerge.

The earliest explorations of instructional television were pioneered by the military services, beginning with the United States Navy Special Devices Center in 1946. The military agencies (including the Army and the Air Force) directed their efforts toward equipment development and its application to practical problems.[2] By 1949, the military services shifted the emphasis from equipment development and application to the more theoretical problems of telecommunication and its effect on military training. Dunham, in a detailed analysis of six such studies, finds the results lacking in

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[1] Ibid., p. 237.

[2] C. R. Carpenter, "Psychological Research Using Television," The American Psychologist, X, No. 10 (October, 1955), 607.

conclusiveness, and also finds frequently the use of an invalid research design and that inappropriate conclusions have been drawn from the findings.[1]

Allen, in a 1958 recapitulation of military television research, concludes that civilian groups, notably the universities, largely ignored the military research.[2] In Allen's opinion, the studies conducted by the military were in many respects more comprehensive and significant than many studies undertaken by the universities later. He saw this avoidance as a reluctance on the part of educators to equate military training with professional education.

Professional education, largely through the economic assistance of large foundations, and more recently from the National Defense Education Act of 1958, began to study the new medium earnestly by 1950. Research findings from colleges and universities such as Pennsylvania State University, New York University, Michigan State University, Miami University, the University of Houston, Chicago

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[1]Morton D. Dunham, "An Experimental Study of the Effect of Two Discussion Techniques on Educational Outcomes in a Beginning Educational Psychology Class Taught by Closed Circuit Television" (unpublished Ed.D. dissertation, Michigan State University, 1958).

[2]M. Robert Allen, Television, Education, and the Armed Forces (Fort Lee, Va.: The Quartermaster Training Command, December 1, 1958), p. 8.

Junior College, Case Institute, the University of Iowa, and San Francisco State College, as well as from school systems in Hagerstown, Maryland, Evanston, Illinois, and Philadelphia, Pennsylvania, appeared in the literature. In 1955, Carpenter noted that the research "dealt with problems in the area of relative effectiveness and appropriateness of procedures, patterns and applications, and in the area of the acceptability of television to such people as administrators, teachers, and students."[1] The basic comparison in many of the studies was between television and the conventional classroom or regular instruction. In 1955, Wischner and Scheier, after reviewing the available research findings, had come to the major conclusion that television can teach.[2] Still, they cautioned about any overoptimism because the data did not fill important gaps in the then available knowledge about factors affecting the effectiveness of televised instruction.

By the middle fifties, the results of numerous research projects made it evident that students of both school and college levels

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[1]C. R. Carpenter, "Television," The New Media in Education, ed. J. Edling (U.S. Department of Health, Education, and Welfare, 1960), p. 44.

[2]George J. Wischner and Ivan H. Scheier, "Some Thoughts on Television as an Educational Tool," The American Psychologist, X, No. 10 (October, 1955), 613.

were, for the most part, learning as much from televised instruction as from conventional instruction. Then, too, much of the literature available was not systematized in these early years of television research. It was in 1956 that Kumata's important systemized compilation of the research, An Inventory of Instructional Television Research, appeared. Among the major findings were the following: (1) no significant difference between the achievement scores on subject-matter tests of television students as compared to the conventionally taught students; (2) no significant differences between the two groups was commonly found after administering short-term-retention subject-matter tests; (3) no definite information was obtained to indicate whether there existed significant differences in attitude change or critical thinking.[1]

In the years 1956-60, the research reports continued to mount as new institutions designed experiments similar to those in the first half of the decade. By the end of the decade, research studies of television's effectiveness numbered several hundred and included all kinds of subject matter.[2] Reports of "no significant

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[1]Hideya Kumata, An Inventory of Instructional Television Research (Ann Arbor, Mich.: Educational Television and Radio Center, 1956).

[2]Wilbur Schramm, "Mass Media and Educational Policy," Social Forces Influencing American Education, The Sixtieth Yearbook

difference" dominated the findings as it had the earlier ones. Ivey interpreted this to mean that a major barrier had been broken--that it ended the debate as to whether television could be used "as effectively as a teaching medium as the classroom teacher is being used at the present time."[1] Researchers started to question the findings of "no significant differences." In 1959, Greenhill suggested that the failure in finding significant differences might be the function of the single-variable studies commonly found in television research.[2] He theorized that "the effect of most single variables are too small to have any marked influence in learning."[3] Further, he believed that, since in a single-variable experiment it was possible for better control, it became even less likely for one to find a significant difference.

Acknowledging the fact that approximately 90 per cent of the gross comparisons between learning (information gain) in the

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the National Society for the Study of Education, ed. Nelson P. Henry (Chicago: University of Chicago Press, 1961), p. 216.

[1]John E. Ivey, Jr., "Review and Preview," College Teaching Television, ed. John C. Adams, C. R. Carpenter, and Dorothy R. Smith (Washington: American Council on Education, 1958), p. 161.

[2]L. P. Greenhill, "New Directions for Communication Research," Audio Visual Communication Review, VII, No. 4 (Fall, 1959), 245-53.

[3]Ibid.

television and conventional situation had indicated "no significant differences," Williams warned that the interpretation leading to a general acceptance of instructional television might be an erroneous one.[1] She delineated and discussed several factors which might have contributed to the failure to uncover significant differences: (1) Most comparative studies of television and conventional teaching, in an attempt to measure learning, used multiple-choice or true-false types of tests, which Williams noted take measure of information gain of no greater scope than the student's ability to recall specific information. (2) Related to the first is the matter of concomitant learning. Since the test instruments used to measure information gain did not evaluate the student's ability to apply the new information to entirely different situations, a major objective of education problem-solving has been left unresolved in the comparative evaluation. Williams claimed the findings of no significant difference to be open to question as long as information-gain evaluation does not also assess the concomitant learning. (3) Timing of the tests and the duration of most of the experimentation are noted as other interrelated factors contributing to the neutral findings.

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[1]Catharine M. Williams, "The Examination of 'No Significant Differences' that ITV Studies Report," Audio Visual Communication Review, X, No. 4 (July-August, 1962).

The fact that tests are administered directly at the conclusion of an instructional period and cramming by a student, especially at the college level, is a distinct possibility, probably confounding the findings. Williams suggested a long-term comparison encompassing many years of examination of both groups.

As a basis for analyzing the information available by 1960, Kumata compared the decade-end knowledge with that reported in his 1956 Inventory of Instructional Television Research.[1] He cited the research which continued to report no significant differences. However, at the elementary and high school levels Kumata noted that there had been an increase in the number of studies showing significant differences in favor in television.

Kumata reported the following as being suggested by the research: (1) Motivation for viewing television--whether the viewing is voluntary or captive--is an important factor affecting instructional television. It was often found that the voluntary audience situation results in the superiority of television, as compared with the captive situation. (2) Superiority of television is reported more often in those cases where subject-matter preparation and integration

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[1] Hideya Kumata, "A Decade of Teaching by Television," The Impact of Educational Television, ed. W. Schramm (Urbana: University of Illinois Press, 1960), pp. 176-92.

into a teaching process is more commonly carried out, as in the lower educational levels. (3) Intelligence is a factor in television learning, although it has not been clearly demonstrated what in instructional television causes differences in intelligence levels. (4) Attitude toward television and subject matter are prime factors affecting learning by students.[1]

In each of these preceding findings, it was Kumata's interpretation that motivation, subject-matter preparation and integration, and intelligence were factors influencing learning by television and not the television transmission itself. Kumata may well have been attempting to distinguish between two of the elements of the communication process--namely, the message and the channel, as discussed by Deutschmann.[2] Kumata continued his summary of the research for the period 1956-60 by commenting on interaction and talkback. These findings will be discussed in greater detail in the third section of this chapter.

In an important study, the intent of which was "to analyze and correlate pertinent research in the utilization of television in

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[1] Ibid.

[2] J. Paul Deutschmann, "Measurement in Communication Research," Introduction to Mass Communications Research, ed. R. O. Nafziger and D. M. White (Baton Rouge: Louisiana State University Press, 1958), p. 170.

the teaching-learning process," Holmes listed fifty-three results of his analyses.[1] These findings were substantially the same as those of Kumata. He observed that, although some conclusion information was available, there was much yet to be determined regarding television in the teaching-learning process.

Emerging from his study were three problems which Holmes believed needed to be done to improve instructional television research:

> First, there is a need for an accepted system of correlating results based on common definitions and explicit terminology. Second, there is a need for more accurate and sensitive instruments, and criteria for measuring learning. Third, there is a need for greater attention to and evaluation of learning from visual material.[2]

A Review of Communications and Learning Theory Related to Feedback

The purpose of this section is to survey the literature and to bring together a representative sampling of the theories, opinions, and observations which are related to the problem of the present

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[1]Presley Holmes, Jr., Television Research in the Teaching Learning Process (Ann Arbor, Mich.: National Educational Television and Radio Center, 1959), p. 80.

[2]Ibid.

study: feedback in instructional television. It is intended that this sampling will set the problem in its theoretical background.

Interaction, the give-and-take between teacher and student, is commonly accepted by educators as being a necessity in the learning situation so that clear and meaningful learning can take place. It is this lack of interaction in the television situation that critics of instructional television attack as being a serious detriment to learning by television.

From the communication theorist's viewpoint, interaction is a two-way communication process between the sender and the receiver. It is the return aspect of the process in the two-way flow of communication, either verbal or visual, that is called feedback; it is what tells the sender how his messages are being interpreted by the receiver.[1] According to Berlo, feedback provides the source (sender) with information concerning his success in accomplishing his objective.[2] In doing this, feedback exerts control over future messages which the source transmits.

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[1]Wilbur Schramm, The Process and Effects of Mass Communication (Urbana: University of Illinois Press, 1954).

[2]David Berlo, The Process of Communication (New York: Holt, Rinehart, Winston, 1960), p. 111.

Like so many other concepts in communication theory, the principle of feedback has its origin in electronics, in this case the application of mathematics to the study of telephony in the 1930's. Cherry defines feedback from this viewpoint:

> If a certain action is taken which has a certain result, and if this result departs slightly from some desired result, the difference is observed and caused to modify [feed back to] the initiating action by a suitable correction.[1]

In the classroom situation, the concept of the sender adjusting his subsequent messages according to the feedback from the receiver on his reaction to the earlier message can be likened to the teacher who revises his teaching because of the responses, both oral and visual, that the learner makes. Insel suggests that an instructor who does not have the opportunity to receive feedback to his ideas restricts his own learning potential.[2] At a 1959 National Education Association seminar on "interaction in learning," one participant, a college instructor, put it this way:

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[1]Colin Cherry, "Telecommunications--Its Social Background and Some Implications of Modern Developments," Communication Media and the School, ed. George Bereday and Joseph Lauwerys (Tarrytown, N.Y.: World Book Company, 1960), p. 84.

[2]Shepard Insel, "Learning via Televised Instruction," College Teaching by Television, ed. John C. Adams, C. R. Carpenter, and Dorothy R. Smith (Washington: American Council on Education, 1958), pp. 28-42.

> When I'm talking to a group, I'm constantly making judgments on the basis of certain feedback observations I get from the group. . . . I have to judge: I'm moving too fast, but I have only 35 more minutes. Will they get it if I move at this speed or shall I slow down? Shall I stop and go back and reiterate? Should I summarize? Should I change pace? Should I get a little more excited and get other people more excited?
>
> The regulating-controlling mechanism helps you gauge the level of difficulty in relation to the receptive capacity of the audience; you completely lose them by working at a level that is too difficult or abstract. You have to make judgments and you need feedback cues for that. The puzzled look, the individual who disengages from the conversation, and withdraws or even leaves the class--that kind of response tells you whether we are talking on the same wave length.[1]

Dunham, in summarizing the research in communication related to feedback, concluded that, "insofar as teaching is the communication of information from the instructor to the student, . . . learning will be at a maximum where feedback from the student to the instructor is also at a maximum."[2] He saw this principle as being especially appropriate where the information is of an abstract nature or where students are to learn to make applications of the learned material or to draw inferences. Theoretically at least, Dunham noted, feedback between student and teacher should be at a maximum where high classroom morale, good interpersonal relations between students and teacher, and changes in student attitudes and behavior are essential objectives.

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[1]Finette P. Foshay, p. 11.

[2]Dunham, p. 7.

To underscore these conclusions, Dunham reported an experiment conducted by Leavitt and Mueller in which a group of students were to produce the size and the shape of rectangular figures of equal areas but of varying shapes that were being communicated to them by the experimenter.[1] The students were placed in four groups, and in each group feedback was controlled to a different degree. These experimental conditions were: (1) zero feedback, where there was no contact with the experimenter whatsoever except for being able to hear the description of the figures; (2) partial feedback, where the students could communicate with the experimenter by facial expression; (3) partial feedback, where the experimenter could reply to students' questions by "yes" or "no"; and (4) free feedback, where students and experimenter had complete freedom of communication. The subjects were unable to see the geometric figures under all conditions of the experiment. Each of the four groups received each of the four treatments of feedback. The following conclusions were reported: (1) Feedback increases the accuracy with which information is transmitted. (2) Feedback

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[1]Harold J. Leavitt and Ronald A. H. Mueller, "Some Effects of Feedback on Communication," Small Groups: Studies in Social Interaction, ed. A. Paul Hare, Robert Bales, and Edgar F. Borgotta (New York: Alfred A. Knopf, 1955).

increases sender and receiver confidence in what they have accomplished. (3) Increased feedback results in more time spent in explanation. (4) Feedback experience improves subsequent zero feedback trials considerably. (5) Sender experience contributes more than receiver experience to improved accuracy of communication. (6) Zero feedback engenders hostility in the receiver. (7) Zero feedback engenders doubt in the sender.

Essentially, the communications approach to feedback says that feedback is the second half of the two-way flow in the communication act. Its function is to determine whether the message has been understood as the sender intended it to be. Communication theory views feedback as being interpersonal. (The response is overt.)

Some psychologists consider feedback within the broad behavioral concept of homeostasis and consequently feedback takes on an intrapersonal perspective. (The response is covert.) Although feedback in this case is intrapersonal, it still effectuates a response. Hilgard noted that in trial-and-error learning the organism adjusts with each succeeding response until the goal is reached.[1] Each

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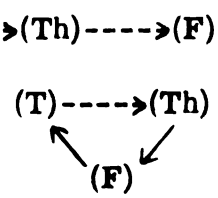
[1]Ernest Hilgard, Theories of Learning (New York: Appleton Century, 1956).

unsuccessful response is called a "provisional try." He continues with the observation that the "provisional try" implies that feedback corrects the provisional responses according to their response.

Mowrer, applying a cybernetics model to feedback, explains the concept in terms of open and closed systems. He uses Tustin's scheme to illustrate the point:



> Feedback loop (at bottom) contrasted with open control sequence (top). In a hypothetical heating system, the outside temperature (To) might be employed to actuate the thermostat control (Th) on the furnace (F) to adjust room temperature (T). But there is no provision for determining whether the room temperature has attained the level desired. This self-regulating principle is uniquely provided by the feedback circuit. Here the variable which is to be controlled, the room temperature, itself actuates the thermostat. It thus controls the performance of the furnace.[1]

Mowrer sees the relevance of this approach in helping to explain the mystifying characteristic of the living organism--self-adjustment. And, since machines have been constructed that are self-regulating, Mowrer feels that the principles involved in their make-up have inspired learning theorists to attempt to explain the

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[1]O. Hobart Mowrer, Learning Theory and the Symbolic Process (New York: John Wiley and Sons, Inc., 1960), p. 263.

adaptive capacities of living organisms by more objective means. Mowrer concurs with Hilgard by saying that the consequences of a response act back upon the organism by either increasing or decreasing the expectancy of it occurring in the future (law of effect).

Boulding takes the same position as does Mowrer.[1] He, in fact, talks about thermostats and furnaces also. But, taking it farther, Boulding relates feedback to a biological function of the organism that maintains a state of equilibrium of certain variables despite changing environmental conditions. The physiologist Cannon gave it the term "homeostasis."[2]

As applied to the Boulding concept of "image," it is the organic "thermostat" which acts on the environmental messages to tell whether the ideal of the image value system and the "outside" information conform. When it is the same it ceases to act. Whenever the value system (image) does not conform to the messages received, the "thermostat" acts to bring the two into agreement.

In the test-operate-test-exit (TOTE) concept of Miller, Galanter, and Pribram, the notion of feedback is extremely

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[1]Kenneth Boulding, The Image (Ann Arbor: The University of Michigan Press, 1960), p. 20.

[2]Ibid., p. 21.

essential.[1] In comparing the reflex theorists' use of feedback with their own, they caution that the reinforcement meaning of the reflex theorists should not be identified with the feedback in a TOTE unit. They explain the differences as follows:

1. a reinforcing feedback must strengthen something, whereas feedback in a TOTE is for the purpose of comparison and testing.
2. a reinforcing feedback is considered to be a stimulus (e.g., pellet of food), whereas feedback in a TOTE may be a stimulus, or information (e.g., knowledge of results), or control (e.g., instructions).
3. a reinforcing feedback is frequently considered to be valuable, or "drive reducing," to the organism, whereas feedback in a TOTE has no such value.[2]

Psychologists, aside from the intrapersonal perspective of learning, speak of learning in the teaching-learning process from the interpersonal aspect. Miller outlined certain fundamental factors in the teaching-learning process:

(a) Drive or as it is often called, motivation. The student must want something.
(b) Cue, or as it is often called, stimulus. The student must notice something.
(c) Response, or as it is often called, participation. The student must do something.

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[1]George A. Miller, Eugene Galanter, and Karl H. Pribram, Plans and the Structure of Behavior (New York: Henry Holt and Company, Inc., 1960).

[2]Ibid.

(d) Reward, or as it is sometimes called, reinforcement. The student must get something that he wants.[1]

Through feedback, reinforcement can take place. Reinforcement is an integral part of the S-R theory. The concept as defined by Glaser is that behavior is acquired as a result of a contingent relationship between the response of an organism and a subsequent event.[2] Vander Meer lists as modes of reinforcement: knowledge of results, the verifiability of information by the learner, the importance of repetition, the clarity of goal, and the differential effectiveness of reward and punishment.[3] He cautions that the animal-behavior-derived conception of reinforcement which states that reinforcement reduces a biological need may have little relevance to human learning. Reinforcement, Postman asserts, is able to convey to the learner punishment or reward.[4] But not only is punishment

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[1]Neal E. Miller, "Learning via Televised Instruction," College Teaching by Television, ed. John C. Adams, C. R. Carpenter, and Dorothy R. Smith (Washington: American Council on Education, 1958), pp. 28-42.

