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ABSTRACT

The history of research concerned with the use of television for instruction has been replete with statistically non-significant and inconsistent results. Studies for almost two decades have focused on the comparative effectiveness of television with other mediums of teaching. The research focus of the Children's Television Workshop provided a contrast to the great bulk of the existing instructional television studies. This paper examines the two bodies of research from the point of view of theoretical progress achieved by two different approaches to scientific inquiry: summative and formative. Examination of the historical and research context indicates that the approach of summative research has been premature in the field of communication research regarding instructional television. Formative research, on the other hand, demonstrates the need for the preparatory, exploratory type of study necessary in a field where the testable variables are yet to be discovered. (Author)

The Nature of Inquiry and Analysis of Theoretical Progress in Instructional Television from 1950 - 1970

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In 1968 the Children's Television Workshop began a massive attempt to test the power of television as an educational instrument.[1] Although the results of almost two decades of research in instructional television existed by that time, the research team planning Sesame Street concluded that:

> There were no precedents of sufficient scope and generality either from the field of educational television or from the field of educational planning and research in general, to provide clear guidelines.[2]

A review of the studies and literature relevant to research in instructional television for children prior to 1968 appears to support this assessment. Two consistent conclusions are apparent: there is a preponderance of inconsistent and statistically non-significant results; there is a recognition of the need for research which will correlate specific production variables with learning. In contrast to the history of instructional television research which lay behind them, CTW approached the problem from a different point of view and, after one year of broadcast, achieved significant and consistent results in measures of learning. The most apparent difference in the studies prior to Sesame Street and those of CTW is in the approach to the research question. Inquiry prior to Sesame Street may be categorized as summative, while the approach taken by CTW was formative.

For the purposes of this paper I will use the term summative research to define inquiry based on scientific validation which seeks the discovery of laws.[3] Summative research is concerned with: (1) effects that have been hypothesized, a priori, within the framework of a broader deductive system, (2) the use of empirical and statistical procedures that provide replication, and (3) generalizability.[4] The term formative research is used to represent inquiry based on interpretation within a context which seeks information for improving a product or practice. Formative research is concerned with: (1) meeting informational needs of product designers, (2) quantitative rather than inferential data, and (3) broad, speculative interpretations.[5]

It is the thesis of this paper that the approach defined by summative research, as opposed to formative research, has been premature in the field of communication research regarding instructional television programming for children. I will suggest that the major factor contributing to the hsitory of non-significant and inconsistent results in instructional television research is the bias of the scientific community to inquiry which is dedicated to scientific validation. In an attempt to show why the approach of summative research has not provided theoretical progress in the field of instructional television, I will first examine the nature and results of scientific inquiry from 1950 to 1970. Secondly, I will examine the context of instructional programming for children prior to Sesame Street and at the conception of Sesame Street. Finally, I will examine

some of the philosophical arguments regarding the approach to scientific inquiry which appear during this period.

Generally speaking, the research question in instructional television has been: how can television be used to teach? An examination of the research from 1950 - 1964 by the Institute for Communication Research identifies over 350 studies of instructional film and television which speak to this question.[6] Although perhaps not exhaustive, the body of studies represent a comprehensive attempt to survey the research of the period. Sources include USOE studies, Dissertation Abstracts, Armed Forces studies, published, mimeographed, duplicated and offset materials, and 36 journals and periodicals. In addition, reviews of research literature during this period support the findings of the Institute Report.[7]

The studies reported approach research from the point of view characteristic of summative research, and may be categorized as comparative effectiveness, utilization, basic and attitude studies. By far the largest single category of research, comparative effectiveness studies account for 17 of the 35 studies reviewed by the Institute which relate to programming for children. Table I presents examples of the studies in this category.

