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ABSTRACT

An instructional television program, "Place of Doors," developed by the New York State Education Department's Bureau of Educational Communication to teach science, ecology, health, social studies, and consumerism to fourth graders was evaluated. The program was used to provide mainline rather than supplemental instruction. Nine hundred and one students from nine school districts participated in the television-based program for two hours a day for 20 days. Three hundred and fifty matched control students were drawn from the same districts. Data were collected through criterion-referenced pretests, midtests, posttests, and retention tests developed from the cognitive objectives of the program. The mean test performance for experimental and control groups across test occasions showed greater improvement for the experimental groups. Other statistical analyses showed reading and pretest scores to be significant in predicting posttest scores. The science and social studies areas of the program were influenced less by reading ability than other content areas. There was no relation shown between student liking or the program and student performance. (KB)

LEARNING FROM TELEVISION

A Television Based Learning System

As A Capable School Resource*

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Abstract

The majority of research investigating the comparative effectiveness of different media in attaining learning objectives has generally produced results of inconsequential theoretical and statistical significance. Rather than attempting to expand the existing preponderance of non-significant results, a project was undertaken to explore the capabilities and potentials of one instructional medium, television. This project set out to design and field test a television learning system that would provide main-line rather than supplemental instruction. The objective of the project was to build a self-contained instructional sequence of video lessons and video programmed activities that would teach essential aspects of the school curriculum (science, social studies, health, consumerism, and ecology).

After two formative evaluation phases and a number of revisions of the video lessons, the program was tested with over 900 students who participated in the program two hours per day for twenty days. This paper summarizes the results of that summative evaluation study. The sample of experimental students was drawn from nine different school districts, stratified on the basis of reading and school type. A total of 350 matched control students were drawn from the same districts. Data were collected at four points (pre-test, mid test, post test, retention), by means of four criterion referenced tests developed from the cognitive objectives of the program. Additional data were obtained through student questionnaires as well as from student records.

Cognitive results demonstrate the effectiveness of a television learning system in positively affecting student performance. Analyses indicate that the television programming produced consistent and statistically significant increases in student performance across the entire exposure time of the experimental groups. Learning (as measured by a retention test) was maintained even

e month after the completion of the program. The control groups indicated
learning growth.

The program effectiveness was further analyzed in terms of school characteristics, student reading ability levels, and student interest in the program.

A discussion of the theoretical and practical implications of the learning system as an efficient school resource conclude the study.

Introduction

Educational research has continually sought to enhance learning and improve instruction. As part of this quest numerous studies comparing different instructional treatments or presentations have been conducted and their results permeate the research literature.

The instructional media literature is particularly replete with examples of this comparative research (among compilations of these studies are: Chu and Schramm 1968, Lumsdaine 1961, Carpenter, 1953). Despite decades of investigation attempting to substantiate the instructional superiority of different media for different learning contexts, little of statistical or theoretical significance has been demonstrated. The primary reason these studies resulted in non-significance could be that the comparative studies have generally been formulated within an almost atheoretical framework that confounded media types, media attributes, and media content with individual learner attributes and interests. (Salomon 1970) In light of the serious theoretical and methodological inadequacies of most of these studies, it is no wonder that lack of significance was found. An overview of the literature indicates that in general no one media type or series of attributes or approaches have been found to be universally better than another in terms of an overall population.

Over the past five to seven years, however, there has been a renewed interest in investigating the differential relationship between media attributes, learner characteristics, and learning tasks. Aptitude Treatment Interaction studies have assumed a new importance in the research literature (Allen 1975, Parkhurst 1975, Salomon 1973, Salomon 1970, 1972; and Snow 1970; Cronbach 1959). The ATI approach has produced a shift away from comparative studies solely investigating main effects of different media to indepth studies

of the interactions of particular media with learners. This shift has resulted in a deemphasis of media characteristic schemes and taxonomies because they deal with externally defined variables that may not be psychologically operative. Instead, research has begun to examine media in terms of the unique presentational modes they perform (how they present information) and the psychological function they fulfill (how they induce the human processing of information).

In an attempt to explore and develop a more theoretical formulation of the salient instructional characteristics of television and the interaction of these coding and message carrying attributes with particular student abilities, the New York State Education Department's Bureau of Educational Communications developed an unique television learning system entitled the Place of Doors.