[2]Robert Glaser, "Learning and the Technology of Instruction," Audio Visual Communication Review, IX, No. 5 (1961), 45.

[3]A. W. Vander Meer, "Our Debt to Educational Philosophy," Audio Visual Communication Review, VIII, No. 5 (1960), 46.

[4]Leo Postman, "Human Learning and AV Education," Audio Visual Communication Review, IX, No. 5 (1961), 71.

and reward communicated so is needed information as well. Mowrer reports that the reward-or-punish effect from the feedback of a response impinges on the probable occurrence of a similar response.[1] If, on the one hand, the feedback is punishing it tends to weaken the response, while, on the other hand, a rewarding feedback tends to strengthen the response. Whether the feedback is considered by the organism as punishing or rewarding will depend in part of the relation of the feedback to the goal orientation of the organism. The promise of reward is a strong motivational force. Clearly, feedback, when it communicates reward and punishment to the organism, would seem to have some significant correlation with learning.

The factor of reinforcement, in this case reward, is inherent in the psychology of programmed learning. Actually there are two essential aspects: immediate, continuous reinforcement; and knowledge of results. There is continuous feedback in programmed learning which provides immediate reward when a correct response has been made to an item. Programmed learning, however, is a unique instructional tool in regard to reinforcement and knowledge of results being fed back immediately to the learner. In many other instances of the teaching-learning process the feedback is

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[1]Mowrer, p. 264.

delayed. Mowrer in discussing this point comments that when feedback (reinforcement), either rewarding or punishing, is delayed the rate and amount of learning are correspondingly reduced.[1] Glaser is in accord with Mowrer and states further that a delay in reinforcement may result in no learning at all.[2]

Krumboltz cites three studies in immediate versus delayed reinforcement which substantiate the desirability of immediate reinforcement.[3] Moreover, he says, active participation by the learner tends to increase learning.

Knowledge of results is also germane to a discussion of feedback. By means of feedback the organism can determine whether or not his response is considered correct. Determining the correctness of a response has implications for learning. Human subjects, the research has revealed, learn significantly better with than without knowledge of results.[4]

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[1] Ibid.

[2] Glaser, Audio Visual Communication Review, IX, No. 5, 48.

[3] John D. Krumboltz, "Meaningful Learning and Retention: Practice and Reinforcement Variables," Review of Educational Research, XXXI, No. 5 (1961), 540.

[4] Mowrer, p. 264.

This discussion of the theory related to feedback makes it clear that feedback is vital to the full success of the communication act and the learning process. Since the utilization of television as a medium of instruction encompasses both communication and learning, it would seem fair to conclude that feedback is an important consideration. Indeed, feedback in instructional television has been a consideration of educators and communicators beginning with the earliest applications of television in instruction. In the next section the literature germane to feedback in instructional television will be discussed.

Feedback in Instructional Television

In considering television as a potentially effective medium of instruction, many educators have been critical of the unidirectional characteristic of the medium. Both faculty and students have frequently objected to the severely reduced teacher-student interaction in instructional television.[1] Commenting on large-group instruction, which would include instructional television, Pulliam criticizes the lack of interaction which he says clarifies subject matter and

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[1]C. J. McIntyre and L. P. Greenhill, "The Role of Closed-Circuit Television in University Resident Instruction," The American Psychologist, X, No. 10 (October, 1955), 600.

attitudes for the student and gives the teacher feedback which assists him in evaluating the effectiveness of his lectures.[1]

Nasca concedes that there is little opportunity for discussion in televised instruction and even that opportunity decreases in direct proportion to the number of students.[2] Costello and Gordon claim the upper limits of the number of students who can effectively feed back in the television situation has not been tested.[3] They do, however, cite an example where four hundred fifth-grade students, as much as twenty miles apart, utilized a feedback system. Zorbaugh asserts that where there are a great number of viewing rooms the problem of feedback may well be insoluble.[4]

Still, an essential condition in learning theory is that there be interaction between the learner and the information to be learned, and between the learner and the teacher. The utilization of television,

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[1]Lloyd Pulliam, "The Lecture," Phi Delta Kappan, XLIV, No. 8 (May, 1963), 384.

[2]Donald Nasca, "How Good Is TV for Teaching Science?" Audiovisual Instruction, VI, No. 9 (November, 1961), 452.

[3]Lawrence Costello and George Gordon, Teach with Television (New York: Hastings House, 1961), p. 99.

[4]Harvey Zorbaugh, "Television--Technological Revolution in Eucation?" Journal of the Society of Motion Picture and Television Engineers, LXVI, No. 11 (November, 1957), 674.

unless provisions are made for intercommunication, places a serious limitation on this important condition for effective learning.

Niven sees intercommunication as being found in two forms:

a. Feedback between the teacher and the student so that the instructor can determine response and how the information he is presenting is received.
b. Intercommunication between teacher and student as a part of the total teaching--learning process for the purpose of clarification and practice through such methods as discussion and drill recitation.[1]

One of the results of this incongruity between the requirement for interaction and the one-way flow of information in televised instruction has been the strong recommendation by some researchers and theorists for investigation of this problem. A group of researchers who assembled at National Education Association headquarters in Washington suggested needed research in educational uses of the newer media.[2] Among the fundamental questions they raised was the important one of interaction in the newer media:

> What are the nature and significance of the interaction in teaching and learning between learner and teacher, learner and

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[1]Harold Niven, Jr., "A Glance at ITV Research," National Association of Educational Broadcasters Journal, XX, No. 3 (May-June, 1961), 55.

[2]Wesley C. Meierhenry, "Needed Research in the Introduction and Use of Audiovisual Materials: A Special Report," Audio Visual Communication Review, X, No. 6 (November-December, 1962), 307-16.

> learners, and learners and educational media? Can learning proceed satisfactorily without interaction? What is the place of participation and feedback in learning?[1]

Guba characterized learning as existing on three levels:

a. action level--the student on his own initiative teaches himself through suitable interval.
b. the reaction level--the student learns by reacting to the instruction of a teacher.
c. the interaction level--the student learns by interaction with the teacher and other students.[2]

In his critique of television research, Guba concludes that only the reaction level has been studied, and then only with respect to facts, but the other levels must also be investigated.

Since the television teacher has no face-to-face contact with the students during the telecast, the need for providing a substitute for normal teacher-student contact is paramount.[3] Schramm summarizes the general feelings of educators when he states:

> There must be opportunities for the student to speak and to be advised about performance, or to have his paper graded and criticized. In any television course, there must be a way for

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[1] Ibid.

[2] Egen Guba, "Ten Years of Research in Instructional Television," The North Central Association Quarterly, XXXV, No. 4 (April, 1961), 305.

[3] Television in Instruction: An Appraisal (Washington: Department of Audiovisual Instruction, National Education Association, 1958), p. 16.

the student to ask questions or to seek enlightenment from a teacher.[1]

A minority view can be found in an extensive study into the uses of television in the continuing education of the practicing physician. Frank discusses the liability of no feedback and the possible implications in televised postgraduate medical education.[2] He concludes that, because didactic methods are commonly used and have a place in postgraduate medical education, then seemingly the effect of unidirectional television presentation would be no more adverse than when didactic methods are used in face-to-face presentations. Frank does indicate, however, that medical educators in some places have attempted to ameliorate the problem by providing talkback systems of different sorts.

The National Program in the Use of Television in the Public Schools reports that the anticipated weakness of reduced interaction did not prove to be overwhelming.[3] It was found that a television

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[1]Schramm, in Social Forces Influencing American Education, p. 218.

[2]Jack B. Frank, "A Study of Television as a Channel for the Communication of Continuation Education to the Practicing Physician" (unpublished Master's thesis, Michigan State University, 1961), pp. 100-103.

[3]Elmer F. Pfieger, The National Program in the Use of Television in the Public Schools--A Report on the Third Year (New York: The Ford Foundation, May, 1961).

teacher who was continuously aware there were students at the receiving end of the transmission could personalize his teaching. Immediate feedback was not possible since the television programs were open circuit. Monthly meetings and telephone and mail reports from classroom teachers offered the opportunity to correct the shortcoming of no student responses.

Holmes indicated that it is possible to incorporate into instructional television programs provisions for stimulus, response, and reinforcement.[1] Television lessons, he observes, often elicit the covert responses which he claims critics of instructional television have largely ignored. The covert response, Holmes says, is not to be discounted in the teaching-learning process. Grosslight concurs with Holmes that covert activities within each student which cause him to question, criticize, and investigate on his own should also be considered as being important to learning in instructional television.[2] He observes that the frequency of questions might be

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[1]Presley D. Holmes, Jr., "Understanding Television: Significant Differences?" Audio Visual Communication Review, X, No. 4 (July-August, 1962), 258-59.

[2]Joseph H. Grosslight, "Conditions of Learning in a Closed Circuit Television System," College Teaching by Television, ed. John C. Adams, C. R. Carpenter, and Dorothy R. Smith (Washington: American Council on Education, 1958), pp. 42-48.

an indication, but still he wonders if the failure to ask questions indicates a lack of student participation.

At the University of Chicago, Bloom found that there was no correlation between overt participation in discussion and achievement in a nontelevision course. It was the covert participation which was the significant factor.[1] Tyler in commenting on Bloom's study concludes that the task of the instructor would seem to be to stimulate the covert processes regardless of the instructional method used.[2]

Holmes offers the notion that a covert response to a certain extent overcomes the objections of no participation on the part of the student.[3] He sees the central question, however, as really being the problem of immediate reinforcement of proper responses. He concludes that the student may well weather the "so-called loss" better than the teachers do.

In an observation with which many other educators agree, Dale points out that feedback does not seem to show up significantly

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[1]I. Keith Tyler, "Learning through Discussion," The Two Ends of the Log, ed. Russell Cooper (Minneapolis: University of Minnesota Press, 1958), pp. 258-59.

[2]Ibid.

[3]Holmes, Audio Visual Communication Review, X, No. 4, 259.

in television teaching where superior teachers are employed.[1] He interprets this to mean that the able teacher as a result of his previous experiences in the classroom can often anticipate the questions and reactions the students develop in certain instances. Evidence reported at the 1958 Purdue seminar supported this thesis.[2]

Despite these conflicting opinions and beliefs which on the one hand say that provisions for feedback are mandatory for effective learning and on the other hand state that, although feedback is vital, it can be overcome to a certain degree by building into television lessons stimuli that will elicit covert responses or by information that anticipates the students' reactions, various types of feedback systems have been conceived for incorporation in television programs.

A 1959 seminar of leading educators arranged feedback practices in instructional television along a continuum, beginning at one end with simulated interaction, next came quasi interaction, and then

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[1]Edgar Dale, "New Techniques of Teaching," The Two Ends of the Log, ed. Russell Cooper (Minneapolis: University of Minnesota Press, 1958), p. 199.

[2]Raymond Wyman, "The Purdue Findings," Audiovisual Instruction, IV, No. 3 (March, 1959), 94.

"live" interaction.[1] Simulated interaction is most frequently discovered in total teaching by broadcast television. A minimal amount of feedback is directed to the television teacher by means of examinations, letters to the station, or occasional interviews. The conferees expressed the viewpoint that besides the minimal feedback just described the only other kind of interaction conceivable is that which takes place within the learner. They are apparently speaking about the covert response mentioned earlier.

By utilizing a panel of students in the studio who ask questions at the end of the formal lesson which might be asked by the viewing audience, a quasi interaction is provided for the instructor. Sometimes questions mailed in by students are asked by the studio group. An extension of the idea of indirect question-asking is to have the television teacher in the studio with a class of students. The notion is that the studio group would supply feedback cues to the teacher typical of all students viewing the program. Some participants of the seminar saw value in this technique; others viewed it as interfering with learning, since the students being taught by television would be watching the teacher teaching another class, and

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[1]Finette P. Foshay, pp. 18-22.

the effect of direct communication between the television teacher and the viewing students would be lost.

"Live" interaction, the one most closely related to the present study, is categorized into two areas: discussion groups and instrumentation. Buzz groups and discussion groups are present in the classroom following the posing of a question or concept outline by the television teacher while the television screen is blank. The television teacher resumes the lesson after a stipulated time interval. A variation finds the lesson being terminated at a given time prior to the end of the class period, with discussions then taking place in each viewing situation. There were some educators who were not satisfied with the lack of immediacy in feedback from student to teacher. To solve the problem of immediacy, instrumentation was developed to permit instantaneous, live, two-way audio communication between classrooms and studios. For open-circuit television or where television is to be used in large-group areas, such equipment had little or no application. Instead, television teachers relied on telephone and radio circuits. However, for closed-circuit instructional television, numerous talkback systems were initiated. Carpenter and Greenhill, supported by several years of favorable experience, recommend that reciprocal audio be installed and used as supplementary equipment with all closed-circuit television

systems.[1] They estimate the cost in the range of two to three thousand dollars. The potential usefulness of a talkback system, Carpenter and Greenhill believe, justifies the expenditure.

At least one institution, Case Institute, has combined audio and video in their talkback system.[2] With a television camera in each viewing room, the television teacher is able to see the students for visual feedback cues while he is lecturing and during the time the audio portion of the feedback system is being utilized.

Brown has listed criteria for a technically advanced student response system which provides for continuous and intermittent feedback from the individual learner to the teacher (these are not limited to audio):

a. Be useful in measuring student responses to questions and assignments related to all significant course objectives, not simply those of information.
b. Stimulate constant, not intermittent, attention--by making every student liable to response at any time during the period.
c. Be useful in uncovering instances of lack of clarity in instruction at the point of occurrence and to provide guidance with respect to the pacing or level of difficulty.

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[1] C. R. Carpenter and L. P. Greenhill, "Facilities for Instructional Television," Educational Television--The Next Ten Years (Stanford, Calif.: The Institute for Communication Research, 1962), pp. 326-27.

[2] Ibid., p. 326.

d. Provide opportunities for instructors to assess immediately the nature and quality of the responses of the class as a whole as well as individual--perhaps simultaneously.
e. Provide residual data (paper records, tabulator scores for example) for later use or analysis.[1]

As noted in a previous discussion, the earliest investigations into television's effectiveness as a teaching medium were initiated by the military services. Similarly, the initial research in feedback in instructional television was reported by the military agencies.

A Signal Corps study (1953) was undertaken as a result of an earlier Army study which reported that, in mass training by television, intercommunication is not needed if a studio panel is utilized during the telecast and all trainees are given the opportunity to ask questions during "application periods" following the television lesson.[2] The Signal Corps investigated three methods. Three groups were arranged as follows: (1) a studio class and no intercommunication, (2) a studio class and a class in a remote classroom which had use of telephone-type handsets, and (3) no

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[1]James W. Brown, "Student Response Systems," Audiovisual Instruction, VIII, No. 4 (April, 1963), 214.

[2]Training Evaluation and Research Programs, Instructor-Student Contact in Teaching by Television (San Luis Obispo, Calif.: Southwestern Signal Corps Training Center and Camp, July 1, 1953).

class in the studio and students in a remote classroom with walkie-talkies. During the experimental period, researchers observed the trainees' behavior and at the conclusion of the experiment an evaluation form was given to the trainees. The results revealed that in the first treatment the students in the remote rooms had the impression the instructor was giving primary attention to the studio class. They reacted unfavorably to the experience. In the second method the students were kept involved and alert through the use of instructor questions. With no class in the studio, it was observed that the viewing room students were not at a disadvantage and they felt the instructor was talking to them personally. It was concluded that a studio audience was not desirable because viewing room students do not get the instructor's attention and that an intercommunication system helps students feel they are part of the class rather than onlookers.

Kanner reports that Army studies in 1953 showed that the elimination of questions and answers did not reduce learning.[1]

A 1953 Fort Monmouth study observed that communication between classroom and studio varied with the ability of the instructor.

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[1]Joseph H. Kanner, "Future Trends in Television Teaching and Research," Audio Visual Communication Review, V, No. 4 (Fall, 1957), 519.

The researchers concluded that intercommunication is not particularly needed with outstanding instructors.[1]

At Lowry Air Force Technical Training Center the television coordinator found that a talkback system was neither as helpful nor as necessary as originally supposed.[2] An analysis of questions asked by students revealed that 70 per cent of them would have been answered by the television teacher if they had been held because they were already included in the lesson. Another 20 per cent were irrelevant to the topic and were reported to have disrupted orderly development of the subject. Acting as important indicators to the television instructor concerning deficiencies in the prepared lesson were the remaining 10 per cent. The Lowry television staff saw the value of the talkback system as being in evaluation of new courses. By recording and analyzing student responses, weaknesses in television lessons could be corrected and thereafter the course could be taught without the provision of talkback.

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[1]The Signal Corps, Fort Monmouth, New Jersey, "Teaching by Television--A Report on the Experimental Use of Television in Technical Military Training--1953," Audio Visual Communication Review, V, No. 2 (Spring, 1957), 496.

[2]"Technical Training by Televised Instruction" (United States Air Force Air Training Command, Lowry Technical Training Center, Denver, Colorado, n.d.). (Mimeographed.)

Caparo reports the results of a study of the effect two-way communication has on learning and attitudes in a television course for air science students.[1] Four groups of thirty cadets each were assigned to four television viewing rooms; two rooms had talkback facilities, the other two did not. No significant difference between the talkback and no-talkback groups was found on the results of an objective-type examination on weapons information and on an attitude scale. Caparo concludes that there is no basis that opportunities for asking questions affects informational learning or attitudes toward television instruction.

In Cincinnati, a series of television experiments were conducted during two consecutive school years, 1957-58 and 1958-59.[2] Ninth-grade biology students in four different schools were the subjects. The four schools were selected to represent one school with students of general above-average ability, two schools of general average ability, and the fourth school of general below-average

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[1]Thomas C. Caparo, "A Study of the Effects of Class Size, Supervisory Status, and Two-Way Communication upon Learning and Attitudes of AFROTC Cadets in a Closed-Circuit Television Instructional Program" (unpublished Doctoral dissertation, Pennsylvania State University, 1956).

[2]James N. Jacobs and Joan K. Bollenbacker, "Teaching Ninth Grade Biology by Television," Audio Visual Communication Review, VIII, No. 4 (July-August, 1960), 187.

ability. In the 1957-58 experiment, an opinionaire showed that the students in all the schools felt a greater opportunity to ask questions in the conventional classroom than they did in televised instruction. But in the 1958-59 experiment, only the students in the above-average-ability school continued to have the same feeling. The authors believe there was a reduction in the reaction to the opportunity to ask questions because the 1958-59 telecasts were shorter, which allowed for questions and discussion immediately following the tele-lesson. The follow-up period had not been available to the students in the 1957-58 experiment.