Table 1

Comparative Effectiveness Studies
(Studies in Category: 17)

Study	Research Question	Research Design	Results
Suchy and Bauman[8]	effectiveness of TV and face to face instruction in elementary math, science, and safety	three year study classes assigned to TV and face to face instruction students matched on basis of IQ Tests: achievment and critical thinking (pre-post, post different from pre)	1. First year no-significant difference 2. Second year no-significant difference for critical thinking significant differences for TV learning 3. Third year no significant difference
Enders[9] (1960)	effectiveness of TV and face to face instruction for elementary science	classes assigned to: 20 TV lessons 12 TV lessons face to face inst. Tests: achievement (pre-post) and lesson quizzes for TV group	significant difference for TV instruction
Pflieger[10] (1959)	effectiveness of TV and face to face instruction in elementary health, science and Spanish	classes assigned to TV and face to face instruction students matched on basis of IQ, sex, aptitude, listening Tests: achievement (pre-post)	significant difference for face to face instruction in science other measures, non-significant difference
Carner[11] (1961)	effectiveness of TV and face to face instruction for elementary reading	students assigned to TV instruction compared to students receiving face to face instruction of previous year	for superior readers, significant difference for face to face for below average readers, significant difference for TV

The research question in all of these studies is a comparison of learning for students instructed over television with the performance of students instructed directly. Studies include televised instruction of science, health, guidance, spelling, Russian, Spanish, speech, art, reading, mathematics, French, music and safety. The research design in most cases involves the matching of groups of students according to intelligence and achievement scores. Pre and post testing provides the basis for analysis of variance between treatment groups. The results show non-significant differences in ten studies, significant differences in favor of television in five cases, significant differences in favor of face to face instruction in one case, and significant differences for parts of the sample for both televised and face to face instruction in two of the studies.

Research in the categories of utilization studies and basic studies is also concerned with measuring learning as a result of televised instruction. Typically, utilization studies compare one method of using the medium against another method to determine which utilization produces the most learning. Basic studies seek to identify learner and media variables which may be related to achievement.[12] As is apparent from the summarization of utilization and basic studies in Tables II and III, the quantity of such studies is markedly less than with comparative effectiveness studies.

Table II

Utilization Studies
Studies in Category: 7)

Study	Research Question	Research Design	Results
Garry[13]	effectiveness of TV instruction when used with different placements in the lesson, teacher training, and pupil activity for elementary science	classes assigned to experimental treatments utilizing TV and face to face instruction Tests: achievement, interest, attitude, reasoning ability (all treatments include teacher follow-up)	significant difference in achievement for experimental groups non-significant correlation of TV as terminal activity/ common class assignment and TV as initiating activity/individual projects
Hayman[14] (1963)	effectiveness of second viewing of TV instruction for elementary Spanish	two year study classes assigned to: TV instruction TV instruction with teacher follow-up TV instruction with second viewing students matched on basis of: IQ, GPA Tests: listening, oral, achievement (pre-post)	First Year 1. significant difference for teacher follow-up 2. significant difference for second viewing Second Year 1. significant difference for teacher follow-up
Kraft[15] (1961)	effectiveness of TV instruction when used with different placements in the lesson, teacher training, and pupil activity	classes assigned to: control (TV only) experimental (TV with other variables) Tests: non-standard achievement (pre-middle-post)	no significant differences correlation of TV as terminal activity/common class assignment and TV as initiating activity/ individual projects

The most apparent problem in analyzing the results of the utilization studies is the multitude of variables that are being tested. In general, the research question in these studies involves testing the effectiveness of various combinations of classroom teaching with the use of a televised course. The most commonly tested variables are teacher training, supplementary teaching methods, opportunity for feedback, second viewing, and type of student assignment. The research design for most utilization studies involves assignment of classes to control and experimental groups, and the matching of students according to intelligence and achievement tests. As with comparative effectiveness studies, pre and post testing of achievement provides the basis for analysis of variance between control and experimental groups. The results of the utilization studies which tested similar variables are generally consistent, but rarely show significance. Consistency of results is found for four variables: teacher follow-up results in more learning, televised instruction at the end of the lesson is better when the class is given a common assignment, televised instruction at the beginning of the lesson is better when students are given independent study assignments, and viewing twice is more effective than viewing once. A statistically significant difference in achievement, however, is found only in the first variable.

Research in the category of basic studies is concerned with the effect of production variables on learning (Table III). In three of

the four studies, treatment groups viewed different forms of a production and were tested for achievement. Significant results were obtained for such variables as active student response, in-studio class, and rehearsal of information. There are not enough studies in this category, however, to comment on consistency of results.