The development of this television learning system took place in a climate and period where the efficiency and cost effectiveness of technology were being applied to learning in order to improve productivity of schools (Scanlon and Weinberger, 1973; Kiesling 1975). Increased concern with input-output relationships, as well as a realization of the labor intensive nature of the traditional school were the impetus to examine present and future potential resources for schools. Television with its unique power to fascinate and involve, as well as to present information, seemed a valuable resource to develop for increased instructional effectiveness.

The following report summarizes the evaluation results of the Place of Doors instructional television program and discusses the program's theoretical and practical implications. The Place of Doors television-based instructional system consists of a forty one-hour videocassette lessons and adjunct student activity materials for each of the hours. These learning activities are programmed into each television lesson and range from individual workbook exercises to psychomotor exercises and small group interactions.

The forty one-hour videocassette programs provide a varied instructional sequence and pace in the content areas of science, ecology, health, social studies, and consumerism. Lessons were designed for students at the fourth grade level, drawing from the recommended fourth grade curriculum for New York State. The Place of Doors program was created and designed by the New York State Education Department's Bureau of Educational Communications in conjunction with classroom teachers and curriculum experts from around the State. It was produced by a professional production house in New York City.

The programs were designed to investigate whether a technology based learning system when used as a self-contained instructional sequence rather than as an instructional supplement, could supply effective and meaningful instruction for part of a student's day. The study attempted to determine whether the supportive role to which instructional media and technology were usually relegated could be effectively expanded. The question which the study sought to answer, in addition to whether a television learning system could be used as an effective school resource to supply total management and instruction for part of a student's day, was which type of students, with which characteristics, would the program be most effective. Although television has frequently been discussed in terms of a mass medium, with large scale effects across audiences, the nature of television learning as it relates to individual students was of key importance in this study.

To answer these questions, fourth grade students in a number of school locations throughout the State participated in twenty days of television lessons for two hours each day. Within the technology centered environment of their school day students were exposed to the televised curriculum of the Place of Doors, emphasizing science and social studies content. While in the technology centered learning environment, students were monitored by an adult non-professional. During the other part of their day, while in the teacher-centered

environment, students were taught the basic skills of language arts, reading, and mathematics.

Focus of the Study

This paper will attempt to investigate and explore some of the relationships between the television programming and particular individual learner characteristics.

Among the specific quesions the study will answer are:

1. Can a self-contained television based learning system serve as an efficient and meaningful learning resource for a significant portion of the school day?
2. Can the television learning system facilitate significant learning?
3. What content does the learning system teach most effectively?
4. For which students, with what characteristics does the system work best, and for what contents?
5. How do students feel about a technology based learning system?
6. What are the economic potentials and theoretical implications of using a television based instructional system to free teachers from a portion of their regular teaching responsibility?

Method

The Place of Doors program has gone through three testing and evaluation phases, two formative and one summative. The formative phases involved over 1000 students from approximately 20 schools throughout New York State. Data collected in these formative phases was used for program modification and redesign and will not be discussed here although the formative phase did influence instrumentation and design procedures for the third phase. The summative evaluation of the Place of Doors reported on here was based on 901 experimental and 385 control students, all at the fourth grade level. Experimental schools were selected from schools within districts whose school administrators and

teachers had expressed interest in the program. As a result of the exposure gained from the formative evaluation phases numerous schools wanted to participate in the program, so the sample was drawn from this pool of volunteer schools. Attempts were made to assure a stratified representative distribution in terms of reading ability and general socioeconomic and school factors. Factors which entered into the selection of the sample besides reading level types were district types, (urban, suburban, rural); parochial and public; and finally geographical area of the State.

Since intact class groups were being used, once experimental sites were determined either all or a portion of the fourth grade classes in each school were utilized, depending on the number of classes and the desires of the principals and teachers. Control classes were selected from the same school as the experimental group whenever possible, or from a school within the same district and neighborhood as the experimental site when necessary. Reading abilities of experimental and control sites were matched to assure similarity. Table 1 summarizes relevant district data.

Insert Table 1 About Here

Design

The design for data collection in the study is summarized in Figure 1. The evaluation used a longitudinal design established to obtain repeated measures

Insert Figure 1 About Here

from both experimental and control students. The exact data collection protocol was specified in a testing manual which was distributed to each test site coordinator. Coordinators were trained personnel who received specific in-person

testing instructions in addition to the manual. They were not part of the regular school staff but employees of the New York State Education Department and each served as a member of the on-site evaluation team at each testing site.