In a similar study conducted earlier (1956) in St. Louis, ninth-grade students in a science class and in an English composition class were queried as to their opinions about not being able to ask questions in instructional television situations.[1] In answer to the question, "How much did you miss the opportunity to ask questions?" the students in the science class divided their replies as follows: a great deal, 46.4 per cent; a little, 38.6 per cent; not at all, 15.0 per cent. The students in the English composition class

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[1] St. Louis Education Television Commission, An Investigation of Television Teaching (St. Louis: St. Louis, Missouri, Public Schools, September, 1956).

replied: a great deal, 62.9 per cent; a little, 25.0 per cent; not at all, 12.1 per cent.

The arrangement of a discussion session directly following a television lecture in a general psychology course was examined by Greenhill, Carpenter, and Ray.[1] Some groups of students had a fifteen-minute discussion led by a graduate student. The television teacher had "starter" questions for the graduate student should it be necessary to instigate a discussion. Some other groups, through a technique called "vicarious" discussion, observed a discussion by means of television conducted by the television teacher with a group of eight students in the originating room. The remaining groups of students had no opportunity for discussion of any kind. They were permitted to study notes and textbooks or to leave the classroom.

Analysis of the results revealed no significant difference in academic achievement or in general attitude toward the course. A significant difference was discovered in attitude toward discussion arrangement. Students in the live discussion were more favorably inclined than were those who observed or who did not have any

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[1] L. P. Greenhill, C. H. Carpenter, and W. S. Ray, "Further Studies of the Use of Television for University Teaching," Audio Visual Communication Review, IV (1956), 205-6.

discussion. Replication of the study in two different class sequences disclosed similar results.

In a somewhat similar study, Barrow and Westley had one student group exposed to a teacher-led discussion following a broadcast while another group did not have any discussion.[1] An immediate-recall test was administered which produced no significant difference in scores between the two treatments.

Holmes reviews several studies specifically related to feedback.[2] He reports a study which shows that students decidedly preferred talkback, but less than 1 per cent of the students actually made use of the facilities. In another study, Holmes cites the finding that television students are reluctant to ask questions as compared to conventional students, while another study reveals that students never used the talkback, but rather favored a suggestion box. A final report indicates that 32 per cent of the students felt they were able to communicate with the television instructor as well as or better than the conventional class. Electronic talkback hampered interaction, the other 68 per cent believed.

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[1] Lionel C. Barrow and Bruce H. Westley, "Comparative Teaching Effectiveness of Radio and Television," Audio Visual Communication Review, VII (1959), 23.

[2] Holmes, Television Research in the Teaching Learning Process, p. 61.

Student reaction to the general problem of asking questions in televised presentations was reported by New York University.[1] In response to the query, "How do you feel about not being able to raise questions during the TV presentation?" students in five courses answered (figures in per cents):

Course	It was good		It was not good		Do not feel strongly either way		No answer	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
A	17	19	75	58	8	23	0	0
B	12	19	82	62	6	18	0	1
C	57	50	39	37	4	13	0	0
D	45	65	46	18	8	16	1	1
E	44	38	40	49	8	13	8	0

The percentage of students who disapproved at the beginning of the course dropped at the end of the course in all cases except one, while the percentage of those who approved at the start increased in three of the five cases at the conclusion of the course. The percentage of those students who did not feel strongly either way increased in all five courses. These results led the researchers to conclude:

> Television has here failed, as has conventional instructional television before it, to settle the questions-versus-no-questions

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[1] Hope L. Klapper, Closed-Circuit Television as a Medium of Instruction at New York University--1956-57 (Fund for the Advancement of Education, 1958), p. 53.

controversy. It is, nonetheless, interesting to find that students disliked it far less than they expected.[1]

At the State University of Iowa, three discussion methods involving a television group, a large lecture group, and small discussion groups were examined against five criteria by Becker, Murray, and Bechtoldt.[2] One of the criteria was to compare the three discussion methods on the basis of the average number of student participants and the average number of different students participating each day during a sample period in each of two semesters. For the sake of comparison, so that each group had approximately equal numbers of students, the participations of the three small discussion groups were combined. On the average number of participations there was no significant difference among the three treatments in the first semester, but there was a difference in the second semester. However, this was attributed to the greater number of students in the television and lecture groups than in the combined small discussion groups, a condition which was not present in the first semester.

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[1] Ibid., p. 54.

[2] Samuel Becker, James Murray, and Harold Bechtoldt, Teaching by the Discussion Method (Iowa City: State University of Iowa, 1958).

Findings on average number of participants were similarly confused. Becker and his associates attributed this to the numbers of students not being closely equal and to differences in the manner in which the discussions were conducted in each of the three groups. Nothing of value could be derived from this part of their analysis.

In the large discussion group it was hypothesized that the students sitting closest to the instructor would participate to a greater degree than those seated at the rear of the room. Analysis of the data disclosed that there were no significant differences between the average daily participations or number of participants in the front or rear sections of the classroom.

The television discussion group was comprised of three sections--one in the studio and two in viewing rooms. The average number of participations and the average number of students participating were compared for each of these three sections. The studio group participated to a greater extent on each of these criteria than either of the viewing room groups. The researchers concluded, "It would appear that it was much easier for those students in the studio to participate and/or they were much more motivated."

A conclusion drawn by Becker et al. from this experiment and other experimentation carried out at the State University of Iowa

during 1954-55, 1955-56, and 1956-57 was that closed-circuit television neither deterred nor aided discussion with seventy-five to eighty students.

A 1958 Pennsylvania State University instructional television research report reveals some of the most important findings about talkback in instructional television.[1] Among the findings is one concerning the extent of the use of the audio communication device: "The extent of its use in courses has been a function of the degree of encouragement to ask questions that students have received from their instructor, the nature of the course, and the manner and style of the instructor's work."[2] In courses of detailed and precise information, frequency of questions was greater than in courses dealing with general principles. It is in the former type of courses that it was believed the system had value in learning, but this still needed to be established.

Furthermore, the authors of the report hypothesized that students who had questions sought sources of information other than

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[1] C. R. Carpenter and L. P. Greenhill, Instructional Television Research Report Number Two (University Park: The Pennsylvania State University, 1958).

[2] Ibid., p. 48.

the instructor. They interpret this to mean that television might be used to force students to more work on their own.

The use of the talkback system had little or no influence on student achievement in most courses. But both students and faculty liked having a system available for their use. The authors saw the presence of an intercommunication system as being important in gaining acceptance for the use of television.

The report cautioned that question-and-answer responses are different from and should not be confused with detailed and extended discussion.

Television for direct instruction at the college level has been used by the State University College at Brockport, New York, since 1956. From the beginning, two-way audio communication has been an integral part of all direct, total teaching telecourses.[1] Two typical comments by television instructors regarding feedback are those of Thomas and Emmerson:

> Students who normally feel free to ask questions and give opinions in an ordinary class are very often hesitant to use the talkback system to communicate with the instructor in the studio. Thus the instructor has more difficulty judging how well he is pacing the presentation. Students have much more difficulty

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[1] How Instructional Television Works in New York State (Albany: The University of the State of New York, The State Education Department, 1958).

> trying out their ideas and interpretation on the instructor than they would have in the usual classroom setting.[1]
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> On questionnaires administered after the course of the students' only negative comments were related to the lack of opportunity to ask questions. After the televised experience students were almost unanimous in their approval of televised instruction.[2]

Comprehensive television research reports often have a section devoted to faculty reactions to instructional television. Many reports, such as those from Miami University,[3] San Francisco State College,[4] and Pennsylvania State University,[5] frequently quoted faculty statements which underscore their reservations about the problem of student feedback in the television situation. Several

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[1]Murray Thomas, in Instructional Television Summary (Brockport: State University of New York, Teachers College at Brockport, June, 1958), p. 12.

[2]Harold Emmerson, in Report on Instructional Television (Brockport: State University of New York, College of Education, Brockport, August, 1961), p. 9.

[3]F. Glenn Macomber and Laurence Siegel, Final Report of the Experimental Study in Instructional Procedures (Oxford, Ohio: Miami University, 1960).

[4]Robert Dreher and Walcott Beatty, Project Number One--An Experimental Study of College Instruction Using Broadcast Television (San Francisco: San Francisco State College, 1958).

[5]C. R. Carpenter and L. P. Greenhill, Project Number One --An Investigation of Closed Circuit Television for Teaching University Courses (University Park: The Pennsylvania State University, 1955).

papers delivered by television teachers at a 1957 conference sponsored jointly by the American Council on Education and Pennsylvania State University clearly indicated disappointment in the void created in teaching without students present in the same room.[1] Occasionally, however, there are reports such as those from the College Faculty Released Time Program for Television Instruction[2] and a superintendent's seminar on educational television[3] that say the reduced communication between student and teacher can be overcome, negating to a certain degree the lack of interaction in instructional television.

A recent experiment (1960) conducted at Ohio University by Johnson is one of a very few that directly attack the problem of feedback in instructional television.[4] The purpose of this experiment was to determine whether a student studio audience affected an instructor's effectiveness as he taught over closed-circuit

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[1]John C. Adams, C. R. Carpenter, and Dorothy R. Smith (eds.), College Teaching by Television (Washington: American Council on Education, 1958).

[2]Meany, pp. 54-64.

[3]The Superintendent's Viewpoint on Educational Television (New York: Thomas Alva Edison Foundation, 1959), p. 28.

[4]F. Craig Johnson, "Feedback in Instructional Television," The Journal of Communication, X, No. 3 (1960), 140-46.

television--the idea being that the group would serve as a feedback source. The transmission of information was the objective of the lecture. Eight classes of twenty students each received a 25-minute lecture via television from eight different lecturers. Half of the classes viewed the lecture while an audience was seated in the studio, whereas the other half viewed the lecture with no studio audience to provide feedback to the instructor. Four instructors lectured with a studio audience, while the four other instructors did not have any students present in the studio. A pretest and a posttest of an achievement type were administered to the receiving room students.

The analysis of the test scores of the two viewing groups--that is, of one which received a lecture before a studio audience and the other which had received a lecture presented with no studio audience--revealed no significant difference. The conclusion drawn was that an instructor is equally as effective with or without a studio audience under the conditions of this experiment.

The following are Johnson's concluding remarks:

> As the process occurred in this experiment, feedback is of no value in communication. However, since the circumstances in which feedback occurs vary greatly from one situation to another, the writer does not regard the result of this experiment as constituting evidence for doubting the value of feedback generally. The experiment does establish, however, that any

assumption that feedback is always beneficial should be rejected. Further experimentation in this area is advisable.[1]

Another recent experiment (1961) was reported by Wolgamuth, who compared three techniques of student feedback.[2] Undergraduate students were assigned to four experimental groupings: (1) a control group for which there were no provisions for immediate communication from student to teacher; (2) a viewing group which was to be represented by a studio group whose reactions would provide vicarious participation; (3) a viewing group with two-way audio communication which the television teacher controls; and (4) a group for which communication with the teacher was provided by an electrical device which informed the television teacher whenever one-third or more of his students, acting individually, pressed one of four buttons (slow down, pace too slow, repeat, explain further). Each group was given one week's instruction comprised of five 50-minute lectures.

Five learning and three attitude null hypotheses were stated. All learning hypotheses (null) were accepted which implied that

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[1] Ibid., p. 146.

[2] Dale Wolgamuth, A Comparative Study of Three Techniques of Student Feedback in Television Teaching: The Effectiveness of an Electrical Signal Feedback System (Title VII; Office of Education, U.S. Department of Health, Education, and Welfare).

under the conditions of this experiment the provision for student-to-teacher feedback had no significant effect on learning nor on retention of learning. The analysis of the attitude data revealed that teacher effectiveness, as perceived by students, was not affected because feedback systems were provided.

In his final paragraph, Wolgamuth summarizes thus:

> It is not believed that the results reported herein, should be taken as a basis for rejecting feedback theory. It is true that these results are consistent with the experience of other experimenters. Nevertheless, the apparent plausibility of the feedback notion would suggest that the experimenters lack sufficient empirical insight into the subject to warrant the broad and general experimental condition devised to test the theory.[1]

The electronic feedback equipment used in Wolgamuth's experiment to record and analyze student responses is presently enjoying a resurgence of interest.[2] A 1963 article by Brown[3] described six response-analysis systems of various complexity, and Twyford lists fifteen.[4] Carpenter and Greenhill recommend that

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[1] Ibid., p. 20.

[2] Carpenter and Greenhill, in Educational Television--The Next Ten Years, p. 326.

[3] Brown, Audiovisual Instruction, VIII, No. 4, 214.

[4] Loran C. Twyford, "Profile Techniques for Program Analysis," Audio Visual Communication Review, II (1954), 243-62.

response analysis deserves further development.[1] MacLean comments that a design for such a system can be found in Wolgamuth's report but then critically remarks, ". . . which, so far as the evidence indicates, won't help much anyway."[2]

An interesting observation was made by participants at a National Education Association seminar who, in identifying limiting factors in television use in education, pointed to the problem of feedback as being the result of trying to do total teaching by television. Television instruction, they felt, should be supplementary. If television is to be used as a total teaching medium they recommended it be supported by study guides, feedback arrangements, and much individual help from the classroom teacher, and only then would it be justifiable to teach a subject area totally by television.

Kumata, in a review of the television research during the period 1959-60, had these comments regarding, as he put it, "the question of feedback":

1. Students desire feedback facilities and gives them greater willingness to take a course by television.
2. Talkback facilities are seldom used by students.

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[1]Carpenter and Greenhill, in Educational Television--The Next Ten Years, p. 327.

[2]Malcom S. MacLean, "Critical Analysis of 12 Recent Title VII Research Reports," p. 11. (Mimeographed.)

3. When talkback facilities are not available, student evaluation of television is negative.
4. There is no significant difference in achievement as a result of talkback being present.
5. Two-way audio and video does not affect achievement.[1]

Kumata raises the question as to the extent to which sheer opportunity to talk is an adequate substitute for interaction. He concludes, based on the research results, that it is not, and suggests that interaction is probably best met in the discussion session following a television lesson by a teacher in the classroom.

Holmes in his comprehensive study of television research was able to draw these conclusions from findings related to feedback:

1. In comparisons indicating differences in achievement and information gain show that: (a) one-way television is slightly favored over large-lecture type classes, (b) small-discussion type classes are slightly favored over one-way television, (c) small-discussion type classes are greatly favored over television with audio feedback, (d) small-discussion type is favored over small-discussion type originating rooms, and (e) one-way television is slightly favored over printed matter.
2. There is significantly greater gain in critical thinking and problem-solving under conventional conditions than there is under one-way television, particularly for high intelligence students.
3. Face-to-face interaction produces positive changes in group structure, attitudes, and socialization than does one-way television, but television can stimulate and enhance the process.
4. There is little relationship between students' information gain, and their attitudes toward the communication condition.

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[1]Kumata, in The Impact of Educational Television, pp. 176-92.

5. Students express a preference for talkback facilities in television conditions, even though a very small percentage of the students use them to ask questions or communicate with the instructor.
6. In the opinion of students, small classes are more important than the communication condition, i.e., they prefer small one-way television receiving rooms to large lecture halls.
7. Instructors are greater indices of student learning than are the communication situations.[1]

In the discussion following his conclusions, the above being only a few, Holmes states that it is possible that class size and the student awareness of the physical equipment necessary to communicate with the instructor might be contributing factors affecting both the students' use of talkback and their achievement.

Summary

Reviewed in this chapter was the literature of three major areas pertinent to the problem of the present study--feedback in instructional television. The three areas reviewed were: (1) the general findings related to the effectiveness of instructional television, (2) feedback in learning and communication theory, and (3) specific studies and information related to feedback in instructional television.

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[1]Holmes, Television Research in the Teaching Learning Process, p. 61.

The earliest investigations of television as an instructional medium were undertaken by the military services in the 1940's. At first the military directed their attention toward equipment development and application, but by 1949 the emphasis was placed on theoretical problems of using the medium for training purposes. Educators largely overlooked the military findings, probably because the educators were not willing to equate training with education.

By 1950, educational institutions and agencies began to investigate the possibilities of utilizing television for instruction. The first half of the 1950-60 decade saw numerous research results published. A 1956 systemized compilation of the research made it evident that students at all levels of education were, in the main, learning as much from televised instruction as from conventional methods; "no significant difference" was the general finding.

In the second five years of the decade a profusion of research reports continued to appear in the literature supporting the claim of "no significant difference." But by the end of the decade researchers and educators were seriously questioning the findings of no significance. Several hypotheses were offered suggesting possible reasons for the failure to find significant differences in learning between television and conventional means. It was apparent there is a need to improve instructional television research.

In the review of communication and learning theory, it was shown that feedback is an essential aspect of both. Communication theory views feedback as being interpersonal (overt). As found in the communication process, feedback is either verbal or visual and it tells the sender whether the receiver understood the message as it was intended. The sender's future messages are usually conditioned by feedback from previous messages.

Feedback in learning theory is both interpersonal (overt) and intrapersonal (covert). From the interpersonal perspective, feedback is considered integral to reinforcement, reward, and knowledge of results. References to learning theorists indicated the application of reinforcement, reward, and knowledge of results to be important to the teaching-learning process. From the intrapersonal view, feedback was shown to be an ingredient in the behavioral concept of homeostasis. Behavioral adjustments in trial-and-error learning and to environmental conditions are the result of biological feedback messages within the organism. The importance of feedback in the learning situation was demonstrated to set the theoretical background for an understanding as to the reason feedback in instructional television is one worthy of investigation.

Evidence for the need of feedback in instructional television was cited. Opinions of teachers, students, and authorities in

television were discussed. There were some citations which nevertheless reported that the lack of feedback could be overcome by using experienced, superior teachers as television teachers employing delayed feedback methods and by incorporating in television lessons provisions for covert responses. A case was made for the place covert responses have in learning, and that all student responses need not be overt. Feedback practices were arranged by educators along a continuum, from simulated interaction at one end to quasi interaction in the middle, and at the other end "live" interaction.

"Live" interaction is the practice most relevant to the present study. Instrumentation in the form of instantaneous two-way audio intercommunication between the television teacher and the students has been developed to provide for "live" interaction. Not many studies have dealt directly with the problem of feedback, but those reviewed generally found that students desire feedback facilities but seldom use them; there is no significant difference in achievement as a result of feedback facilities being present; the use of feedback facilities is a function of teacher encouragement, the nature of the course, and the instructor's style; discussion periods following a television lesson had little effect on learning;

and that more experimentation is needed in the general area of feedback and of feedback in instructional television in particular.