Table III

Basic Studies
(Studies in Category: 4)

Study	Research Question	Research Design	Results
Gropper and Lumsdaine[16] (1960)	use of student response to increase learning	control group: TV instruction with no response experimental: TV instruction with response	significant difference for active response group
Schwartz-walder (1960)	effect of arrangement and presentation of visual material on learning	classes assigned to view shows with: continuity vs. random order of visuals super vs. no super to reinforce content teacher vs. studio manipulation of visuals	no significant differences
Hayman[18] (1961)	effectiveness of TV instruction by direct lecture, lecture with student response, lecture with in-studio class and student response	classes assigned to: telecast lecture telecast lecture/ response telecast/in-studio class/response matching on basis of IQ, GPA, achievement Tests: listening comprehension	significant difference for group with telecast/ in-studio class/response scores on rehearsed items significantly higher than non rehearsed

Guba and Wolf[19] (1964)	visual field	laboratory experiment to measure visual attention to objects used in televised instruction Tests: IQ	High IQ: more attention to pertinent visual areas than low IQ subjects exhibit tendency to look at face of narrator, hands when manipulating object, object to which verbal attention is directed

The fourth category of research prior to Sesame Street is attitude studies (Table IV). The studies concerned with instructional programming for children measured attitude toward both subject matter and the medium.

Table IV

Attitude Studies
(Studies in Category: 7)

Study	Research Question	Research Design	Results
Sheehan[20] (1960)	attitude toward subject taught on TV for elementary science	classes assigned to: control (TV only) experimental (TV and other variables) Tests: attitude	television or experimental conditions least important factors relating to attitude change
Hardaway[21] (1963)	attitude toward TV as medium of instruction	attitude scales administered to students exposed to televised instruction (pre-post)	no significant difference between pre and post attitude scores

Two studies measured attitude as a factor of different treatments, and five studies surveyed large groups of students who had experienced courses on television. Of the two studies that measured attitude change, one found no significant difference and one found the medium to be the least important factor relating to attitude change. The results of the studies in this category do not show consistency or statistical significance. In addition, there is the obvious difficulty of drawing conclusions from verbal measures of attitude.

The nature of scientific inquiry prior to Sesame Street has been examined according to the research question, the research design, and the results. Using these same descriptors, one can examine the nature of inquiry defined by formative research. The initial Sesame Street studies are examined here, both because they represent the formative approach to research and because they are the first large scale attempt at formative research in instructional television. The body of research represented by these studies, however, included the succeeding research on Sesame Street as well as the Electric Company, and the studies of the Appalachia Preschool Program. As summarized in Tables V, VI and VII, the studies conducted on Sesame Street fall into three categories: instructional goals, appeal, and achievement.

Table V

Instructional Goals

Study	Research Question	Research Design	Results
CTW[23]	needs assessment competence level of audience, behavioral goals	five three-day workshops of professionals from child related and production fields review of data on competency of audience	Goals: symbolic representation, cognitive process, reasoning and problem solving, the child and his world Priorities: (based on competence of audience) allocation of program time, selection of specific learning instances in each goal area Behavioral terms: integrating, generalizing, anticipating, imputing motives, evaluating

Research in the category of instructional goals is directed toward planning. The research question is concerned with the establishment of goals and priorities on which to base production. Designed to collect the preliminary data on instructional needs and competence level of the proposed audience, workshops consist of professionals in production and child related fields.[24] The goal areas established as a result of this research are symbolic representation, the child and his world, reasoning and problem solving, and cognitive processes. Definition of behavioral terms to be measured in these goal areas include integrating, generalizing, anticipating, imputing motives and intentions, and evaluating. Based on

the assessment of audience competence, priorities are established for allocation of program time and selection of specific learning instances.[25]

Research in the category of appeal studies is concerned with providing information about production design variables. The research question in these studies is concerned with the identification of program design techniques which attract and hold the attention of children.