Testing in the nine districts took place over a four month period (January to April 1975). Within each district, the testing of both the experimental and control groups took place simultaneously. The testing sequence for the experimental groups was: pretest before the first day of programming, mid-point test after the first 10 days (20 hours of the program), post test the day after the last day of programming and a retention test one month following the posttest. Control groups did not receive the programming but did receive the same tests in the same sequence pre-test—10 days—mid-point test—10 days posttest. The control groups received no retention tests.

An attitudinal survey was also administered to all experimental students at the same time as the posttest.

Instrumentation

The primary data collection instruments were a series of four parallel test forms. These four forms were constructed from a series of criterion referenced cognitive objectives. The forms were designed to sample from the cognitive information in each of the five subject or content clusters that the program was based on. Those learning objectives which received a greater proportion of program time were more heavily represented in each test form. Both halfs of the program were equally represented in terms of the number of items for objectives in each half.

Test items were obtained after a rigorous development process that included culling those items which were most effective in phases one and two (formative evaluation), as well as writing and pilot testing new items to minimize problems of language and vocabulary.

instrumentation in terms of its bearing on the initial research questions formulated for the study.

A frequency distribution of the item difficulty levels for all four tests forms (across all testings) was created, and the results in Table 2 indicate that all four forms were reasonably comparable in terms of item difficulties.

Insert Table 2 About Here *

Frequency distributions of biserial correlation coefficients at five intervals from 0 to 100 were calculated for each test. All four of these item test correlations were nearly identical as can be seen in Table 3 and provided evidence of moderate test discrimination.

Insert Table 3 About Here

Hoyt reliability coefficients were then calculated for each test. The Hoyt method (as the Spearman Brown), uses the analysis of variance model for determining the reliability coefficient. Table 4 demonstrates that the four tests were almost identical in terms of reliability.

Insert Table 4 About Here

Experimental Results

The first analysis undertaken to determine whether the treatment (Place of Doors programming) had any effect for the experimental group, was a two-way ANOVA. For this analysis, total test scores were calculated for each student

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*Note that all the item statistics and preliminary data analyses were completed by Dr. Ambrosino.

at each testing. The two factors were district (with 9 levels for 9 districts) and test occasion (with four levels for pre-test, mid-test, posttest and retention test). Numerous cases were missing data from one or more testing points, therefore, data were first edited to eliminate any case which was missing the pre- or post test score. The remaining data, particularly from some of the lower SES school districts, still exhibited numerous missing data points which in some cases exceeded 15% of the total. The magnitude of this missing data problem made subsequent analyses impossible in those cases which exceeded 15% of the data set since statistical procedures for replacement of that sizable a proportion are not available. (Replacement with school means was used.)

Table 5 displays the results of the analysis. Scheffes approximation was applied in all instances where missing data were encountered. As can be seen, both the Testing and District main effects were significant beyond the .001 alpha level. However, a significant interaction effect ($p < .05$) was also found between the factors measured.

Insert Table 5 About Here

A pairwise comparison of the mean overall test results of the nine districts (experimental sites) was then undertaken. Table 6 summarizes these results. Duncan's New Multiple Range Test was used for the comparison and produced evidence of statistically significant differences in overall test performance between a number of districts.

Insert Table 6 About Here

Examining Table 6 we find no significant differences between the three districts having the lowest SES levels and reading levels, nor any differences between the three districts having the highest SES levels and reading levels.

Significant differences were found, however, between all the members of the lowest group and all members of the highest group.

Duncan's New Multiple Range Test was also applied to the comparison of overall test means of the experimental groups across the four test administrations (pre-test, mid-test, post test, and retention test). In investigating all pairwise comparisons the directional hypothesis of improved performance from the pre-test to the post test is confirmed (see Table 7).

Insert Table 7 About Here

Figure 2 graphically displays the mean test performance across each test performance for each test administration, and visually substantiates this improved performance. The control groups scores are also included.