It is the disparity between theory stating feedback is essential to learning and television studies indicating that certain kinds of learning will take place under limited or even nonexistent overt feedback conditions that prompted the present study to be attempted. Greater insight into the problem is needed.

CHAPTER III

EXPERIMENTAL METHODS AND PROCEDURES

The Setting of the Study

The course

At the State University College at Brockport, New York, each student is required to take the course Psychology 100, "General Psychology," regardless of his major area for the bachelor's degree. All entering students are assigned to a section which meets for one hour, three times per week, and carries three semester credits. Of the twenty-five sections of Psychology 100 in the fall, 1962, with an enrollment of 573 students, three sections with a total of 75 students were assigned to television instruction and another section was designated a control (conventional instruction) section. These sections constituted the subjects for the present study.

In a course description on file with the Psychology Department, Psychology 100 is described as follows:

> An introduction to the basic principles of scientific psychology. Provides the student with a foundation for further study of behavior. Attention is focused upon the concepts of motivation, perception, learning, and adjustment.

Each hourly session was televised except during the first and last weeks of the course or whenever examinations were administered. This course was appropriate for experimentation because: (1) it was a required course and the students, who were freshmen, were assigned to the sections rather than having a choice of any of the offered sections (students at Brockport have tended to avoid television courses); (2) it was a course taught by television in several prior semesters at Brockport and one which was considered by faculty to be effectively taught by television; (3) it was a course which usually has had at least a "normal" amount of interaction between students and instructor; and (4) it was an introductory course having as a prime objective the presentation of informational matter.

Instructional staff

The television sections and the live section were taught by the same instructor. The instructor, aside from having taught this course for many years, had had experience in teaching the course by television during two prior semesters. The instructor was selected not only on the basis of his knowledge and experience but also because it was felt that he had a favorable predilection for

research and an open-mindedness and flexibility necessary for experimentation.

Physical facilities

Each television section viewed the telecasts in its own separate classroom. The classrooms are regular college rooms (with movable armchairs) which are equipped with a 24-inch television receiver, a speaker system, and a talkback system. One important reason Brockport uses viewing rooms instead of a large lecture hall is to keep section size to normal numbers of between twenty and forty students per section. The notion is that there will be greater use of talkback from a number of small groups than from a single large-group viewing situation, since the size of the class is more nearly like the conventional class. The present study to a certain extent put this notion to a test in that it measured frequency of responses between small television sections and the conventional section. Furthermore, the comparison between small-numbered television sections and a regular and equal-numbered conventional group would seem to make a comparison between two such groups a fairer one.

The ease with which students in the television viewing rooms could make oral responses to the television instructor in the studio

was important to the present study. The talkback facilities in use at Brockport make it comparatively simple for a student to converse with the instructor.

In each viewing room there is a talkback box with a three-position switch: normal, call, and talk. When the switch is in the normal position nothing happens; it is as if there were no talkback at all. When the switch is placed in the call position a signal light is activated in the studio directly under an identifying room-number sign for that particular room. Finally, when the switch is in the talk position any student in the room, by speaking directly toward the front of the room where the television set is positioned, can be heard by the instructor in the television studio and by all the students in the other viewing rooms. The student need not stand nor move in any manner from his seat. In order to hear the instructor's reply or following comments, the switch must immediately be placed back into the normal slot.

In actual use, when a student has a question or wishes to contribute a comment he instructs the talkback box operator--another student in the front right side of the classroom where the box is located--to indicate his desire to respond by calling to the operator "question" or "comment." It is at this moment that the student operator places the switch on the box into the call position.

When the lamp in the studio is lighted by the activation of the switch in the classroom, the room number is relayed to the instructor by means of hand signals. It is now the prerogative of the instructor as to the precise moment he wishes to recognize the signal; it is very much akin to the situation in the classroom whenever a student raises a hand.

The television instructor may, whenever he desires, query or present a problem to the viewing room students. An individual student may be called by name or by television room number or the instructor may make no definite designation, thus allowing any student in any room to answer. Under the conditions of the present study, the instructor was asked not to call on individuals or rooms since it was the intent of the investigation to discover which students responded of their own volition.

The face-to-face feedback situation took place in the conventional classroom where the students sat in desk-chairs arranged in five rows. The room had a seating capacity of approximately forty students. An instructor's desk and a chalkboard were located in the front of the classroom. With one exception, teaching techniques and class procedures were as the instructor would normally have it. In order not to contaminate the data, the instructor was requested to recognize volunteers only.

The Population and the Sample

The population

The population included all freshmen students entering the State University College at Brockport in the fall of 1962 and all transfer students who had not had a course in general psychology. The students were males and females representing all the major areas--general elementary education, early secondary education, secondary education, and health and physical education--in which degrees are offered. The total number of students enrolled in the "General Psychology" course was 573; these were divided among and assigned to twenty-five sections, averaging 23 students per section.

The sample

Sections 10, 13, and 17 were designated by the associate dean as television sections, while section 6 was marked as the control group. The sample totaled ninety-five students, seventy-five in the three television sections and twenty in the conventional section. All the students in the sample completed the course; there were no dropouts. No student was absent more than three times during the semester. Absences exceeding three automatically require that a student leave the course.

The Design of the Experiment

The experimental design was structured to compare the feedback of two groups. One group was designated the television group (experimental) and had to make use of an electronic audio intercommunication system to talk to the instructor. The other group was designated the conventional classroom group (control), and feedback was in the normal face-to-face situation of students sitting in the same classroom as the instructor.

The same instructor taught both groups. The purpose was to reduce the contamination of the instructor variable in the experimental design. He instructed the television group at ten o'clock in the morning and the conventional group at one o'clock in the afternoon of the same day. The instructor was asked to keep his lesson content to both groups as similar as possible on the same day. The class met three days a week. The same visuals, experiments, and vignettes were to be given to the two groups. At any time that one group's meeting had to be canceled, the other group's period was also dismissed in order to keep both groups at exactly the same juncture in the course curriculum. On the basis of experience and the literature, it was theorized that by having the instructor teach the television group prior to the conventional group

there would be less chance of the instructor altering his second presentation because of feedback cues from the first. Furthermore, it was believed that by having the second presentation on the same day and scheduled as close to the first as possible, alteration of the second lesson would be minimized.

The primary independent variable under study, of course, was the mode of feedback: electronics system versus face-to-face. From among the many independent variables with possible effect on feedback, three were selected which the experimenter felt were both practical and significant to the purpose of the study. These three independent variables were: (1) preference for instructor by the students; (2) a personality characteristic of the student, namely extrovert-introvert; and (3) ability level of the students.

Preference for instructor, and whether a student received or did not receive the type of instructor he preferred, was theorized to be a probable factor affecting the feedback behavior of a student. For example, a student who had an instructor with the characteristics he preferred might like the course more than a student who did not have the type he preferred, and consequently the former student might participate at a greater rate than the latter student. In the same way it was theorized that the personality trait extrovert-introvert might be a possible factor influencing the feedback of a

student. An extrovert because of interest in external objects and actions might be expected to respond more than the introvert in a learning situation. Similarly, the ability of students was theorized to be a possible variable impinging on the feedback of a student. The high-ability student might be expected to respond because he is more inquisitive, while the low-ability student might respond for the reason that he finds it necessary to seek information to better understand a concept.

The instruments used to measure the independent variables are discussed fully under the heading "Evaluation Instrument" later in the present chapter.

Since the major purposes of the study were (1) to discover whether differences in feedback exist between a television-taught and a conventionally taught course of the same subject matter and (2) to determine whether student characteristics are factors influencing feedback, it was considered that the dependent variables most appropriate were those of frequency of feedback and the nature of the feedback. Frequency was the quantity effect--the number of oral responses made by a student. The quality effect was the nature of the feedback to be evaluated according to selected criteria. Traditional instruments such as tests, scales, and opinionaires were of no value in measuring the criterion variables. Accordingly, a

method was devised to collect data for each of the criterion variables. These methods for obtaining the data will also be discussed fully under "Evaluation Instrument" in the present chapter.

Individual differences of the subjects in an experiment require some degree of control; otherwise these differences might be a factor affecting findings. Uncontrolled variables due to individual differences can be reduced by randomly placing the subjects into the experimental and control groups. In the present experiment, although not placed randomly according to research procedures, a student had an equally likely chance of being in either the television or the conventional group. A detailed discussion of this topic will follow in the next section.

The instructor variable as a source of error has been previously discussed to show the manner in which control was attempted (see Chapter I, assumption 3, page 21).

Inherent in an experiment of the present type is that class sessions randomly chosen as a sample for collecting the data related to frequency and nature of response might not be truly representative of all the class sessions. The particular course unit being taught at a given time could be a variable influencing the frequency and nature of student responses. Subject-matter units within a course are different from one another in terms of difficulty, mode

of presentation, and the instructor's own enthusiasm and interest, and for this reason student response might vary. Another variable affecting student feedback might well be the point of time in the 18-week semester. If student response is a function of time, it may be theorized that students respond more with each passing week of the semester because the personal relationship with the instructor grows; this extraneous variable might influence the results. In the present experiment these two variables were controlled by gathering data from all class meetings excluding the first and last weeks of the course, examination periods, and periods devoted mainly to showing motion pictures.

Provisions for replications were not considered for the present experiment. Although such provisions might enhance the findings by substantiating the results, it was not feasible because of extenuating circumstances. Using the present design, it was conceivable during the same semester to have another television group and control group taught in the same manner as the original study but using a different instructor. Because there was no other experienced television instructor assigned to this course during the fall, 1962, semester, a true replication would not have been possible. Since the same course when offered during the second semester has only one or, at best, two sections because of small enrollment, a

sufficient number of subjects for both experimental and control groups would not have been available to replicate the study in the subsequent semester.

Randomization Procedures

There are several methods of randomization available to the experimenter to act as a control of variables of the subjects not controlled for in the experiment. None of these procedures could be applied in the present experiment. Because of administrative problems and decision, class schedules of entering students are prepared in advance by the office of the associate dean. With students already assigned to sections, randomization by accepted research techniques was precluded. However, an inquiry into the procedure of the office of the associate dean for placing freshmen in class sections indicated that it came extremely close to providing a random sample of the freshman population.

The associate dean explained that the entering students were arbitrarily assigned to one of the twenty-five sections. Insofar as he was concerned, each student had an equal chance of being placed into any of the four sections involved in the present experiment.

To determine whether the assignment by this method had resulted in a disproportionate number of subjects of any one student

characteristic being placed in either the experimental or control groups, which would introduce a distortion factor in the statistical analysis, a chi-square was calculated (see Appendix B). There were no significant differences found for each of the independent variables.

Although some error may have been introduced into the sample because of the limited randomization procedure, it may be a fair conclusion to state that in consideration of the relatively small total number in the population (573), the approximately 16 per cent chosen as subjects for the present experiment are representative of students in the total population.

Evaluation Instrument

For the purposes of the present investigation, and because of the research design, measuring instruments as commonly used in many experiments were applied only to the measurement of the independent variables. The dependent variables--that is, frequency and nature of student responses--were recorded by tallying the responses made by each student and then by analyzing the responses. This section of the chapter will contain a description of the procedures involved in tallying and analyzing responses, and will describe the other evaluation instruments used in the study.

It will be recalled that the independent variables were: (1) the feedback system--electronic, or face-to-face; (2) ability level of the students; (3) preference for instructor by the students; and (4) personality characteristics of the student. A description of the feedback systems as defined for the present study were fully described earlier in this chapter under the subheading "physical facilities." To measure the independent variables, the following instruments were utilized:

1. Selective Admissions Test (SAT). The Selective Admissions Test is a form of the School and College Ability Tests published by the Educational Testing Service especially for the State University of New York. As the test name implies, it is used by State University Colleges as one diagnostic indicator of a student's capacity to undertake academic work in college. All students entertaining the idea of attending any of the units of the State University are required to take the SAT. The SAT measures two kinds of school-related abilities deemed important in college endeavors--verbal and quantitative; it yields a verbal score, a quantitative score, and a total score. It was the total score which was used in the present study as a measure of an individual's ability. Using the Kuder-Richardson Formula 20 as an estimate of total

score reliability, it was found to be at least .95 when applied to several samples.

2. Preferred Instructor Characteristics Scale (PICS). The Preferred Instructor Characteristics Scale was developed by Farquhar and Krumboltz to determine a student's preference for instructor on a "cognitive-affective" continuum of instructor characteristics.[1] The cognitive instructor is described as being concerned with the intellectual, abstract, subject-matter goals of teaching; the affective instructor as being more concerned with emotional adjustments and student interaction in the classroom. The scale is comprised of thirty-six items; in each item one of six cognitive statements believed to be characteristic of this type of instructor is paired with one of six affective statements believed to be characteristics of this type of instructor. Each statement of the one type is paired with each statement of the other type. In responding to the paired items, the subject is required to choose the one statement he prefers most; he must make a choice--no item is allowed to be left unanswered. A high score on the PICS

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[1]John D. Krumboltz and William W. Farquhar, "The Effect of Three Teaching Methods on Achievement and Motivational Outcomes in a How-to-Study Course," Psychological Monographs: General and Applied, LXXI, No. 14 (1957), 15-16.

indicates that a student prefers a cognitive type of instructor, and a low score indicates a preference for an affective-type instructor. A test-retest reliability coefficient of .88 is reported by the authors, and a test reliability of .90 when computed by Hoyt's analysis of variance.

The PICS was administered to the subjects of the present study on the first class meeting of the semester. It was also given to former students of the instructor during the tenth week of the semester.

3. The Personality Inventory (TPI). The Personality Inventory is a measure designed by Bernreuter. It has been used successfully with high school students, with college students, and with adults. Six personality traits can be measured on each of six separate scales. The choices--"yes," "no," and "?"--in each of the 125 items are assigned weights from plus 7 to minus 7 depending on the trait to be scored. The individual's score for any one trait is the algebraic sum of the weights which correspond to the responses made by the individual.

For the present study, the scale B3-I (a measure of introversion-extroversion) was used. Students scoring high tend to be introverted, while those scoring low tend to be extroverted. Bernreuter describes introverts as being imaginative and tending to live

within themselves.[1] He says extroverts "rarely worry, seldom suffer emotional upsets, and rarely substitute daydreaming for action."[2] There is a high intercorrelation between the introversion-extroversion scale (B3-I) and the confidence in oneself (F1-C) and neurotic tendency (B1-N) scales.

Using the split-half method and applying the Spearman-Brown prophecy formula, in two separate cases, the reliability of the B3-I scale was found to be .89 and .85. The inventory was administered to the students during the second class meeting of the course.

Each of the independent variables was subdivided into two levels for purposes of analysis:

1. Mode of feedback
   a. electronic
   b. face-to-face

2. Ability
   a. high
   b. low

3. Personality
   a. extrovert
   b. introvert

4. Preference for instructor
   a. did receive type preferred
   b. did not receive type preferred

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[1]Robert G. Bernreuter, Manual for the Personality Inventory (Palo Alto, Calif.: Consulting Psychologists Press, n.d.).

[2]Ibid.

Since all the subjects in the experiment were college students and of above-average ability, the designations "high ability" or "low ability" were relative ones. Students were given either designation depending on the scores attained on a State University of New York entrance examination. Personality placement was decided by scores on The Personality Inventory by Bernreuter. Norms for the inventory were consulted to determine to which category a student was to be assigned. To establish whether a student did receive or did not receive the type of instructor he preferred, a Preference for Instructor Characteristics Scale was administered to find the type of instructor the student preferred. It was then necessary to determine where the instructor in the experiment would be placed on the cognitive-affective scale, or, in other words, what type of instructor he is. After considering several sources who might be able to identify the instructor's type, it was finally concluded that the best single source would be students who had spent eighteen weeks of a semester in a classroom or in a viewing room taking the same course. Former students were administered the same scale but rather than reading each item with the preface "I prefer an instructor who," the students were asked to say, "Doctor X is an instructor who." In this manner the same instrument would be involved in a student's preference as in determining the instructor's

type. When the instructor's type had been established, it was then possible to make a judgment about whether a student did or did not receive the kind of instructor he preferred. This procedure will be discussed fully in Chapter IV. (A copy of each instrument is included in Appendix A, except for the Selective Admissions Test which the State University does not permit to be made public.)

Frequency of feedback

Frequency of feedback was measured by tallying the responses made by each student during the formal class sessions. Among the available techniques for tallying overt human behavior (in the present study it was oral verbal responses by students), Good and Scates in a discussion on observational techniques in research elaborate on stenographic notes. The authors state, "Stenographic notes as observational records have provided evidence of the relative amounts of verbal participation by teachers and by pupils, extent to which participation is concentrated or scattered in the class, type of English used, and topical emphasis."[1]

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[1]Carter V. Good and Douglas E. Scates, Methods of Research--Educational, Psychological, Sociological (New York: Appleton-Century-Crofts, 1954), pp. 646-88.

For tallying the student responses a stenographer was used.[1] During the first week of the course, before responses were to be recorded, a trial attempt at utilizing a tape recorder for recording the feedback failed because of technical problems. The safest technique appeared to be the stenographic one. The stenographer was instructed to record the content of every student response regardless of whether it were a single word or one of many sentences. Along with the content the stenographer also indicated the name of the student who made the response.

In the television feedback situation, the stenographer was placed in the studio where she could easily hear the student responses electronically transmitted from receiving rooms back to the studio. Students were requested, and reminded from time to time, to identify themselves when the instructor recognized the room signal and asked for the response. By being identified in this manner, the stenographer was able to simply note the student's name on her stenographic pad. The stenographer had in her possession a list of the students' names according to the rooms in which they were placed. The list was to provide a safeguard against recording the names incorrectly.

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[1]The stenographer was a state civil service person of established high ability.

Requesting students to identify themselves when responding through the electronic feedback system was customarily made for all courses offered by television at Brockport. Hence, the subjects did not feel it unusual to say their names before responding. It should be noted, however, that not remaining anonymous when responding may have modified the feedback behavior of the students. The lack of anonymity should be considered a limiting factor of the study.

The conventionally taught students were assigned to a television viewing room. The reason for being in a television room and not in one without television was that a talkback system would be available. Except for the television receiver and the talkback system, a television receiving room is exactly the same as any classroom in the building. However, by having the class assigned to a viewing room, it was possible for the researcher and the stenographer to listen into the class. This was done by setting the talkback box in the "talk" position just prior to the class meeting. Everything said in the classroom could then be heard clearly in the studio. The students were not told that their class discussion was being recorded. Since they were freshmen, the students were not aware there was an intercommunication device in the room nor that they could be overheard elsewhere. Insofar

as the students were concerned, they were in a "normal" classroom situation.