Table VI

Appeal Studies

Study	Research Question	Research Design	Results
CTW[26]	methodology for appeal research	assignment to one of three methods of response	1. development of the distractor method 2. small group observation most effective 3. development of observation instrument: visual attention verbal response motor response
CTW[27]	identification of program design variables which hold attention	measurement of attention for five existing television preschool programs and cartoons	1. attention levels highest for animation 2. attention level affected by introduction of new object, novelty, and variety 3. motor and verbal eliciting techniques rare in existing programs

CTW[28]	appeal levels for Sesame Street productions according to subject variables, interaction of viewer and program variables program content	field test of program segments and pilot shows group observation using distractor method attention rating instrument	1. high appeal for: animation, pixiliation, rapid changing, jingles, slapstick, simplicity, animals, children 2. low appeal for: adults talking 3. repetition suited to some kinds of material 4. active participation in TV games 5. certain types of actions imitated
CTW[29]	empirically linking identification of program design variables to effects on viewers	group observation using distractor and observation instrument	interrater reliability established for observation instrument validity of prediction of appeal of observation instrument established

The research design involves the observation of small groups of children using the distractor method. Appeal is measured according to visual, verbal and motor activity. The results of the appeal research include the development of a valid and reliable method of appeal measurement, measures of attention level according to subject variables, and identification of program design variables with effective attention holding appeal. The research indicates, for example that attention levels vary according to the size of the group viewing, and the sex of the viewer. In addition, the research shows high appeal for such techniques as

animation, pixiliation, jingles, slapstick, simplicity, animals and children on the screen, and low appeal for adults talking.

Research in the category of achievement studies is directed at the identification and definition of features of program design which are reliable predictors of learning.[30] This category includes both the formative studies of CTW and the summative studies of the Educational Testing Service. The research question in these studies is concerned with the educational effectiveness of specific production techniques as well as the composite effectiveness of complete programs and a whole series. The research design involves comparison of achievement scores according to treatment, and comparison of achievement and appeal ratings with content analysis of program segments. Analysis of variance is based on matching of individuals according to age, sex, socio-economic status, prior achievement, and home background. In general the results show that gains in achievement are related to such factors as the emphasis in programming, the manner of presentation, and the extent to which the presentation elicited overt response.

Table VII

Achievement Studies

Study	Research Question	Research Design	Results
CTW[31]	assessment of variables in content and program design according to educational impact, identification of teaching approaches appropriate to TV, instructional conditions of TV	groups of children matched, viewed video segments observed for appeal pre-post testing of achievement in goal areas (symbolic or pictorial)	1. high correlation between test items and content 2. items most commonly missed related to content that drew little or no verbal or motor response
CTW[32]	relationship of achievement scores to appeal measures for a complete show	experimental and control groups according to: home or day care viewing, socio-economic class Tests: achievement (pre-post) comparison of appeal measures and achievement scores analysis of variance on basis of matching	1. achievement performance related to: repetition, varied treatment, visual simplicity positive gains in goal areas related to emphasis, manner of presentation, overt response
CTW[33]	educational effectiveness of broadcast series	samples as above post testing at 3 wk, 6 wk and 3 mo interval progress in goal areas measured at: item level, general skills areas, total test areas, composite score for entire program	same as above
ETS[34]	educational effectiveness of broadcast series	national samples matched on basis of age, sex, SES, prior achievement Tests: pre-post achievement, observation and viewing record, content analysis of programs, parent and teacher questionnaire (pre-post)	same as above greatest effectiveness related to: amount of viewing time, activity eliciting nature of content

The body of studies associated with Sesame Street and the studies prior to Sesame Street delineate two distinct approaches to research during the period for 1950 - 1970. In general, the research designs are similar across both bodies of research. The difference exhibited in the research questions, however, is critical. In the summative studies, a situation is hypothesized and then tested. These hypotheses ask, for the most part, either-or questions: either television teaching is more effective than face to face teaching, or it is not; either television teaching with teacher follow-up is more effective than with no teacher follow-up, or it is not; either a televised lecture with an in-studio class is more effective than a lecture without an in-studio class or it is not. Asking the research question in this manner limits the results to either acceptance or rejection of the hypothesis, or, perhaps, an indication of the direction in which the results deviate from the hypothesis. In the formative studies, on the other hand, the research question is posed not as an a priori statement, but in terms of the context. Instead of arranging the conditions to represent a hypothesis, formative research accepts the natural range of variables.[35] To identify production techniques with appeal, children are observed and rated according to attention and response activity; to assess the educational effectiveness of presentation techniques, the variables of attention, activity and achievement are correlated.