Insert Figure 2 About Here

Table 8 presents the results of one-way ANOVAs performed on the nine matched experimental and control groups in the study over three-testing points (pre-test, mid-point test, post test). It should be noted that a null hypothesis of no difference between each of the schools at the pre-test failed to be rejected. (There were two exceptions). This lack of significant difference indicates that the experimental and control sites were approximately comparable in terms of prior ability. The remaining comparisons within each analysis indicate statistically significant differences at either the .05, .01, or .001 alpha level between each experimental and control pair at the mid-point test and the post test. (There were also two exceptions to this).

Insert Table 8 About Here

The post test scores of the experimental groups (criterion) were regressed on the experimental groups pre-test, mid-test, individual reading score, and attitude toward the program. Table 9B summarizes the regression results, and indicates that 50% of the variance in the post test scores is explained by the four predictors. The zero order correlation coefficients for this analysis are provided in table 9A. As can be seen the relationship between reading and test scores at the three testing points is moderate (pre, .47; mid .56; post .56), the relationship between test scores at each testing is minimal (pre-.09, mid-.02, post -.04) and the relationship between reading and liking the program is minimal (-.15). Approximately 68% of the total experimental group took the three tests (pretest, midtest, and posttest).

Additional analyses were made on the pre-test and post-test data from the Place of Doors evaluation in which the regression model was used to decompose and describe the linear dependence of cognitive learning on the post-test in terms of district effects, reading effects, and program liking effects. The model in figure 3 illustrates the relationship between these variables (excluding program liking).

Insert Figure 3 About Here

These analyses were formulated in an attempt to determine the influence of the independent variables separately, and in combination in terms of their contribution to the dependent variable-cognitive posttest score.

Table 10A provides the zero order correlation coefficients for all the variables involved in the model. Table 10B provides the means and standard deviations for each of the variables. Pretest and post test scores were used (and midpoint test and retention test scores were excluded) to maximize the number of data points.

Insert Tables 10A and 10B About Here

Separate regression analyses were performed first on each of the independent variables and the dependent variable . As Table 11 illustrates District effects account for about 18% of the variance in post test score, reading accounts for about 32%, pre test score for about 32%, and Student liking of the program for about .03%.

Insert Table 11 About Here

A series of hierarchial regressions were then run adding variables into the regression equation based on a time order sequence. Because of its insignificant effect, program liking was dropped from the analyses. Table 12 summarizes the results of these analyses. Reading and Districts (1, 4, 7, and 8) account for significant amounts of post test variance (36%). The introduction of the pre-test score on the second step of the analysis accounts for an additional 9% of the variance of the post test score after reading an district effects have been controlled for. The partial regression coefficients (Standardized Betas) are included in Table 12 along with the F tests for each partial regression coefficients.

Insert Table 12 About Here

All possible interaction terms were calculated and entered into the equation on the third step of the analysis. The increase in R^2 with these interactions combining Reading X District, Reading X Pre-test Score, Pre-test Score X District, and Reading X Pre-test X District increased the variance accounted for by approximately 2% of the total. This R^2 was calculated to be insignificant (Kerlinger, 1973).

Regressions were also run on the control groups. The results, as listed in Table 13A demonstrate the amount of variance explained by districts, pretest, and reading considered separately. Because a large percentage of individual control students' reading scores were not available they were replaced with their respective school means, thereby reducing the amount of variance explained in the regression. Table 13B provides a direct comparison of the combined district and pretest effects for both the experimental and control groups. The combination of these two variables (district and pretest) explain 72% of the post-test score variance in the control group while explaining only 38% of the post-test score variance in the experimental group.

Insert Tables 13 A and B About Here

The final series of analyses dealt with the various content dimensions of the program relative to the experimental groups. The five content area scores on the pre-test and posttest are summarized in Table 14A.

A 2 X 5 ANOVA was first computed using the classroom means from each experimental site. Table 14B summarizes the analysis of variance with one factor testing (2 levels) and the other factor content (5 levels). Table 14C provides a pairwise comparison of means between the content areas using

Duncan's multiple range test. The analysis provides evidence for significant main effects of testing and content, as well as a significant context X testing interaction. Pairwise comparison exhibited significant learning in consumerism, social studies, and science.

Insert Tables 14A, 14B, and 14C About Here

Regression analyses were run on the individual posttest scores for each of the content areas (sub-scores of the total posttest score). The hierarchial regression of posttest included districts and reading on the first step and pre-test score on the second step of the regression.