There was a problem, however, as to the means by which the stenographer situated in the studio would know which particular student was responding. To request the students to identify themselves as in the television situation would probably compromise the classroom status of normalcy. With the television group it was a reasonable request since the students understood the instructor could not see them and this was the only way he would know who was talking. It seemed far wiser to have the instructor call students volunteering a response by name. He was instructed not to call on students by pointing, by nodding his head, by the word "yes," nor by any manner other than by the student's name. If a reply to the student's response were necessary, the instructor often used the student's name in his retort as assurance that the recorded response was attributed to the correct student.

Frequency of response could easily be tallied simply by counting the number of times a student's name appeared in the stenographic notes. When a student carried on a discussion with the instructor, he might respond several times consecutively. For the purposes of tallying, a discussion was given a single count.

Nature of the feedback

Nature of the feedback was determined by analyzing the content of the responses. The analysis was done by the instructor himself on the same day the responses were recorded by the stenographer. A typewritten copy of the stenographer's shorthand notes was given to the instructor after the second presentation (the conventional class) as soon as the typing was completed. It was deemed important that the analysis be done promptly while the lesson and the activities of the class session were still fresh in the instructor's mind.

Upon completion of reading a student response, the instructor indicated the nature by using the following code:

Initiation of the response

T Teacher-initiated

S student-initiated

Type of question

The T and S were sublettered with an s or a q to indicate whether response was a statement or a question.

Objective

O Related to the objective of the course or lesson

P_E Related to the personal needs of the students outside of the course; i.e., "may I leave early"

P_R Related to procedural matters of the course; i.e., "when will the next exam be given"

Relevancy

R Relevant to the subject matter

I Irrelevant to the subject matter

Thus, for example, a student response might have been coded "T_SOR," meaning the response was a statement in reply to something said by the instructor (teacher-initiated) which pertained to the objectives of the course or lesson and was relevant to the subject matter.

Another response might have been coded "$S_q P_E$I," meaning the response was a question initiated by the student (not in direct reply to the instructor) which pertained to a personal need and was irrelevant to the subject matter.

Personal contacts with the instructor

A subproblem of the present study was to investigate whether students might be in a feedback situation with the instructor other than during the formal class session. The instructor was asked to note the names of all students who spoke to him after class in front of the classroom, in the hallways, in his office, in the coffee shop, or wherever. In the subproblem, nature of the feedback was not considered--only frequency. The instructor was to record all

contact except for student greetings. He was asked to use his own discretion in determining whether a contact ought to be noted.

Collection and Recording of Data

The Preference for Instructor Characteristics Scale and the Personality Inventory were administered during the first week of the course by the instructor. No time limit was set for completion by students of either instrument. Both instruments were hand-scored, and the scores were recorded on the Personal Data Card of each student (see Appendix B).

Student scores on the Selective Admissions Test were received from the office of the dean of students. An individual student's score was entered on his Personal Data Card.

Student responses were collected, analyzed, coded, and recorded on the Personal Data Card for each class session, except for those during the first and last weeks of the course and those sessions devoted to examinations or a large amount of motion-picture film showing.

Former students of the instructor were administered the Preference for Instructor Characteristics Scale in the tenth week of the course. These scores were used to determine where on the Cognitive-affective scale the instructor in the study should be placed.

These students were students who had taken the same course in previous years either by television or by the conventional methods.

The instructor's grade books for these courses were used as a source of former students' names. Because there were a greater number of former television students than former conventional students, every third name in television sections and all names in conventional sections were selected. In total, eighty-three former students were invited by notes in their personal mailboxes. The invitations were signed by the instructor and requested the students to assist him in an experiment. On the appointed day and hour, forty-three students appeared. The researcher gave instructions following a welcome and a description of the experiment by the instructor. The students were asked to rate the instructor on the PICS, and they were assured that they would remain anonymous. Their names did not appear on the PICS scoring sheet.

The Personal Data Card was the primary source for raw data used in the statistical analyses.

Statistical Hypotheses

The frequency of responses and the nature of the responses --the number of times a particular nature appeared--were considered to be raw scores, similar to scores one would derive when

dealing with conventional instruments. The mean scores are used to test the statistical hypotheses, stated in the "null," that there are no significant differences. The following null hypotheses were to be tested:

I. Frequency

A. There is no significant difference between the mean scores of feedback frequency of the television and conventional groups attributable to the mode of feedback (electronic versus face-to-face).

B. There is no significant difference between the mean scores of feedback frequency of the television and conventional groups attributable to the ability of the students (high ability versus low ability).

C. There is no significant difference between the mean scores of feedback frequency of the television and conventional groups attributable to the personality of the students (introvert versus extrovert).

D. There is no significant difference between the mean scores of feedback frequency of the television and conventional groups attributable to the preference for instructor of the students (received versus did not receive).

II. Nature (teacher-initiated responses)

A. There is no significant difference between the mean scores of the teacher-initiated responses of the television and conventional groups attributable to the mode of feedback.

B. There is no significant difference between the mean scores of the teacher-initiated responses of the television and conventional groups attributable to the ability of the students.

C. There is no significant difference between the mean scores of the teacher-initiated responses of the television and conventional groups attributable to the personality of the students.

D. There is no significant difference between the mean scores of the teacher-initiated responses of the television and conventional groups attributable to the preference for instructor of the students.

III. Nature (student-initiated responses)

A. There is no significant difference between the mean scores of the student-initiated responses of the television and conventional groups attributable to the mode of feedback.

B. There is no significant difference between the mean scores of the student-initiated responses of the television and conventional groups attributable to the ability of the students.

C. There is no significant difference between the mean scores of the student-initiated responses of the television and conventional groups attributable to the personality of the students.

D. There is no significant difference between the mean scores of the student-initiated responses of the television and conventional groups attributable to the preference for instructor of the students.

IV. Frequency within the television group

A. There is no significant difference between the mean scores of feedback frequency of the high-ability and low-ability students in the television situation.

B. There is no significant difference between the mean scores of feedback frequency of the extrovert and introvert students in the television situation.

C. There is no significant difference between the mean scores of feedback frequency of those students who received the type of instructor they preferred and those who did not in the television situation.

V. Teacher-initiated responses within the television group

A. There is no significant difference between the mean scores of teacher-initiated responses of the high-ability and low-ability students in the television situation.

B. There is no significant difference between the mean scores of teacher-initiated responses of the extrovert and introvert students in the television situation.

C. There is no significant difference between the mean scores of teacher-initiated responses of those students who received the type of instructor they preferred and those who did not in the television situation.

VI. Student-initiated responses within the television group

A. There is no significant difference between the mean scores of student-initiated responses of the high-ability and low-ability students in the television situation.

B. There is no significant difference between the mean scores of student-initiated responses of the extrovert and introvert students in the television situation.

C. There is no significant difference between the mean scores of student-initiated responses of those students who received the type of instructor they preferred and those who did not in the television situation.

VII. Personal contact

A. There is no significant difference between the mean scores of personal contact frequency attributable to the mode of feedback (electronic versus face-to-face).

The statistical procedures used to test the null hypotheses are discussed in the next section.

Statistical Procedures

To facilitate the analysis of the data, all background information, scores, and information related to the student responses were recorded on Personal Data Cards, a card for each student. The cards were grouped in cells according to the independent variables and for each of two levels of the independent variables. Twelve cells were formed. Then each card was placed in a group identified by either electronic feedback or face-to-face feedback.

Each cell contained information pertaining to the N (the number of students in the cell), the sum of the number of responses, the sum of the squares of the number of responses, and the mean number of responses. The same information was computed for the electronic feedback and face-to-face feedback groups by totaling the data in the respective columns. This procedure made it possible to compare any two groups on significant differences in their responses. The process described above was repeated for the nature-of-responses analysis.

The principal statistical technique used in the present study to analyze the data was the *t* test. The *t* test is a useful

statistical method to find out whether a particular behavior or performance of comparable groups placed in different conditions is a function of these conditions. The particular behavior studied in the present experiment, of course, was student responses or feedback, while the different conditions were electronic and face-to-face feedback. A significant difference between the mean scores of the two groups would indicate that the conditions did indeed affect the behavior or performance. The *t* test is used to determine whether the mean scores are significantly different. The results of the *t* test are used to tell whether the null hypotheses are to be rejected or not. It was utilized to test all the null hypotheses except the last one. Because of the very small numbers of students who had personal contact with the instructor, chi-square was employed.

The level of confidence was set at 5 per cent for the present study.

CHAPTER IV

ANALYSIS OF THE EXPERIMENTAL RESULTS

A description of the computational procedures and the results of the statistical analysis of each of the dependent variables will be discussed in the present chapter. It will be recalled that the *t* test was the primary statistical technique used to test the null hypothesis. The first twelve null hypotheses were concerned with differences between the mean responses of the television and conventional groups. These hypotheses were divided into three groups: (1) frequency, (2) teacher-initiated responses, and (3) student-initiated responses. In other words, it was a measure of the effect a condition --electronic feedback--had on oral verbal student responses. The next nine null hypotheses concerned themselves with differences between the mean responses of the subjects within the television group. This analysis made it possible to determine whether students in the electronic feedback condition (television) were responding in a significantly different manner--that is, whether the television feedback situation was affecting the response of students of certain characteristics differently.

The final null hypothesis was related to differences in students' personal contacts with their instructor.

Computational Procedures

The basic data for each individual, including his name, sex, the experimental group (television or conventional), scores on the independent-variable measuring instruments, and the frequency and nature of his responses, if any, were entered on the individual's Personal Data Card. Except for the names, the basic data are tabulated in Appendix B, "Original Data." The cards for each experimental group were then sorted on the Selective Admissions Test (SAT) scores and the cutting-score for high- and low-ability groups determined. The cutting-score was computed by finding the mean score on the SAT for the entire sample. Subjects whose scores fell above the mean score were designated high and those below as low. For the present sample the cutting-score was 77.5.

The cutting-score for The Personality Inventory (TPI) was established by reference to the tentative percentile norms published by the Stanford University Press. The norm listing indicates the percentile conversion of the raw scores for each of the six traits measured by the TPI. The raw score at the fiftieth percentile was chosen as the cutting-score. For college men this score on the

extrovert-introvert scale is -30, and for college women it is -15. Consequently, students with scores above -30 and -15, respectively, were designated introverts and those below were extroverts.

The determination as to whether a student did or did not receive the type of instructor preferred was a more complex procedure. Each student was administered the Preference for Instructor Characteristics Scale (PICS) to ascertain the student's preference. It will be recalled that the instructor in the study was typed by requesting former students of the instructor, who had had the same course, and were either television or conventional students as those under study, to rate him on a slightly revised PICS. The mean rating score on the PICS (12.1) of forty-three former students was used to place the instructor on the PICS scale of 0 to 36. The subjects were said to have received the type of instructor they preferred if their scores on the PICS were within .67 of one standard deviation of the mean score. In this manner it would be possible for approximately 50 per cent of the students to be designated as having received the type preferred, while those beyond .67 of one standard deviation would not have received the type preferred. Consequently, students having scores between 7 and 17 were considered "did receive," and those under 7 and over 17 as "did not receive."

With all subjects identified as each subcategory for each of the independent variables, grouping according to the subcategory was possible. The sums of scores, the sums of squares, the mean of scores, and the number of subjects could be entered for each of these subgroups. This information is shown in Appendix B. With this information the computation of the *t* test was undertaken.

There are several *t*-test formulas available to a researcher. In experiments where the number of subjects in the two groups differ considerably (in the present study there were seventy-five in the television group and twenty in the conventional group) the following *t*-test equation is recommended:[1]

$$t = \sqrt{\frac{(N - 2)(n_2\Sigma x_1 - n_1\Sigma x_2)^2}{N[n_1n_2(\Sigma x_1^2 + \Sigma x_2^2) - n_2(\Sigma x_1)^2 - n_1(\Sigma x_2)^2]}}$$

Essentially the same computational procedures were used to test the significance of means on the nature of the response criterion (teacher- or student-initiated), and for differences between subgroups within the television group.

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[1]Frank J. McGuigan, Experimental Psychology: A Methodological Approach (Englewood Cliffs, N.J.: Prentice-Hall, 1960), p. 93.

A subjective analysis of the data related to the nature of feedback was undertaken through tabular comparisons of the number of respondees and their mean responses. These analyses were used not to test the null hypotheses, but rather to disclose any information or relationships in the data which might give further insight into the results. Chi-square was employed to test the null hypotheses concerned with student contacts outside of the formal-class situation.

Analysis of the Frequency of Feedback

The *t*-test results of the null hypotheses related to the frequency of feedback (IA-D) are presented in Table 1. Each of the independent variables is shown, as is the gross comparison between the television and conventional groups. The last column in the table--"Null Hypotheses Tested"--indicates the disposition of the hypotheses as a result of the analysis and focuses on the exact hypothesis being tested. The null hypothesis number refers to the statement of the statistical hypothesis in the section on "Statistical Hypotheses" in Chapter III. It should be noted that each null hypothesis has two *t*-test analyses, one for each subcategory within the independent variable being analyzed. The designation "p" in the tables refers to probability.

TABLE 1

RESULTS OF THE *t* TEST OF THE DIFFERENCE BETWEEN MEAN SCORES (FREQUENCY) FOR THE ELECTRONIC FEEDBACK (TELEVISION) AND THE FACE-TO-FACE (CONVENTIONAL) GROUPS FOR EACH OF THE INDEPENDENT VARIABLES

Group	N	Mean	SD	*t*	p	Null Hypotheses Tested
Television	75	1.96	3.52	5.64	.001	Reject IA
Conventional	20	12.10	13.62			
High-ability:						
Electronic . . .	40	1.63	2.72	4.31	.001	Reject IB
Face-to-face . .	9	11.22	12.53			
Low-ability:						
Electronic . . .	35	2.34	4.24	3 72	.001	Reject IB
Face-to-face . .	11	12.82	14.40			
Extroverts:						
Electronic . . .	35	2.20	4.40	3.85	.001	Reject IC
Face-to-face . .	11	12.36	13.16			
Introverts:						
Electronic . . .	40	1.75	2.48	4.11	.001	Reject IC
Face-to-face . .	9	11.78	14.16			
Received:						
Electronic . . .	32	2.56	4.19	4.31	.001	Reject ID
Face-to-face . .	11	11.91	9.21			
Not received:						
Electronic . . .	43	1.52	2.49	13.81	.001	Reject ID
Face-to-face . .	9	12.33	7.60			

An inspection of Table 1 reveals that the obtained means of frequency of response were significant at the 5 per cent level for the independent variables. The four null hypotheses under consideration are rejected.

Previous researchers and the present one have found that students in televised courses compared with conventional students do not frequently use available talkback facilities. The analysis of the frequency findings would seem to indicate that the significant differences are not the function of the student characteristics under study but of the treatment, electronic feedback as opposed to face-to-face feedback. Students in the electronic feedback system responded significantly less than those in the face-to-face situation regardless of student characteristics. The analysis demonstrated consistency for all levels of the independent variables and was highly significant for all of them, removing any reasonable doubt of a chance situation.

Analysis of Nature of Feedback

The analysis of the nature of feedback is divided into two major parts: responses which were teacher-initiated and those which were student-initiated. While these analyses will be used to accept or reject the null hypotheses IIA-IID (teacher-initiated responses)

and IIIA-IIID (student-initiated responses), a subjective comparison of other data will be made in an attempt to uncover additional information relative to student responses. However, this subjective comparison will not have any bearing on the testing of the null hypotheses. This comparison will be found following the tables and findings related to the null hypotheses being tested.

Teacher-initiated responses

The *t*-test results for mode of feedback and teacher-initiated responses are presented in Table 2. In addition to a comparison between the total experimental and control groups, each of the independent variables is shown in Table 2.

The analyses show that the difference between the obtained means on teacher-initiated response scores for the electronic and face-to-face group for each subcategory of the independent variables is significant at the 5 per cent level of confidence. It is reasonable to state that the significant differences found in the frequency of responses initiated by the teacher is the function of the mode of feedback and not the characteristics of the students. Consequently all null hypotheses pertaining to teacher-initiated responses are rejected.

TABLE 2

RESULTS OF THE *t* TEST OF THE DIFFERENCE BETWEEN TEACHER-INITIATED MEAN SCORES FOR ELECTRONIC AND FACE-TO-FACE GROUPS FOR EACH OF THE INDEPENDENT VARIABLES

Group	N	Mean	SD	*t*	p	Null Hypotheses Tested
Total:						
Television . . .	75	1.40	2.14	7.65	.001	Reject IIA
Conventional . .	20	10.15	8.84			
High-ability:						
Electronic . . .	40	1.13	1.66	4.74	.001	Reject IIB
Face-to-face . .	9	9.78	10.73			
Low-ability:						
Electronic . . .	35	1.71	2.55	6.12	.001	Reject IIB
Face-to-face . .	11	10.45	6.89			
Extroverts:						
Electronic . . .	35	1.51	2.55	7.24	.001	Reject IIC
Face-to-face . .	11	10.36	5.39			
Introverts:						
Electronic . . .	40	1.30	1.70	4.33	.001	Reject IIC
Face-to-face . .	9	9.89	11.75			
Received:						
Electronic . . .	32	1.84	2.61	5.88	.001	Reject IID
Face-to-face . .	11	9.91	7.01			
Not received:						
Electronic . . .	43	1.07	1.66	5.35	.001	Reject IID
Face-to-face . .	9	10.44	10.63			

Further analysis of teacher-initiated responses

Shown in Table 3 is a tabular comparison of the teacher-initiated response according to these characteristics: (1) those related to the objectives of the lesson, (2) those related to course procedural matters and matters personal to the student. Personal-type responses were grouped with procedural-type responses because there were very few of the personal type. This grouping was considered reasonable since both personal and procedural responses were, by definition, not related to the objectives of the lesson.