Directed by different research questions, it is not surprising that the results of the two bodies of research differ also. While both

bodies of research represent disciplined inquiry, the degree to which each develops scientific theory delineates a critical comparison. Judged according to the ability to provide organization, prediction, explanation, understanding or control of events, theoretical progress prior to the Sesame Street studies is, indeed, limited.[36] Beyond the generalization that children can learn from televised instruction, the summative studies provide little support for more refined conclusions.

Statements describing production techniques which can be empirically tied to learning are limited to the research categorized as basic studies. In addition, problems in the experimental designs of the great majority of the studies make interpretation difficult. In most cases the main variable of televised versus direct instruction is mixed with other variables such as different teachers in each of the experimental conditions. One investigator concludes, in fact, that "a well trained and motivated classroom teacher is the most effective single learning aid."[37] It may be that many of these studies were measuring the varying abilities and motivations of teachers rather than the variables of television and face to face teaching, or any of the other treatment conditions. Secondly, most of the studies make comparisons based on existing or intact classes. Although individuals are matched for intelligence and achievement, other factors may have biased the results. Some factors to consider are socio-economic status, potential for learning, help from home environment, or motivation.[38]

A third problem with interpretation of many of the studies occurs from the measurement instruments. Although the majority of the studies base their conclusions on measures of learning, there is a lack of evidence for the reliability and validity of the tests used. In summary, then, the summative research studies fail to generate either substantive or generalizable principles relating to instructional television.

The results of the formative studies, on the other hand, indentify principles of presentational learning, establish a research model, and identify a theory of instructional television. Established in the research, for example, are principles which relate learning to production variables: achievement is related to the manner of presentation of the subject matter, to the extent to which programming elicit overt responses, and to repetition, variety of treatment, and visual simplicity. The research model which can be extracted from the CTW research includes categories of independent variables (major program attributes), dependent variables (viewer outcomes), and principles of program design (statements linking specific independent variables and dependent variables).[39] The statements arrived at in the third category may be defined as the principles of presentational learning. Finally, the formative approach to inquiry of instructional television identifies a testable theory: the activity producing potential of the medium is the basis for its instructional value.[40] Support of the theory is seen in all four of the achievement studies, as well as in developmental psychology. According to Piaget, for example, the "experiences that

constitute intrusions upon a child's existing cognitive structures initiate activity which culminates in a new set of structures at a higher level."[41] The research of CTW successfully identifies many of the ways that television is particularly suited to this "intrusion." The possibility of showing reversability of processes and relationships, of objectifying mental manipulations through animation, of juxtaposition of examples of a concept which are normally too widely separated in time and space to be connected, or of creating magical experiences which compel examination of assumptions all speak to the activity producing potential of the medium at the intellectual level. In addition, the CTW studies find that learning is increased when programming provides for motor and verbal responses.

The review of the studies related to instructional television programming for children from 1950 -1970 establishes the 'givens' of the research for that period. Having established what happened, let us examine the context of instructional television research as well as philosophic arguments regarding the nature of scientific inquiry to determine why research producing non-significant and inconsistent results has dominated inquiry in instructional television, and the meaning to be found in this occurance.

Included in the factors which might have contributed to a history of research producing little theoretical progress are (1) the motivation for using the medium, (2) lack of recognition of the appropriate

research question, (3) inherent limitations of formative research, and (4) historical bias to the summative research model. In the 1950's and early sixties television was accepted into the burgeoning mass of educational teaching aids. With its ability to reach large numbers of people, to present courses that otherwise could not be offered, and to expose many of the talents of outstanding, high prestige instructors, television was seen as a particularly valuable tool in meeting the problems of increased enrollments, teacher shortages, and the need to expose students to a more comprehensive body of knowledge.[42] The faith exhibited in the use of television to meet instructional needs in the 50's and 60's is evidenced by the increasing use of television courses and the extensive support given to instructional television research. A conservative estimate indicates the number of students enrolled in television classes in 1960 to be over one-and-one half million. In 1961 the estimate is at almost three million, and by 1962 the numbers rise to over ten million. In 1961, thirty six percent of all students were served by television instruction.[43] Programming for children, to which this paper has addressed itself, accounted for sixty percent of those enrolled in televised courses. A great volume of research during this period was supported, first by the Defense Department, and later, by philanthropic foundations and such agencies as the Office of Education. In addition, a considerable amount of dissertation research considered the topic of instructional television programming.[44]