As table 15 summarizes, the variance accounted for in the content area posttest score by the district, reading and overall pre-test scores were Health 18%, Ecology 29%, Science 25%, Social Studies 30%, and Consumerism 28% respectively.

Insert Table 15A, 15B, 15C, 15D and 15E About Here

The results of the analyses indicate that controlling for all other variables, reading was most important in ecology and health contents, and progressively less important in consumerism, science, and social studies respectively. Districts and pre-test scores differed from content area to content area, probably as a function of prior instruction and emphases in the various districts. A combined beta for the district variables (sum of squared betas squared) resulted in a nonsignificant district effect for each content area, leaving pre-test score and reading as the two significant effects.

Discussion

Results of the overall analyses provide ample support for a directional hypothesis of increased learning across the testing points from pre-test to posttest. Furthermore, learning appears to have been maintained one month after the end of the treatment, the Place of Doors programming. Based on the research data available, the television learning system did provide for and facilitate student learning during the course of student's participation with it.

Although initial investigation indicated a district X testing interaction, regression analyses demonstrated that with reading and pre-test controlled for, district effects as a whole were not significant. With district controlled for however, reading and pre-test score contributed significantly to posttest score variation. Thus it can be concluded that district type, region of the state, or scoio-economic level as reflected in the various districts of the sample are not significant factors in student learning. It would appear that student reading and pre-test scores were significant factors in predicting student posttest scores. It should be noted that the pre-test score (which is an indication of prior knowledge and probably of ability) contributed more than reading to the over prediction equation with districts held constant.

It would appear that the television learning system, despite its attempts to empahsize a more visual, non-reading based approach, did require prior student knowledge and reading abilities. It is interesting to note, however, that science and social studies areas of the program which were the most substantive (dealing proportionately with more factual information as measured in a content analysis) were influenced considerably less by reading than the other content areas (dealing with more general information, behaviors, and attitudes). The most influential variables in predicting learning within

Science and Social Studies was the pre-test score for each of the respective content areas. It might tentatively be concluded, therefore, that the television learning system when working to present information of a more cognitive or factual nature depends less on student reading ability than on prior knowledge of the information. The implications of this tentative conclusion, will not be discussed because they are wrought with problems of program characteristics and presentation that may have confounded the results.

It is also interesting to note that while district effects in terms of variance accounted for were about the same in both the experimental and matched control groups (18%), the addition of reading and pre-test scores accounted for 45% of the variance in the posttest scores of experimental groups while accounting for over 75% of the posttest scores variance of the control groups.

A most interesting aspect of the study is the apparent lack of relationship between student liking of the Place of Doors (as measured at the conclusion of 20 days of programming) and student performance. As Khan and Weiss (1972) discuss, numerous studies have found a very low correlation between liking of school and achievement on standardized instruments.

Student liking of the Place of Doors programming appeared to have no correlation with reading, or student performance in the pre- and posttests. Since reading ability correlates fairly highly with academic success and since success is functionally related to favorable attitudes toward learning, we might expect a moderate correlation between reading and program liking. Although this discrepancy would be due to a number of factors, including insensitivity of instrumentation, it is possible that the programming is not necessarily reliant on prior school success or motivation. It is conceivable that the television learning systems appeal is due to its less

traditional school orientation (including reading) as well as to other as yet uninvestigated phenomena. It is also quite probable that over a longer period of time, when attentional and motivational factors would be more influential, interest in programming would demonstrate a stronger relationship with learning performance.

Limitations of the Study and Research Recommendations for Future Studies

Although the research design encorporated in the summative evaluation of the Place of Doors television learning system attempted to minimize all potential systematic error, numerous program testing and subject constraints made the achievement of this goal quite difficult. Among the specific areas of the investigation which may have introduced non-random error are:

1) Instrumentation—which attempted to measure a great deal of cognitive information, much of which was visual, by means of written tests. Despite some pictorial items on the tests, the major items on each form utilized written language. To alleviate particular reading biases on the tests, test site coordinators were instructed to pronounce (but not provide the meaning for) individual words that students could not understand. This assistance was provided for all students (experimental and control) at all sites for all testing points. No other additional assistance was provided for students. Future research attempts should incorporate more visually oriented instrumentation, including television-based testing. More traditional written tests should also be included in any research design. A task X apptitude X treatment interaction might explain differences in learning.