Inspection of Table 3 reveals that every or nearly every student in the face-to-face feedback situation, at the gross comparison level and at all levels of student characteristics, was involved at least once in responding to a teacher-initiated remark. This was not true of the television students. One of the conditions of the experiment was that the instructor call on volunteers only. Hence, all but one of the conventionally taught students volunteered and were recognized at least once during the semester. The number of students in the experimental and control groups might have been a factor affecting this finding. Since there were significantly more students in the television group, perhaps there was less opportunity for a student to be recognized as the one student to respond to the instructor's comment or question, yet 46.7 per cent of

TABLE 3

COMPARISON OF TEACHER-INITIATED RESPONSES ON THE BASIS OF CHARACTERISTICS OF THE RESPONSES

Independent Variables (Television versus:)	N	Objective		Procedural and/or Personal	
		Total Respondees	Mean Responses of Respondees	Total Respondees	Mean Responses of Respondees
Conventional:					
Electronic . . .	75	35	2.97	1	1.00
Face-to-face . .	20	19	10.68		
High-ability:					
Electronic . . .	40	18	2.44	1	1.00
Face-to-face . .	9	9	9.78		
Low-ability:					
Electronic . . .	35	17	3.53	0	0.00
Face-to-face . .	11	10	11.50		
Extroverts:					
Electronic . . .	35	14	3.79	0	0.00
Face-to-face . .	11	11	10.36		
Introverts:					
Electronic . . .	40	21	2.43	1	1.00
Face-to-face . .	9	8	11.12		
Received:					
Electronic . . .	32	16	3.69	0	0.00
Face-to-face . .	11	11	9.91		
Not received:					
Electronic . . .	43	14	3.21	1	1.00
Face-to-face . .	9	8	11.75		

the television students responded--their average number of responses was nearly three, and there was a range of one to fourteen responses (see Appendix B). This would seem to indicate that there were some students who desired to respond on enough occasions that they were recognized. Table 3 shows that it was the "high-ability" (2.44) and the "introvert" (2.43) students who were responding much less than the mean for the entire television group, while the "extrovert" (3.79) and "received" (3.69) students responded more than the average. However, there were more "high-ability" and "introverts" responding than any other subgroup.

Of all the teacher-initiated responses, there was only one which was not concerned with the objectives of the lesson.

Tabulated in Table 4 are the results of the gross comparisons of the electronic and face-to-face feedback groups on the relevancy of the teacher-initiated response.

The results of the comparisons of the experimental and control groups show that only one response was irrelevant. It was not deemed necessary to compare on student characteristic levels because of the one irrelevant response.

TABLE 4

THE NUMBER OF TEACHER-INITIATED RESPONSES ON THE BASIS OF RELEVANCY

Group	N	Relevant Responses	Irrelevant Responses
Electronic	75	104	1
Face-to-face	20	203	0

Student-initiated responses

In Table 5 are summarized the results on the *t* tests on student-initiated responses.

The obtained means between the two groups were significant for all subgroups except for the "high-ability" and "did receive type of instructor preferred" characteristics. That is, students in the television class responded significantly less than those in the conventional situation of their own volition (student-initiated), but this was not true of high-ability students and students who received their preference of instructor type. Students of these two

TABLE 5

RESULTS OF THE *t* TEST OF THE DIFFERENCE BETWEEN MEAN SCORES FOR THE ELECTRONIC FEEDBACK AND FACE-TO-FACE GROUPS ON THE BASIS OF STUDENT-INITIATED SCORES FOR EACH OF THE INDEPENDENT VARIABLES

Group	N	Mean	SD	*t*	p	Null Hypotheses Tested
Total:						
Television . . .	75	0.56	1.41	3.31	.001	Reject IIIA
Conventional . .	20	1.95	2.32			
High-ability:						
Electronic . . .	40	0.50	1.34	1.72	N.S.	Accept IIIB
Face-to-face . .	9	1.44	1.88			
Low-ability:						
Electronic . . .	35	0.77	1.49	2.71	.01	Reject IIIB
Face-to-face . .	11	2.36	2.58			
Extrovert:						
Electronic . . .	35	0.57	1.60	2.22	.05	Reject IIIC
Face-to-face . .	11	2.00	1.85			
Introvert:						
Electronic . . .	40	0.45	1.20	2.36	.05	Reject IIIC
Face-to-face . .	9	1.89	2.80			
Received:						
Electronic . . .	32	0.72	1.92	1.90	N.S.	Accept IVD
Face-to-face . .	11	2.00	2.50			
Not received:						
Electronic . . .	43	0.44	1.21	2.72	.01	Reject IVD
Face-to-face . .	9	1.89	2.13			

characteristics initiated responses at rates not significantly different regardless of the mode of feedback at their disposal.

Further analysis of student-initiated responses

Tabulated in Table 6 is a comparison of the student-initiated responses for the face-to-face and electronic feedback groups. As with the teacher-initiated responses, the procedural and personal responses are grouped together.

Inspection of Table 6 shows that the mean response on the procedural-personal characteristic was higher for the electronic feedback group than for the face-to-face group on the gross comparison as well as for each of the individual subgroups. In both the student-initiated and the teacher-initiated analyses, this is the first case where television students have had a greater rate of response than the conventional group. Furthermore, more television students responded than conventional students in the procedural-personal category, with the exception of the "high-ability" students. Although the number who responded is only slightly more, it is worthy of notice because it occurred only in the above comparison and consistently across groups. It is noteworthy also that the percentage would have been greater for face-to-face students if the entire group had been used, but since this study was concerned

TABLE 6

COMPARISON OF STUDENT-INITIATED RESPONSES ON THE BASIS OF CHARACTERISTICS OF THE RESPONSES

Independent Variables (Television versus:)	N	Objective		Procedural and/or Personal	
		Total Respondees	Mean Responses of Respondees	Total Respondees	Mean Responses of Respondees
Conventional:					
Electronic . . .	75	10	1.30	13	2.23
Face-to-face . .	20	11	2.55	8	1.38
High-ability:					
Electronic . . .	40	4	1.00	7	2.29
Face-to-face . .	9	4	2.00	8	0.63
Low-ability:					
Electronic . . .	35	6	1.50	6	2.17
Face-to-face . .	11	7	2.86	5	1.20
Extrovert:					
Electronic . . .	35	7	1.29	7	2.14
Face-to-face . .	11	7	2.29	5	1.20
Introvert:					
Electronic . .	40	3	1.33	6	2.00
Face-to-face . .	9	4	3.00	3	1.67
Received:					
Electronic . . .	32	5	1.20	8	2.12
Face-to-face . .	11	6	2.83	4	1.25
Not received:					
Electronic . . .	43	5	1.40	5	2.40
Face-to-face . .	9	5	2.20	4	1.50

with students who did respond, only respondees were used in the computation of the mean responses.

The relevancy of the student-initiated responses appears in Table 7. The data in this table show that there was no major difference in the frequency of relevant responses between the two groups. There was a distinct difference in favor of the electronic group in irrelevant feedback. This finding is to be expected in view of the results discussed relative to the television students' greater number of procedural-personal, student-initiated responses. Feedback related to personal matters is often irrelevant to the objectives of a course.

TABLE 7

THE NUMBER OF STUDENT-INITIATED RESPONSES ON THE BASIS OF RELEVANCY

Group	N	Relevant Responses	Irrelevant Responses
Electronic	75	34	8
Face-to-face	20	38	1

Question and statement responses

Since an important aspect of feedback is student questions, a comparison of the frequency of questions and statements in student-initiated responses is reported in Table 8.

The preponderance of student-initiated responses are questions, and there appears to be no important difference between the two groups. It is of interest to note, however, that the number of television students' statements was larger. These student statements usually were comments which contributed additional information, opinions of feelings to the instructor's lecture or demonstration.

TABLE 8

THE NUMBER OF QUESTIONS AND STATEMENTS IN STUDENT-INITIATED RESPONSES

Group	N	Questions	Statement	Total
Electronic	75	36	6	42
Face-to-face	20	38	1	39

Comparison of teacher-initiated and student-initiated responses

A comparison of teacher-initiated and student-initiated responses was made to determine whether there were any differences which might shed further light on the nature of the feedback. Tabulated in Tables 9 and 10 are the comparisons.

A greater percentage of the total responses for the television students was student-initiated. A close scrutiny of the other data in Table 9 reveals, however, that unlike the conventional group the television students who initiated feedback were seeking information pertaining to procedural and personal matters and not the course work. Both groups' feedback was predominantly teacher-initiated, and slightly more of the student-initiated responses were irrelevant.

Inspection of Table 10 shows that the television group was decidedly more active as respondees in teacher-initiated feedback than in student-initiated responses. It would suggest that the television students were more passive than conventional students in that they responded more often when the instructor asked for a volunteer than to respond on their own initiative. This situation was particularly evident for the "high-ability" and "introvert" students. In fact, the "introverts" were especially active in teacher-initiated responses when compared to their student-initiated responses.

TABLE 9

COMPARISONS OF TEACHER-INITIATED AND STUDENT-INITIATED RESPONSES

Group	Total Responses	Student-initiated Responses	Teacher-initiated Responses
Total:			
Television	147	42[a]	105[b]
Conventional	242	39[c]	203[d]
Objective:			
Television	117	13	104
Conventional	231	28	203
Procedural-personal:			
Television	30	29	1
Conventional	12	11	0
Relevant:			
Television	138	34	104
Conventional	241	38	203
Irrelevant:			
Television	9	8	1
Conventional	1	1	0

[a]28 per cent. [b]72 per cent. [c]16 per cent. [d]84 per cent.

TABLE 10

COMPARISONS OF STUDENTS INVOLVED IN STUDENT-INITIATED AND TEACHER-INITIATED RESPONSES

Group	No. of Respondees Making Student-initiated Responses	No. of Respondees Making Teacher-initiated Responses
Total:		
Television	23	39
Conventional	19	19
High-ability:		
Television	11	19
Face-to-face	12	9
Low-ability:		
Television	12	17
Face-to-face	12	10
Extroverts:		
Television	14	14
Face-to-face	12	11
Introverts:		
Television	9	22
Face-to-face	7	8
Received:		
Television	13	16
Face-to-face	10	11
Not received:		
Television	10	14
Face-to-face	9	8

Analysis of Frequency of Feedback within the Television Group

Using the television students only, an analysis of the frequency of responses for the subcategories within each independent variable was made. Summarized in Table 11 are the results of the *t* tests for the subcategories.

No significant differences resulted from the *t*-test analysis of the data. The null hypotheses of no difference are therefore accepted. From the results of the analysis, it may be said that no one subcategory within a student characteristic is responding differently from the other and hence the dichotomous positions are being affected by the electronic feedback circumstance in essentially the same way.

Analysis of Nature of Feedback within the Television Group

Shown in Tables 12 and 13 are the results of the *t* test for student-initiated and teacher-initiated responses by subcategories for the television students. Inspection of these tables reveals that no significant differences were to be found between subcategories for either teacher-initiated or student-initiated responses. All null hypotheses were accepted. From the results of these analyses,

TABLE 11

RESULTS OF THE *t* TEST OF THE DIFFERENCES BETWEEN MEAN SCORES (FREQUENCY) OF THE SUBGROUPS WITHIN THE TELEVISION GROUP

Group	N	Mean	SD	*t*	P	Null Hypotheses Tested
High-ability	40	1.62	2.71	.87	N.S.	Accept IVA
Low-ability	35	2.34	4.23			
Extrovert	35	2.20	4.41	.55	N.S.	Accept IVB
Introvert	40	1.75	2.48			
Received	32	2.57	4.48	1.27	N.S.	Accept IVC
Not received	43	1.55	2.49			

TABLE 12

RESULTS OF THE *t* TEST OF THE DIFFERENCE IN TEACHER-INITIATED MEAN SCORES OF THE SUBGROUPS WITHIN THE TELEVISION GROUP

Group	N	Mean	SD	*t*	P	Null Hypotheses Tested
High-ability	40	1.13	1.16	1.19	N.S.	Accept VA
Low-ability	35	1.71	2.55			
Extrovert	35	1.51	2.55	.43	N.S.	Accept VB
Introvert	40	1.30	1.70			
Received	32	1.84	2.59	.18	N.S.	Accept VC
Not received	43	1.07	1.49			

TABLE 13

RESULTS OF THE *t* TEST OF THE DIFFERENCE IN STUDENT-INITIATED MEAN SCORES OF THE SUBGROUPS WITHIN THE TELEVISION GROUP

Group	N	Mean	SD	t	P	Null Hypotheses Tested
High-ability	40	.50	1.34	1.76	N.S.	Accept VIA
Low-ability	35	.77	1.50			
Extroverts	35	.57	1.62	.71	N.S.	Accept VIB
Introverts	40	.45	1.20			
Received	32	.72	1.02	.82	N.S.	Accept VIC
Not received	43	.44	1.22			

it may be said that, since each subcategory of a student characteristic is responding in a manner which is not significantly different than any other subcategory, the dichotomous student traits are being affected by the electronic feedback situation in essentially the same way.

Analysis of Personal Contacts by Students with the Instructor

A chi-square analysis of the number of students who contacted the instructor at times other than during the normal class session and the frequency of their contacts are shown in Tables 14 and 15.

TABLE 14

CHI-SQUARE ANALYSIS OF THE NUMBER OF STUDENTS IN TELEVISION AND CONVENTIONAL GROUPS WHO CONTACTED THE INSTRUCTOR

Group	Total N	No. of Students	Expected	Actual	χ^2	Null Hypothesis
Television . . .	75	5	7.9	.50	5.11	Reject VIIA
Conventional . .	20	5	2.1	.50		

TABLE 15

CHI-SQUARE ANALYSIS OF THE NUMBER OF CONTACTS BY STUDENTS IN THE TELEVISION AND CONVENTIONAL GROUPS

Group	Total N	Total Contacts	Expected	Actual	χ^2	Null Hypothesis
Television . . .	75	11	19.75	.44	18.46	Reject VIIA
Conventional . .	20	14	5.25	.56		

The expected was determined on the basis of the total number of students in both groups (ninety-five). It is clear that the television students did not contact the instructor at the rate expected of seventy-five students, and the chi-square analyses of the variance of the actual from the expected for both groups is significant. The null hypothesis of no significant difference is thereby rejected.

Recapitulation of Null Hypotheses Tested

A total of twenty-two null hypotheses were tested. All those grouped under frequency (IA-ID) were rejected, indicating that significant differences did exist for each hypothesis stated. For null hypotheses directed at testing teacher-initiated responses (IIA-IID), all were found significant and were rejected. Student-initiated responses were tested by hypotheses IIIA-IIID, where hypotheses IIIA and IIIC were rejected while IIIB (high-ability students only) and IIID (received students only) were accepted. Hypotheses tested for the frequency of feedback within the television group (IVA-IVC), teacher-initiated and student-initiated responses within the television group (VA-VC and VIA-VIC, respectively) were determined as not significant and all were accepted. The final hypothesis stated pertained to personal contact (VIIA) and it was rejected.

Summary

Initially the basic data for each individual were entered on Personal Data Cards. These cards were the source for all raw data used in computations. The primary statistical technique employed was the *t* test. It was used to test the hypotheses of no significant difference between the mean scores of the television and

conventional groups, in terms of frequency and nature. Gross comparisons between the groups as well as between subcategories of student characteristics were made. In addition, student feedback within the television group was analyzed.

Analysis of the data obtained related to frequency of feedback indicates that significant differences existed at the ability level of the students, the selected personality trait of the students, the preference for instructor of the students, and for the mode of feedback. Apparently feedback is a function of the treatment and not of the selected student characteristics employed in the present investigation.

The analysis of the data regarding the nature of feedback was divided into two categories: teacher-initiated and student-initiated. Significant differences were found for all the independent variables on teacher-initiated responses. All null hypotheses for this criterion were rejected. A subjective evaluation of teacher-initiated responses by television students revealed that (1) all but one response pertained to the objectives of the lesson, (2) they were almost totally relevant, and (3) whereas every conventional student except one contributed to the feedback, less than 50 per cent of the television students did.

Analysis of student-initiated responses showed significant differences at all subcategories with the exception of "high-ability" and "received" students. Accordingly, this finding indicates that under the conditions of the present investigation students of these two traits initiated feedback at a rate that is not significantly different, regardless of the mode of feedback. A subjective evaluation of student-initiated responses by television students indicates that: (1) their responses were generally of the question-type, and there was no important difference between the television and conventional groups; (2) the television students had more statement-type responses; (3) the average response of television students was greater than for the conventional students on procedural-personal matters; (4) except for high-ability students, more television students responded on procedural-personal matters than did conventional students; and (5) the television students made more irrelevant responses.

A comparison of the student-initiated and teacher-initiated feedback disclosed that: (1) the proportion of all responses which were student-initiated was higher in television than in the conventional; (2) more student-initiated responses were irrelevant than were teacher-initiated; (3) a greater number of the total responses for both television and conventional students were of the teacher-

initiated type; and (4) television students were decidedly more active in teacher-initiated responses than in student-initiated responses, especially "high-ability" and "introvert" students.

Analysis of the feedback frequency within the television group found no significant differences due to student characteristics. All null hypotheses were accepted.

Analysis of the teacher-initiated and the student-initiated responses within the television group revealed that there were no significant differences due to student characteristics. All null hypotheses were accepted.

Analysis of the number of students making personal contacts with the instructor outside the formal class session and the frequency of their contacts were both significant in favor of the conventional students. The null hypothesis was rejected.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

At a time when changing societal forces are causing education to seek solutions to the problems engendered by these forces, the application of technology to education has become an increasingly important consideration. Historically, educators have shown little propensity to adapt technology to instructional purposes. The reasons for the resistance to technology are numerous. Still, there is evidence that technology has made important inroads into educational practices and thinking.

It was in the early fifties that television began to be used as an instructional tool. As with other technological instrumentation which preceded it, television was received warmly by some educators, while others regarded it with apprehension and resentment. But since that time, utilitzation of television at all levels of education has increased steadily, although not uniformly across the nation.

Generally, it was found that television could be used effectively for the learning of factual information.

Nevertheless, critics of television see a serious drawback in using television as a medium of instruction: television limits interaction between the students and their teacher or precludes it altogether. Among the many reasons educators feel the need for interaction in the teaching-learning process is the one concerned with feedback. Learning theory suggests that there are psychological requirements in learning that feedback satisfies for the learner. Additionally, communications theory states that feedback provides essential information to the teacher which tells him how accurately his message is being received and whether adjustments are necessary in future messages. Feedback provides the same function when the learner acts as a communicator.

Educators, aware of this vital need in the teaching-learning process, have attempted to provide means, at least, for verbal interaction between students and teacher. In those situations, as in closed-circuit television, where immediate feedback is feasible, instrumentation has been designed. Where it has not been practical or possible, feedback procedures (usually of a delayed type) have been devised to circumvent the situation.

A review of the literature pertaining to feedback in instructional television revealed that there have been relatively few studies objectively investigating the problem, although feedback has been reported as the by-product of major studies and has been discussed widely at conferences and seminars of educators. In general, the findings related to feedback in television disclosed that (1) students desire feedback facilities but they seldom used them, (2) students achieved as well without facilities being present as with them, and (3) feedback problems could be solved to some degree by employing superior, experienced teachers as television instructors and by including in the television lesson provisions for covert responses on the part of the learner.