It does not appear that the motivation for the use of television was much different in 1968 when CTW sought funding for research and production than it was in the preceding twenty years. The Carnegie Commission report on educational television, from which the proposal for Sesame Street grew, suggested that "the informal educational potential of Public Television is greatest of all for children."[45] The report specifically addressed itself to the needs of preschool children whose intellectual and cultural preparation would classify them as disadvantaged. Funding for Sesame Street was based on the premise that television provided the most extensive and least expensive method of reaching the four-fifths of the nations preschool children who do not have the benefit of formal pre-school education.[46] As with the period preceeding Sesame Street, support for research was extensive. The Children's Television Workshop received seven million dollars to support its first year of research and production.[47]

Evidence also appears plentiful to discount the second contention. Throughout the period individual studies as well as reviews of the research literature identify the need for a change of focus in instructional television research. Conclusions consistently recommend identification of programming variables which affect learning. From the studies cited in the first part of this paper one finds such comments as:

> more study is needed to determine what is actually learned by television instruction because teachers reported that they felt intangibles were being

> taught by TV that were not measured by the tests (1959) [48]

Jacobs concludes in 1959, that "further research is needed to determine the cause for differential learning gains for methods of instruction,"[49] and Dietmeier, in 1960, that examination of appropriate teaching techniques in relation to different outcomes is necessary.[50] Going beyond the studies limited to programming for children, the theme is reiterated. In a study done in 1960, Kumata concludes that the mode of presentation significantly affects learning, hypothesizing that television-taught students did less well because of the "use of methods tied to conventional-type teaching in the television situation."[51] Games concludes in 1963 that the "critical factor needing study is the program,"[52] and Siegel in 1966 that research should "inquire into the combination of variables maximizing the desired outcome."[53] Two other studies during this period suggest one variable that should be explored. Pool in 1963 reports that viewers of educational television desire more entertaining methods of communication, suggesting simpler terminology, a lighter, more colorful, and less formal approach, and greater variety.[54] Ferretti, in 1972, suggests that educational television has failed to use the power of the medium because

> the approach has been worthy, dark brown and humorless.... To get an audience you must be entertaining. [55]

The reviews of the literature during this period validate the conclusions of individual researchers, such as those cited above, and indicate that the situation has not yet changed. Addressing the needs

for planning of the administration of Title VII funding by the Office of Education, a 1959 study by Allen concludes that comparative effectiveness studies should be avoided as needless duplication of previous research. In addition, the review cites the critical need for research directed at discovering the "unique educational characteristics of media." In light of the CTW studies, the recommendations of the reviews present an interesting history:

> Further study is needed of production variables... particularly as they relate to audience-learner characteristics... and, incorporating these research findings, doubtless with the cooperation of the producers themselves. 56

It is interesting to note the conclusions of another review by Allen eleven years later, as well as those of Miller in 1972. In 1971 Allen states:

> That students learn from televised teaching cannot be doubted, but the conditions under which such learning takes place and the specific characteristics of televised presentations that bring about this are yet to be determined, and most research (has) ignored such questions. 57

The recommendations of Miller in 1972 are distressingly similar to those of Allen in 1959. Thirteen years of research later, the recommendations include suggestions that comparative effectiveness studies be avoided as duplicating previous research, and lists critical problems needing research to be studies of production variables, incorporating research with production, and applying isolated research findings in operational situations.[58] Reviews between these two points in time substantiate the nature of the recommendations as ongoing concern. Carpenter in 1960, Molstad in 1964, MacLennal in 1964 and

Briggs in 1967 all express the need for research directed at discovery of program variables which affect learning.[59]

Professionals outside the discipline also addressed the question of the focus of media research, as evidenced by the reports of the two White House Converences on Children and Youth held during this period. Both the Converences of 1960 and 1970 included a forum on Children and the Media. Although the two reports differ in appreciation of the influence of television, both recognize a need to address the nature of the effectiveness of the medium. In the 1960 report, television is acknowledged as an important influence on the lives of children, but one which can be controlled by parents, institutions, such as schools, religious groups and civic organizations, and the broadcast industry.[60] The language of the 1970 report indicates a more definitive notion as to the nature of the influence:

> Television plays a dominant role in the overwhelming influence of mass media in our lives. [61]

In its research recommendations, however, the 1960 report touches on questions that would assess the properties of the medium, calling for assessment of the impact of television on behavior, values and learning and concluding that "fundamental to such findings is an understanding of how these effects are achieved."[62] The 1970 report identifies one of the variables as the ability of the medium to encourage "active participation, interaction and continuing dialogue within our society" and directs its research recommendations to this point.[63]

Although admittedly not an exhaustive examination of factors contributing to the historical context, it appears that a pattern of research described by duplication and non-significant results persisted for almost two decades, despite consistent recognition of a need to alter the focus of the research question. If one is to include the findings of Allen and Miller, the pattern continues, inspite of the altered research focus successfully employed by CTW.

Although explanation of the pattern can only by hypothesized, the two further considerations relating to the research context deserve examination. Because formative research is directed toward producing information for decision making, researchers and designers work as a team. The research-production approach, then, is limited to the extent to which researchers, producers and funding agencies are interested in this approach to scientific inquiry. As the reports of CTW are the first to admit, the success of formative research is related to the time required for the team approach and funding.[64] Substantial levels of support for both Sesame Street and the Electric Company allowed utilization of high level production talent and resources as well as extensive use of educational advisors and consultants. In addition, both projects were allowed about eighteen months for prebroadcast planning and production. In addition to the apparent interest of the funding agency in a formative approach to research, researchers and producers began with a fundamental "decision to ... meld production and research ... into a single force directed toward continuous improvement."[65]

Research was considered effective only as it was directed toward the needs of producers, and producers, although initially skeptical "about the idea of researching every moment...and being told how to design," relied on research data in programming decisions.[66] A contrasting situation is apparent, at least superficially, in the studies discussed as summative research. Although there is evidence of substantial support for instructional research, the funding is disseminated in a manner which almost eliminates the possibility for the research-production approach of formative research. The problem appears to lie with the project investigators, however, and not with the funding agencies. For the most part, producers of instructional programming are not provided with expertise in research methodology. Very few public television stations employ even one full-time research person.[67] If the motivation for matching expertise in production and methodology is not with the producers, it does not appear to be with the educators either. The repetition and duplication of comparative effectiveness studies, for example, would seem to indicate the motivation for research to be data collection for the justification of a method of instruction rather than an interest in the nature of the instruction. The substantial funding of a number of formative research projects, however, would tend to indicate, at least since 1968, the willingness on the part of funding agencies to accept proposals of this type. One can cite, for example, the three projects of the Children's Television Workshop (Sesame Street, the Electric Company, and Feeling Good), as well as the Appalachia Preschool Program and the University of Mid-America.

Of final consideration, then, is the possibility of a bias within the scientific community toward research of the summative type. Addressing a similar pattern of summative research producing little theoretical progress in psychology, Cronbach argued in 1957 against the appropriateness of this model of research for the social sciences.[68] Adopting the experimental model from the hard sciences, especially physics, research is necessarily dedicated to the quest for laws of human behavior. As a result, research problems are chosen which fit the mode of model building and hypothesis testing. The restrictions imposed by the summative model on the selection of research problems and research treatments, as discussed by Koch, Scriven and Cronbach, are strikingly similar to the problems we have observed in instructional television research.[69] As examination has shown, research questions in the summative body of instructional television research have not led to theoretical progress in answering the question: how can television be used to teach. Secondly, the problems discussed in relation to the application of an experimental design which requires validation and generalization indicate the inappropriateness of this research approach to at least the initial research problems in instructional television. Similar to the approach of CTW research in instructional television, the suggestion is made in psychology for a contextual approach to research. As defined by Cronbach, the treatment by aptitude interactions approach provides a model for assessment of variables within a context as opposed to the summative approach which is limited by prestructured hypotheses. Again, similar to the pattern observed in instructional