The present experiment was designed to further investigate the problem of feedback in instructional television in the hope that a greater understanding and insight would result. It was the intent of the study to discover whether student oral-verbal feedback in a television class using an electronic feedback system was significantly different, in terms of frequency and nature, from that in a conventionally taught class where the feedback is face-to-face with an instructor in the classroom. Furthermore, it was theorized that certain selected characteristics of the students themselves might be factors impinging on the nature of feedback. As a subproblem,

personal contacts by students with the instructor, at times other than the formal classroom session, were studied in the belief that students might use those opportunities to satisfy feedback needs.

The design

The study was designed to investigate the student responses (feedback) of two groups of students: a television class and a conventionally taught class. Both groups were taught the same course content, during the same day, by the same instructor. The four independent variables were: (1) the mode of feedback (electronic versus face-to-face), (2) the ability level of the students, (3) the preference for instructor by the students, and (4) the personality characteristics (extrovert-introvert) of the students. Feedback was measured on the basis of two dependent variables: (1) frequency of the feedback, and (2) the nature of the feedback. Frequency of feedback was defined as the number of times a student responded. Nature of feedback was analyzed by determining whether the response was teacher-initiated or student-initiated. A subjective analysis of the feedback content was also made. The instructor tabulated the number of student contacts and the name of the student making the contact. Twenty-two null hypotheses were formulated.

Experimental procedures

The experiment was conducted at the State University College at Brockport, New York, in the fall semester of 1962. The population consisted of all entering students required to enroll in Psychology 100, "General Psychology." The sample consisted of students assigned by the office of the associate dean to three television sections and one conventional section. Although the students were not randomly assigned by standard research techniques, it was shown that each student in the population had virtually an equally likely chance of being arbitrarily placed into the sample sections. The sample consisted of ninety-five students. Individuals in the television sections viewed lessons on a 24-inch monitor in a conventional classroom where they had access to an electronic talk-back system through which they could have two-way audio communication with the instructor in the television studio. In the conventionally taught classroom, the students received instruction as the instructor had done for several years. All class sessions, except for the first and last weeks of the course and examination days, were included in the study.

Evaluation instruments

The Selective Admissions Test of the State University of New York, a form of the School and College Ability Tests published by the Educational Testing Service, was utilized to measure the ability of the students. It has a reliability of at least .95.

To measure preference for instructor, the Preferred Instructor Characteristics Scale was administered. Students' preference was measured along an affective-cognitive continuum. A test reliability of .90 has been computed for the scale. Introversion-extroversion was measured by the Personality Inventory. Reliability of the instrument on this particular trait ranged from .85 to .89.

The frequency and nature of student responses were recorded by a stenographer who listened to the lessons for both the experimental and control groups in the studio via the talkback system. The nature of the feedback was analyzed and coded by the instructor. The instructor was also responsible for noting all student contacts outside of class.

All data were entered on Personal Data Cards. These cards were the primary source for the raw data. The data were summarized and tested by the *t* test, except for the personal-contacts

data, which were analyzed by chi-square. The 5 per cent level of confidence was set for all tests.

Results of the experiment

1. Frequency criterion: There are significant differences in frequency of responses between the television and conventional groups, in favor of the conventional group, at the ability level of the students, the selected personality trait of the students, the preference for instructor by the students, and for the mode of feedback. All null hypotheses are rejected.

2. Nature (teacher-initiated) criterion: There are significant differences for all the independent variables, with the conventional group rate being greater. All the null hypotheses are rejected. The subjective evaluation reveals that: (a) less than half of the television students contributed to teacher-initiated feedback, while all but one conventional student did; (b) the responses for both groups were almost totally involved with the objectives of the lesson; and (c) the responses for both groups were almost all relevant.

3. Nature (student-initiated) criterion: There are significant differences in favor of the conventional group for all independent variable sublevels except for "high-ability" and "received"

students. Null hypotheses pertaining to these two traits are accepted and all others are rejected. The subjective evaluation reveals that: (a) question-type responses predominated, and there was no important difference between the television and conventional groups; (b) the television students made more statement-type responses; (c) the television students, on the average, made more procedural-personal responses than did the conventional students; (d) a greater number of television students responded on procedural-personal matters than did conventional students, except for the high-ability students; and (e) more irrelevant responses were given by the television students. For the television students, student-initiated responses were a larger proportion of their total responses than they were for the conventional students. Fewer teacher-initiated responses were irrelevant than were student-initiated responses. Of the total responses for both groups, teacher-initiated predominated. Unlike the conventional students, the television students were involved to a greater extent in teacher-initiated responses than in student-initiated, and this was particularly true for the "high-ability" and "introvert" television students.

4. Frequency criterion within the television group: There were no significant differences due to student characteristics. All null hypotheses are accepted.

5. Nature criterion within the television group: There were no significant differences due to student characteristcis for either teacher-initiated or student-initiated responses. All null hypotheses are accepted.

6. Personal contacts with instructor criterion: There are significant differences in favor of the conventional students in the number of students making personal contacts with the instructor and in the frequency of these contacts. The null hypothesis is rejected.

In summary, the results of the present experiment indicate that the frequency and nature of feedback is significantly different between television and conventional students; that is to say, individuals in a conventional face-to-face feedback situation respond significantly differently from students in the television learning situation who are required to use an electronic feedback system. Television students were responding differently because of the feedback treatment and not because of certain selected student characteristics. However, two exceptions were found: for student-initiated responses, "high-ability" and "received" students were not significantly different for the television and conventional groups.

Although students in the television group were responding differently from their conventional counterparts, they were not responding differently in frequency and nature when students were compared

with one another within the television group according to the selected student characteristics.

Television students did not make the personal contacts with the instructor outside the formal class session at a rate comparable to the conventional students.

Discussion

The constancy of significant findings between the television and conventional groups for both frequency and the initiation of responses (nature) was not totally unexpected. The literature has provided ample evidence that television students in college, despite the availability of an electronic feedback system, make little use of it. However, in an attempt to ascertain whether students with characteristics assumed to be possible factors in student feedback might be affected differently, the evidence from the present study reveals that ability, introversion-extroversion, and preference for instructor apparently are not factors. This finding does not preclude the possibility that other student traits, environmental conditions in the learning situation, social forces, or certain combinations of these might be elements which influence feedback to some extent in the television situation. An illustration of a factor which may have affected feedback in the present study (and may have altered the

findings) was that the television instruction students were expected to identify themselves before responding. If students could have remained anonymous, it is possible a different pattern of student feedback may have developed. Unreportable evidence gathered by the researcher through an informal questionnaire submitted to the television students following the conclusion of the experiment period and after they were told the purpose of the experiment, suggested that student feedback might be influenced partially by (1) inhibitions induced by a fear of making a foolish or senseless remark which can be heard by students in all the other viewing rooms, (2) the awkwardness in the procedure for responding through the electronic feedback system, (3) the strange feeling engendered by talking to a "box" (the television receiver) and not to a "live" instructor in the front of the room, and (4) the attitude of "why bother" since there were some students in the viewing room who were doing most of the responding.

Interpreting the results which indicated that there were no significant differences between "high-ability" and "received" students on student-initiated responses is hazardous. Why it is that these two characteristics were not significant, in light of the significance of the others, is problematical. Perhaps the high-ability student has an intellectual curiosity and need that is to be satisfied

regardless of the learning situation in which he finds himself. The mode of feedback evidently does not affect his performance in initiating responses which in some way meet his needs. Yet, from the results of the within-television analysis it appears that the high-ability students are not responding significantly more than the low-ability students in student-initiated feedback. As for the "received" students, they may be satisfied, contented, and relate better with the instructor and, regardless of the feedback system available to them in the learning situation, will initiate feedback at about the same rate.

The subjective evaluation of the feedback yielded several interesting findings. The findings related to teacher-initiated responses were anticipated. One would expect that teacher-initiated feedback would be involved with the objectives of the lesson and relevant, since it is the instructor who sought the response. Insofar as the difference in the number of respondees in the two groups is concerned, the expectation is that a smaller proportion of students in a large group would respond than would students in a group of fewer students. Hence, the number of students who respond is likely to be a function of the size of the group rather than the mode of feedback. For instance, we know this to be the case in large lecture classes when compared to a classroom group.

The most interesting result of the analysis of student-initiated responses was the preponderance of question-type feedback and the paucity of statement-type. While the prospect of this type of feedback being the question-type is high, the lack of statement-type would seem to indicate that the students were contributing very little in the way of their own thoughts, opinions, ideas, and personal knowledge to the class activities. The fact that this was true for both the television and conventional groups might indicate that the personality of instructor, or the subject matter, or the presentation techniques of the instructor, or all of these may have actuated scant statements. From the standpoint of the study, however, it seems clear that the diminutive number of statements is not a function of the mode of feedback.

It is of interest to note that the only instance in which the television students were more involved than the conventional students was in procedural and personal feedback initiated by the students. A partial explanation may be gleaned from the results of personal contacts outside of the formal class session. Since the television students made significantly fewer contacts, this may have resulted in their asking procedural and personal questions during the class session using the electronic feedback system. Furthermore, an inspection of the procedural-personal feedback indicates

that much of it dealt with technical problems created periodically by the electronic failure of the television audio and video systems. So, even where the television students were more active in feedback it had no apparent direct bearing on the learning process itself.

A most important finding of the study was that, under the conditions of the experiment, the television students were not responding in a significantly different manner according to the student characteristics investigated. An interpretation of this finding would seem to be that, although the television students were responding less frequently than the conventional students, no one type of student in the television situation was being affected more than any other type. Television apparently has some sort of leveling effect on student responses so that students of dichotomous characteristics, who might be expected to respond differently, do not do so in the television learning situation. Inasmuch as learning is the educational outcome desired in instructional television, a judgment as to the value of this leveling effect must be reserved pending further investigation of feedback and its relation to students' characteristics and learning.

A result contrary to expectations was found in the analysis of student contacts with instructor other than in the formal class session. It was theorized that television students might seek

personal meetings with the instructor to compensate for the lack of personal contact in the television situation and possibly due to the expected infrequency of feedback during the formal televised class. Neither the number of television students nor the frequency of their contacts were equal to the rate of the conventional students. This finding might be explained by looking at the television students' perception of the instructor. To them he may have seemed remote and impersonal and one with whom they could not readily identify. As a result of an informal questionnaire it was discovered that many of the television students did more independent work in the television course than in any other course they were taking. Conceivably, this may be a manifestation of the lower feedback rate during the televised class and the fewer personal contacts with the instructor. Again, a judgment of value must be detained. Even though there may be some educators who would say there is extreme worth-whileness in learning through one's own initiative and investigation, there would be others who, although inclined to agree, may feel they cannot do so because those values which may accrue from personal relationships have been forsaken. To be sure, this is a dilemma which educators interested in television instruction must face.

Conclusions

Bearing in mind the limitations of the present study, and cognizant that remarks are confined to the conditions of the present experimental situation, the following conclusions seem warranted:

1. The persistently high significant differences between the television and conventional groups for both frequency and nature of feedback indicate that when college students are placed in the television learning situation, and have to utilize an electronic feedback system, their oral verbal feedback behavior is affected. They tend not to respond as much as conventionally instructed students for either teacher-initiated or student-initiated feedback. The mode of feedback is apparently a factor.

2. Whereas most students have their feedback affected in the same way by virtue of their being in the television learning situation, "high-ability" students and those who "received" the type of instructor they preferred initiate feedback at a rate not significantly different regardless of the mode of feedback.

3. When compared on the basis of certain student characteristics, students in a television learning situation do not differ from one another in the frequency and nature of their feedback. Apparently

the type of students under study are being affected in the same way as a result of the electronic feedback system.

4. Television students do not make personal contacts with the instructor outside the formal class session at the same rate as conventional students. The television learning situation apparently influences this student behavior.

5. A major portion of feedback is teacher-initiated, and there is no difference due to mode of feedback system.

6. The preponderance of student-initiated feedback is in the form of questions; there are few statements.

7. A smaller proportion of television students will partake in the feedback process than will students in the conventional classroom.

8. Television students initiate more feedback pertaining to procedural and personal matters than do conventional students.

Suggestions for Future Research

The problem of feedback in the teaching-learning process, and particularly as it occurs in instructional television, is one which requires more investigation. The conflict between theory on the one hand, which states there is a primary need for feedback in successful learning and in successful communication, and the

research which suggests that certain desirable educational objectives can be attained in instructional television with minimal or entirely without feedback on the other hand, mandates the exigency for definitive studies aimed directly at providing information as to the role feedback plays in the teaching-learning process. The paucity of investigations presently found in the literature might be indicative of the difficulty to be encountered in studying a multifarious process such as feedback within the learning situation. How feedback affects the instructor and the learner, and how it is influenced by subject matter, the level of education, style of presentation, physical environment, and social structure may be so variant from case to case as to make a generally applicable theory impracticable. Still, it would be most desirable to have the validity of the feedback theory confirmed, rejected, or revised to bring it into closer accord with experimental findings. Assuredly, a greater knowledge of feedback would give the educator a sound basis for making decisions as to the utilization of television in the curriculum, the organization and design of television courses, and, from the economic standpoint, whether money should be appropriated for feedback systems. Because it is estimated that one-third of the students in the United States are in schools using television, these decisions are significant and make the need for research urgent.

Feedback in instructional television merits further study. The present study involved one course, one instructor, and one level of education. Would the findings be different if other courses, other instructors, other levels of education were involved? This question suggests that it is difficult to generalize on the basis of the findings of the present study. The "instructor effect" alone is a fertile area for much future research. Are there correlations between an instructor's need for feedback and his intelligence, knowledge of subject matter, teaching experience, personality, or professional prestige? Do these same factors affect the feedback from students, and does it vary from the personal to the less personal situations? How do nonverbal cues--i.e., facial expressions or the reactions of other students during one student's verbal response--affect the instructor's message and behavior? How does the lack of visual cues from students affect the instructor's teaching in instructional television?

Insofar as course content is concerned, a determination needs to be made as to the kinds of subject matter that require feedback and the form of feedback best suited to the situation. Is feedback needed for all kinds of learning goals? Selection of courses for television may be based in part on whether feedback is essential and/or on the form of feedback selected. Is a need for feedback a

function of the level of education? For example, do college students have less need for feedback facilities than elementary school pupils?

The literature has made it clear that feedback is essential for learning to take place. Yet we find in the research that television students do learn as well as conventional students despite the lack of feedback to the instructor. Is this true only for factual learning? What are the implications for such factors as motor skills, attitudes, values, and problem-solving? Does the lack of feedback engender undesirable behavior in the learner? Evidence in the literature seemed to indicate that covert responses are as important as overt responses. Is this the reason learning is taking place? If covert responses do suffice, by what other means can the instructor get feedback?

The findings of the present study indicated that the individual student variables under study were not generally being affected differently by the electronic feedback situation, though differently from students in the face-to-face situation. Other individual characteristics should be systematically explored. In this way it may be possible to determine the particular feedback procedure appropriate for certain types of students.

In the discussion of the results, the procedure for asking questions by means of the electronic talkback system was cited as one probable factor influencing feedback in instructional television. Research should be directed at establishing procedures and criteria for talkback systems which consider the learner's needs and facilitate his responses. In addition, those physical requirements of the television receiving room should be determined which would provide optimum conditions for feedback.

It has been established that both the teacher and the student have feedback needs. Psychological and communication explanations have been cited. In the classroom, however, what motivates the student to respond? Is he motivated by (1) a desire to clarify the message, (2) a desire for additional information, (3) a need for an overt response, or (4) a desire to be heard and recognized by his peers or by his instructor?

Replication of the present study is recommended. In the replication a larger number of students should be considered so that a different statistical analysis may be applied which would yield the interactions of the three independent variables.

Essential to the proper use of television as a medium of instruction in the future is a greater knowledge of feedback in the teaching-learning process. Answers to the questions posed here

would add immeasurably to a clearer understanding of feedback in this process. If a 1964 survey by Stanford University's Institute for Communications Research indicating that by 1971 every major school, college, and university in the country will be employing at least one closed-circuit television system[1] is an indication of the value educators place on television for instruction, then it is imperative that answers to these questions be found.

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[1] New York Times, December 13, 1964, Education Section.

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APPENDIXES

APPENDIX A

MEASURING INSTRUMENTS

The Personality Inventory

The Preferred Instructor Characteristics Scale

THE PERSONALITY INVENTORY

By ROBERT G. BERNREUTER

Date.....

NAME..... Age..... Sex.....

Address.....

Name of school or business firm..... School grade or occupation .....

	B1-N	B2-S	B3-I	B4-D	F1-C	F2-S
Plus						
Minus						
Difference						
Percentile	%	%	%	%	%	%

H.S—COLL.—ADULT

Based on **norms**

MALE—FEMALE

CONSULTING PSYCHOLOGISTS PRESS, INC., PALO ALTO, CALIFORNIA

The questions on this blank are intended to indicate your interests and attitudes. It is not an intelligence test, nor are there any right or wrong answers.

In front of each question you will find: "Yes No ?"

If your answer is "Yes," draw a circle around the "Yes." If your answer is "No," draw a circle around the "No." If you are entirely unable to answer either "Yes" or "No" to the question, then draw a circle around the question mark.

1.	Yes	No	?	Does it make you uncomfortable to be "different" or unconventional?
2.	Yes	No	?	Do you day-dream frequently?
3.	Yes	No	?	Do you usually work things out for yourself rather than get someone to show you?
4.	Yes	No	?	Have you ever crossed the street to avoid meeting some person?
5.	Yes	No	?	Can you stand criticism without feeling hurt?
6.	Yes	No	?	Do you ever give money to beggars?
7.	Yes	No	?	Do you prefer to associate with people who are younger than yourself?
8.	Yes	No	?	Do you often feel just miserable?
9.	Yes	No	?	Do you dislike finding your way about in strange places?
10.	Yes	No	?	Are you easily discouraged when the opinions of others differ from your own?
11.	Yes	No	?	Do you try to get your own way even if you have to fight for it?
12.	Yes	No	?	Do you blush very often?
13.	Yes	No	?	Do athletics interest you more than intellectual affairs?
14.	Yes	No	?	Do you consider yourself a rather nervous person?
15.	Yes	No	?	Do you usually object when a person steps in front of you in a line of people?
16.	Yes	No	?	Have you ever tried to argue or bluff your way past a guard or doorman?
17.	Yes	No	?	Are you much affected by the praise or blame of many people?
18.	Yes	No	?	Are you touchy on various subjects?
19.	Yes	No	?	Do you frequently argue over prices with tradesmen or junkmen?
20.	Yes	No	?	Do you feel self-conscious in the presence of superiors in the academic or business world?
21.	Yes	No	?	Do ideas often run through your head so that you cannot sleep?
22.	Yes	No	?	Are you slow in making decisions?
23.	Yes	No	?	Do you think you could become so absorbed in creative work that you would not notice a lack of intimate friends?
24.	Yes	No	?	Are you troubled with shyness?
25.	Yes	No	?	Are you inclined to study the motives of other people carefully?
26.	Yes	No	?	Do you frequently feel grouchy?
27.	Yes	No	?	Do your interests change rapidly?
28.	Yes	No	?	Are you very talkative at social gatherings?
29.	Yes	No	?	Do you ever heckle or question a public speaker?
30.	Yes	No	?	Do you very much mind taking back articles you have purchased at stores?
31.	Yes	No	?	Do you see more fun or humor in things when you are in a group than when alone?
32.	Yes	No	?	Do you prefer travelling with someone who will make all the necessary arrangements to the adventure of travelling alone?
33.	Yes	No	?	Would you rather work for yourself than carry out the program of a superior whom you respect?
34.	Yes	No	?	Can you usually express yourself better in speech than in writing?
35.	Yes	No	?	Would you dislike any work which might take you into isolation for a few years, such as forest ranging, etc.?
36.	Yes	No	?	Have you ever solicited funds for a cause in which you were interested?
37.	Yes	No	?	Do you usually try to avoid dictatorial or "bossy" people?
38.	Yes	No	?	Do you find conversation more helpful in formulating your ideas than reading?