television research, as assessment of research in psychology by Cronbach twelve years after the address to the American Psychological Association reveals a continuing dedication to summative research and the attendant lack of theoretical progresses.[70] Given the evidence of the historical context, one is left to conclude that the major factor contributing to the domination of research which has produced little theoretical progress in the field of instructional television has been the bias of the scientific community to inquiry dedicated to scientific validation. Although one can understand the proclivity of investigators to continue in a mode that is familiar, one would hope that the history of limited effectiveness would lend support to change.

If, as Cronbach suggests, "too narrow an identification with science has fixed our eyes upon an inappropriate goal,"[71] then examination of that historical pattern might be of value in ascertaining a more appropriate goal. The goal of summative research has been defined as generalizability, i.e., the seeking of laws or rules. In addition the summative approach to research assumes the necessity of experimental conditions with limitations on the number of variables that can be controlled for testing. As Scriven points out, the application of this model of the physical sciences to the study of human behavior is limited.[72] First, the easy questions have been answered. Unlike the phenomena faded by Newton or Galileo, thousands of years of observation of human behavior have provided empirical laws which we regard as common sense. The study of human behavior, then, begins at a

level beyond the basic truisms. Secondly, the study of human behavior does not admit to the same control of variables that propositions describing electrons and atoms do. The social scientist simply cannot play with human life the way a chemist can manipulate elements or a biologist rats. And even if one could, it is probable that the generalizations would not hold constant for construction of the ultimate paradigm. While the world of the physical theorist is relatively steady, the half-life of social and behavioral phenomena rarely admits to isolation.[73]

The limitations of summative research are apparent in the history of instructional television research. The easy question was asked: is televised teaching as effective as the face to face method. The fact that two decades of research never got beyond this question, however, indicates the difficulty of attacking the questions beyond this level. The predominance of insignificant and inconsistent results speaks to the problem of controlling the variables which account for human learning.

The goal of the formative studies, on the other hand, was not generalizability, but rather assessment of events within a context. Cronbach suggests that such a goal is more useful and realistic given the problems of studying human behavior. Accordingly, inquiry can be expected to provide information which will assist application of a treatment in the limitations of the context, and information which will

develop useful explanatory concepts.[74] As the studies of CTW demonstrate, the focus of formative research provided information in these two areas. By observing the effects of the controlled variables within a context, researchers were able also to focus attention on the free range of uncontrolled variables operating in the situation. As these variables were identified, treatments could be adjusted and changed in the search for further correlations. In formative research, then, generalizations become working hypotheses and not conclusions. Secondly, the formative approach provided explanatory concepts that could be used by producers. Indeed, the research was effective only to the extent that it served the developmental and application needs of the producers.

The pattern of research in instructional television during the period examined suggests the point made by MacLeod in discussing the differences of phenomenological and experimental research in psychology: phenomenology is prepatory to a science of psychology.[75] Formative research is phenomenological in that it focuses on the context-- the subject matter is the data of experience, observation of variables is not limited to pre-defined hypotheses, and meaning for the individual is concerned with covering a wide range of empirical questions and with making broad, speculative interpretations of the results. Not hampered by the need for statistical inference, such an approach, as demonstrated by the CTW studies, can freely explore the phenomena of a situation. In addition, the results of the approach show the possibility of

identifying both a body of theoretical principles and a theoretical research mode for instructional television. In the sense that phenomenological research is preparatory to experimental research, formative research can be viewed as a method of inquiry which identifies the appropriate hypotheses to be tested by summative research.

Historic and philosophical considerations appear to indicate a role for both types of research, especially given the unique problems of research in the social sciences. It has not been the intention of this paper to discredit research dedicated to scientific validation, but rather to assess the effectiveness of research based on this model at a particular period of theoretical development within the field. In view of the history of research in instructional television, one can conclude that the approach defined by summative research was premature. Given a field of research where the testable hypotheses are infinite, formative research can bring that "hazy vision to crude sketch to articulate blueprint."[76]

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