39. Yes No ? Do you worry too long over humiliating experiences?
40. Yes No ? Have you ever organized any clubs, teams, or other groups on your own initiative?
41. Yes No ? If you see an accident do you quickly take an active part in giving aid?
42. Yes No ? Do you get stage fright?
43. Yes No ? Do you like to bear responsibilities alone?
44. Yes No ? Have books been more entertaining to you than companions?
45. Yes No ? Have you ever had spells of dizziness?
46. Yes No ? Do jeers humiliate you even when you know you are right?
47. Yes No ? Do you want someone to be with you when you receive bad news?
48. Yes No ? Does it bother you to have people watch you at work even when you do it well?
49. Yes No ? Do you often experience periods of loneliness?
50. Yes No ? Do you usually try to avoid arguments?
51. Yes No ? Are your feelings easily hurt?
52. Yes No ? Do you usually prefer to do your own planning alone rather than with others?
53. Yes No ? Do you find that telling others of your own personal good news is the greatest part of the enjoyment of it?
54. Yes No ? Do you often feel lonesome when you are with other people?
55. Yes No ? Are you thrifty and careful about making loans?
56. Yes No ? Are you careful not to say things to hurt other people's feelings?
57. Yes No ? Are you easily moved to tears?
58. Yes No ? Do you ever complain to the waiter when you are served inferior or poorly prepared food?
59. Yes No ? Do you find it difficult to speak in public?
60. Yes No ? Do you ever rewrite your letters before mailing them?
61. Yes No ? Do you usually enjoy spending an evening alone?
62. Yes No ? Do you make new friends easily?
63. Yes No ? If you are dining out do you prefer to have someone else order dinner for you?
64. Yes No ? Do you usually feel a great deal of hesitancy over borrowing an article from an acquaintance?
65. Yes No ? Are you greatly embarrassed if you have greeted a stranger whom you have mistaken for an acquaintance?
66. Yes No ? Do you find it difficult to get rid of a salesman?
67. Yes No ? Do people ever come to you for advice?
68. Yes No ? Do you usually ignore the feelings of others when accomplishing some end which is important to you?
69. Yes No ? Do you often find that you cannot make up your mind until the time for action has passed?
70. Yes No ? Do you especially like to have attention from acquaintances when you are ill?
71. Yes No ? Do you experience many pleasant or unpleasant moods?
72. Yes No ? Are you troubled with feelings of inferiority?
73. Yes No ? Does some particularly useless thought keep coming into your mind to bother you?
74. Yes No ? Do you ever upbraid a workman who fails to have your work done on time?
75. Yes No ? Are you able to play your best in a game or contest against an opponent who is greatly superior to you?
76. Yes No ? Have you frequently appeared as a lecturer or entertainer before groups of people?
77. Yes No ? Are people sometimes successful in taking advantage of you?
78. Yes No ? When you are in low spirits do you try to find someone to cheer you up?
79. Yes No ? Can you usually understand a problem better by studying it out alone than by discussing it with others?
80. Yes No ? Do you lack self-confidence?
81. Yes No ? Does admiration gratify you more than achievement?
82. Yes No ? Are you willing to take a chance alone in a situation of doubtful outcome?
83. Yes No ? Does your ambition need occasional stimulation through contact with successful people?

84. Yes No ? Do you usually avoid asking advice?
85. Yes No ? Do you consider the observance of social customs and manners an essential aspect of life?
86. Yes No ? If you are spending an evening in the company of other people do you usually let someone else decide upon the entertainment?
87. Yes No ? Do you take the responsibility for introducing people at a party?
88. Yes No ? If you came late to a meeting would you rather stand than take a front seat?
89. Yes No ? Do you like to get many views from others before making an important decision?
90. Yes No ? Do you try to treat a domineering person the same as he treats you?
91. Yes No ? Does your mind often wander so badly that you lose track of what you are doing?
92. Yes No ? Do you ever argue a point with an older person whom you respect?
93. Yes No ? Do you have difficulty in making up your mind for yourself?
94. Yes No ? Do you ever take the lead to enliven a dull party?
95. Yes No ? Would you "have it out" with a person who spread untrue rumors about you?
96. Yes No ? At a reception or tea do you feel reluctant to meet the most important person present?
97. Yes No ? Do you find that people are more stimulating to you than anything else?
98. Yes No ? Do you prefer a play to a dance?
99. Yes No ? Do you tend to be radical in your political, religious, or social beliefs?
100. Yes No ? Do you prefer to be alone at times of emotional stress?
101. Yes No ? Do you usually prefer to work with others?
102. Yes No ? Do you usually work better when you are praised?
103. Yes No ? Do you have difficulty in starting a conversation with a stranger?
104. Yes No ? Do your feelings alternate between happiness and sadness without apparent reason?
105. Yes No ? Are you systematic in caring for your personal property?
106. Yes No ? Do you worry over possible misfortunes?
107. Yes No ? Do you usually prefer to keep your feelings to yourself?
108. Yes No ? Can you stick to a tiresome task for a long time without someone prodding or encouraging you?
109. Yes No ? Do you get as many ideas at the time of reading a book as you do from a discussion of it afterward?
110. Yes No ? Do you usually face your troubles alone without seeking help?
111. Yes No ? Have you been the recognized leader (president, captain, chairman) of a group within the last five years?
112. Yes No ? Do you prefer making hurried decisions alone?
113. Yes No ? If you were hiking with a group of people, where none of you knew the way, would you probably let someone else take the full responsibility for guiding the party?
114. Yes No ? Are you troubled with the idea that people on the street are watching you?
115. Yes No ? Are you often in a state of excitement?
116. Yes No ? Are you considered to be critical of other people?
117. Yes No ? Do you usually try to take added responsibilities on yourself?
118. Yes No ? Do you keep in the background at social functions?
119. Yes No ? Do you greatly dislike being told how you should do things?
120. Yes No ? Do you feel that marriage is essential to your present or future happiness?
121. Yes No ? Do you like to be with people a great deal?
122. Yes No ? Can you be optimistic when others about you are greatly depressed?
123. Yes No ? Does discipline make you discontented?
124. Yes No ? Are you usually considered to be indifferent to the opposite sex?
125. Yes No ? Would you feel very self-conscious if you had to volunteer an idea to start a discussion among a group of people?

Krumboltz

PREFERRED INSTRUCTOR CHARACTERISTICS SCALE

Directions:

What kind of an instructor do you prefer? In the following items you will find two instructor characteristics paired. From each pair choose the one characteristic you most prefer. Then mark your choice in the proper column on the special answer sheet. Do not omit any items. This is to find out your preferences. There are no right or wrong answers.

I prefer an instructor who:

1. a. is an expert.
   b. treats us as mature people.
2. a. makes the classroom pleasant.
   b. thinks logically.
3. a. understands our point of view.
   b. is well known in his field.
4. a. is dedicated to his students.
   b. is dedicated to his subject.
5. a. thinks logically.
   b. is friendly.
6. a. is well known in his field.
   b. makes the classroom pleasant.
7. a. is interested in us.
   b. covers all the material.
8. a. is dedicated to his students.
   b. knows the theoretical background of his subject.
9. a. thinks logically.
   b. treats us as mature people.
10. a. is friendly.
   b. is well known in his field.
11. a. covers all the material.
   b. understands our point of view.
12. a. is interested in us.
   b. is dedicated to his subject.
13. a. is an expert.
   b. is dedicated to his students.
14. a. is well known in his field.
   b. treats us as mature people.
15. a. covers all the material.
   b. makes the classroom pleasant.
16. a. understands our point of view.
   b. is dedicated to his subject.

I prefer an instructor who:

17. a. is interested in us.
    b. knows the theoretical background of his subject.
18. a. is friendly.
    b. covers all the material.
19. a. makes the classroom pleasant.
    b. is dedicated to his subject.
20. a. knows the theoretical background of his subject.
    b. understands our point of view.
21. a. is interested in us.
    b. is an expert.
22. a. is dedicated to his students.
    b. thinks logically.
23. a. treats us as mature people.
    b. covers all the material.
24. a. is dedicated to his subject.
    b. is friendly.
25. a. makes the classroom pleasant.
    b. knows the theoretical background of his subject.
26. a. is an expert.
    b. understands our point of view.
27. a. is dedicated to his students.
    b. is well known in his field.
28. a. is dedicated to his subject.
    b. treats us as mature people.
29. a. is friendly.
    b. knows the theoretical background of his subject.
30. a. is an expert.
    b. makes the classroom pleasant.
31. a. thinks logically.
    b. is interested in us.
32. a. treats us as mature people.
    b. knows the theoretical background of his subject.
33. a. is an expert.
    b. is friendly.
34. a. thinks logically.
    b. understands our point of view.
35. a. is interested in us.
    b. is well known in his field.
36. a. is dedicated to his students.
    b. covers all the material.

Check to see if you left any blanks.

APPENDIX B

ORIGINAL DATA

Personal Data Card

Basic Data

Personal Data Card

Name	Sex	Group (TV or Conventional)
Scores		Responses
PICS		Teacher Initiated
SAT		
TPI		Student Initiated

PICS--Preferred Instructor Characteristics Scale

SAT--Selective Admissions Test

TPI--The Personality Inventory

BASIC DATA

Student	GP	PICS	SAT	TPI	TI	SI
1	TV	18	72	28	2	0
2	TV	6	76	33	5	2
3	TV	2	76	66	0	0
4	TV	22	72	42	0	0
5	TV	3	72	34	0	0
6	TV	34	76	45	1	3
7	TV	21	72	94	0	0
8	TV	31	57	108	0	1
9	TV	6	62	-3	0	0
10	TV	28	67	-22	0	0
11	TV	26	57	60	1	0
12	TV	19	57	20	0	0
13	TV	19	72	-8	1	2
14	TV	23	62	-10	3	0
15	TV	21	76	32	1	0
16	TV	6	76	31	0	0
17	TV	2	57	21	2	0
18	TV	6	67	4	5	0
19	TV	2	72	20	0	2
20	TV	18	76	-70	1	0
21	TV	12	91	-64	1	1
22	TV	8	89	-42	0	1
23	TV	10	83	-86	0	0
24	TV	14	83	-58	0	0
25	TV	11	80	-28	0	0
26	TV	13	95	-44	0	0
27	TV	12	83	-99	2	1
28	TV	14	93	114	4	5
29	TV	14	89	-18	2	1
30	TV	9	87	-17	0	0
31	TV	15	89	28	0	0
32	TV	13	80	0	0	0
33	TV	13	80	5	1	0
34	TV	8	87	-23	2	0
35	TV	10	83	-14	1	1
36	TV	14	80	-9	5	1
37	TV	10	96	-18	3	0

BASIC DATA (Continued)

Student	GP	PICS	SAT	TPI	TI	SI
38	TV	11	62	-49	1	0
39	TV	9	72	-52	0	0
40	TV	8	67	-69	7	1
41	TV	8	62	-87	10	1
42	TV	7	76	-56	0	0
43	TV	10	76	-29	14	8
44	TV	14	67	-72	0	0
45	TV	12	72	-27	1	0
46	TV	14	72	-64	3	0
47	TV	13	67	-2	2	2
48	TV	15	76	33	0	0
49	TV	13	57	74	0	0
50	TV	10	72	-3	0	0
51	TV	12	76	-7	0	0
52	TV	10	57	-9	0	0
53	TV	4	91	-52	0	0
54	TV	2	83	-78	0	0
55	TV	3	83	-69	0	0
56	TV	6	83	-37	1	0
57	TV	3	89	-50	0	0
58	TV	5	91	-25	0	0
59	TV	35	87	-55	0	0
60	TV	2	80	-69	0	0
61	TV	19	80	-64	1	0
62	TV	29	87	-51	0	0
63	TV	18	89	-20	6	0
64	TV	2	83	11	3	0
65	TV	4	83	10	0	0
66	TV	22	87	-17	0	0
67	TV	22	91	-3	2	1
68	TV	31	87	30	6	7
69	TV	23	91	20	2	0
70	TV	24	83	34	0	0
71	TV	3	83	102	0	0
72	TV	24	87	-1	0	0
73	TV	5	80	-18	1	0
74	TV	21	89	20	2	1

BASIC DATA (Continued)

Student	GP	PICS	SAT	TPI	TI	SI
75	TV	35	83	8	0	0
76	C	6	72	-90	17	5
77	C	1	76	-46	12	1
78	C	21	72	-91	10	3
79	C	1	76	13	0	0
80	C	5	62	35	4	0
81	C	18	91	-10	2	1
82	C	3	91	30	37	6
83	C	6	91	6	4	1
84	C	18	87	-35	8	0
85	C	8	62	27	23	8
86	C	14	72	-4	4	0
87	C	16	76	-5	2	1
88	C	14	67	24	13	0
89	C	8	91	-73	4	0
90	C	7	89	-58	3	0
91	C	13	96	-62	19	3
92	C	16	87	-51	5	0
93	C	9	95	-72	6	2
94	C	15	76	-87	17	5
95	C	17	51	-26	13	3

TOTAL GROUP DATA

Group	N	M	SD	Σx	Σx^2
		Frequency			
Total:					
Television	75	1.96	3.52	147	1219
Conventional	20	12.10	13.62	242	6643
High-ability:					
Television	40	1.63	2.72	65	399
Conventional	9	11.22	12.53	101	2545
Low-ability:					
Television	35	2.34	4.24	82	820
Conventional	11	12.82	14.40	141	4098
Extrovert:					
Television	35	2.20	4.40	77	849
Conventional	11	12.36	13.16	136	3589
Introvert:					
Television	40	1.75	2.48	70	370
Conventional	9	11.78	14.16	106	3054
Received:					
Television	32	2.56	4.49	82	854
Conventional	11	11.91	9.21	131	2493
Not received:					
Television	43	1.51	2.49	65	365
Conventional	9	12.33	7.60	111	4150

TOTAL GROUP DATA (Continued)

Group	N	M	SD	Σx	Σx^2
		Teacher-initiated			
Total:					
Television	75	1.40	2.14	105	493
Conventional	20	10.15	8.84	203	3625
High-ability:					
Television	40	1.13	1.66	45	161
Conventional	9	9.78	10.77	88	1900
Low-ability:					
Television	35	1.71	2.55	60	332
Conventional	11	10.45	6.89	115	1725
Extrovert:					
Television	35	1.51	2.55	53	309
Conventional	11	10.36	5.39	114	1502
Introvert:					
Television	40	1.30	1.70	52	184
Conventional	9	9.89	11.75	89	2123
Received:					
Television	32	1.84	2.61	59	325
Conventional	11	9.91	7.01	109	1623
Not received:					
Television	43	1.07	1.66	46	168
Conventional	9	10.44	10.63	94	2002

TOTAL GROUP DATA (Continued)

Group	N	M	SD	Σx	Σx^2
		Student-initiated			
Total:					
Television	75	0.56	1.41	42	174
Conventional	20	1.95	2.32	39	185
High-ability:					
Television	40	0.50	1.34	20	82
Conventional	9	1.44	1.88	13	51
Low-ability:					
Television	35	0.77	1.49	22	92
Conventional	11	2.36	2.58	26	134
Extrovert:					
Television	35	0.57	1.60	25	108
Conventional	11	2.00	1.85	22	82
Introvert:					
Television	40	0.45	1.20	10	66
Conventional	9	1.89	2.80	17	103
Received:					
Television	32	0.72	1.92	23	101
Conventional	11	2.00	2.50	22	112
Not received:					
Television	43	0.44	1.21	19	73
Conventional	9	1.89	2.13	17	73

WITHIN TELEVISION GROUP DATA

Group	N	M	SD	Σx	Σx^2
		Frequency			
High-ability	40	1.62	2.71	65	399
Low-ability	35	2.34	4.23	82	820
Extrovert	35	2.20	4.41	77	849
Introvert	40	1.75	2.48	20	370
Received	32	2.57	4.48	82	854
Not received	43	1.55	2.49	65	365
		Teacher-initiated			
High-ability	40	1.13	1.66	45	161
Low-ability	35	1.71	2.55	60	332
Extrovert	35	1.51	2.55	53	309
Introvert	40	1.30	1.70	52	184
Received	32	1.84	2.59	59	325
Not received	43	1.07	1.49	46	168
		Student-initiated			
High-ability	40	0.50	1.34	20	82
Low-ability	35	0.77	1.50	22	92
Extrovert	35	0.57	1.62	24	108
Introvert	40	0.45	1.20	18	66
Received	32	0.72	1.62	23	101
Not received	43	0.44	1.22	19	73

CHI-SQUARE ANALYSIS OF THE NUMBER OF STUDENTS IN THE EXPERIMENTAL AND CONTROL GROUPS BASED ON EACH OF THE INDEPENDENT VARIABLES

	High-ability		Low-ability	
	Actual	Expected	Actual	Expected
Experimental	40	38.2	35	35.9
Control	9	10.8	11	10.1

$\chi^2 = .488$

	Extrovert		Introvert	
	Actual	Expected	Actual	Expected
Experimental	35	35.9	40	38.2
Control	11	10.1	9	10.8

$\chi^2 = .488$

	Received		Not Received	
	Actual	Expected	Actual	Expected
Experimental	32	33.5	43	40.6
Control	11	9.5	9	11.4

$\chi^2 = .950$