2) Sample—which was a fairly representative and stratified on a number of key characteristics but which utilized intact student groups (classes), drawn from districts and schools which were already interested in participating in the program. Although the exact influence of this positive predisposition is incapable of being assessed, it is likely that it would increase the demand characteristics placed on the experimental students.

3) Experimental Settings—were examined in the analyses in terms of a number of characteristics. However, a number of site related data were not collected or considered in the analyses, and it is possible that a consideration of such characteristics as school climate,

administrative support, teacher support and the non-professional in the classroom, might account for a considerable additional proportion of the learning variance. Further consideration should be given to the variance in district instructional programs that might affect the level of knowledge and experience of subjects.

The exact characteristics that contribute to a general SES index (Education, Income, Occupation, etc.) would also be helpful in explaining the student's posttest scores. Due to the variety of school programs and schedules, the exact time of the day that the program was used with the experimental students was different between morning and afternoon, and may have introduced additional various. Future research might take more of these factors into account.

4) Subjects—while the program was used with a broad range of fourth grade students, a primary problem with the present analysis was subject mortality. A considerable proportion of the total experimental sample (32%) did not take either the pre-test, mid-point test or post-test. Approximately 20% of the total experimental sample did not take either the pre-test or post-test (excluding the midpoint test). The problem of subject mortality over testings was particularly apparent in the lower SES schools where student attendance is generally a concern. Although principals in the lower SES schools stated that student attendance during the Place of Doors programming was higher than normal, the percentage of students available at each testing point was still lower than that of the higher SES schools. The non-random effect of student mortality and its resulting deselection of these lower ability students seems to be a primary limitation of the study and it is, unfortunately, not easily correctable.

Additional, subject characteristics related to specific abilities, non-language skills, and visual learning styles should also be considered in future analyses.

5) Programming--characteristics of the program received consideration in the evaluation, but only relative to the various content areas taught through the program. In order to fully explore the subject programming interactions (non-linear relationships) to make use of the programming for those student for whom it is most appropriate, as well as to develop a model for the development and production of future television programming, finer dimensions of the programming should be measured and analyzed. Among those characteristics presently of greatest interest and under consideration for future studies are: amount of verbal information in the program, amount of visual information in the program (both measured using information theory metrics), complexity of programming types of information in terms of cognitive levels and affective modelling, type of learning tasks required, and types of student responses required. The effect of the adjunct student activity materials were not investigated in this study, and future research should also delve further into the effects television feedback, and the student practice and reinforcement provided in the activities each contribute to student learning.

6) Testing Feedback—Data from each testing point were not made available to students until after the program had been completed, in order to control for teacher variation and use of the results. Instructionally it would make more sense to integrate these test results into the learning process and to consider them as a variable in the overall design. Future designs will make use of this additional instructional variable.

7) Participation of Teacher--During the experimental period, teachers were instructed not to make reference to, use material from, or build their lessons from the Place of Doors programming. This was emphasized to minimize teacher effects. Future designs should encorporate teacher participation as a manipulable variable in order to determine its effect on learning.

Implications/Conclusion

The theoretical implications of this study are related primarily to the study's attempt to look at one medium, television, and to determine its instructional impact when organized into a total learning package. The study tried to determine various interaction effects between the program and students. These preliminary ATI attempts have looked at only a few dimensions of the program and students. Hopefully future studies with the program can investigate more precise dimensions, not only to determine which individual students will benefit most from the programming but also to provide empirical models and criteria for the design of future instructional television programming. The determination of the optimun mode of presentation for a particular individual or group with particular characteristics is a difficult task, wrought with numerous contradictions and assumptions (Allen, 1975). It appears, however, that the complexity of each dimension, as well as the number of dimensions, will determine which students will make greatest use of the treatment. As these dimensions become more clearly defined and their relationship with individual learners is verified, a realistic means for instructional design and specification will be attained.

The practical implications are numerous, but related to the major instructional role that a television-based learning system is capable of serving. Since a resource as the Place of Doors can utilize its numerous capabilities

to motivate, involve, and instruct without the need for a teacher, the teacher's time is made available for other instructional tasks where human resources can be more effective, as for example individualized and small group instruction. Television instruction, along the lines of the Place of Doors, may provide a means to maximize instructional opportunities by utilizing resources most appropriate and effective for the intended instructional outcomes.

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TABLE 1

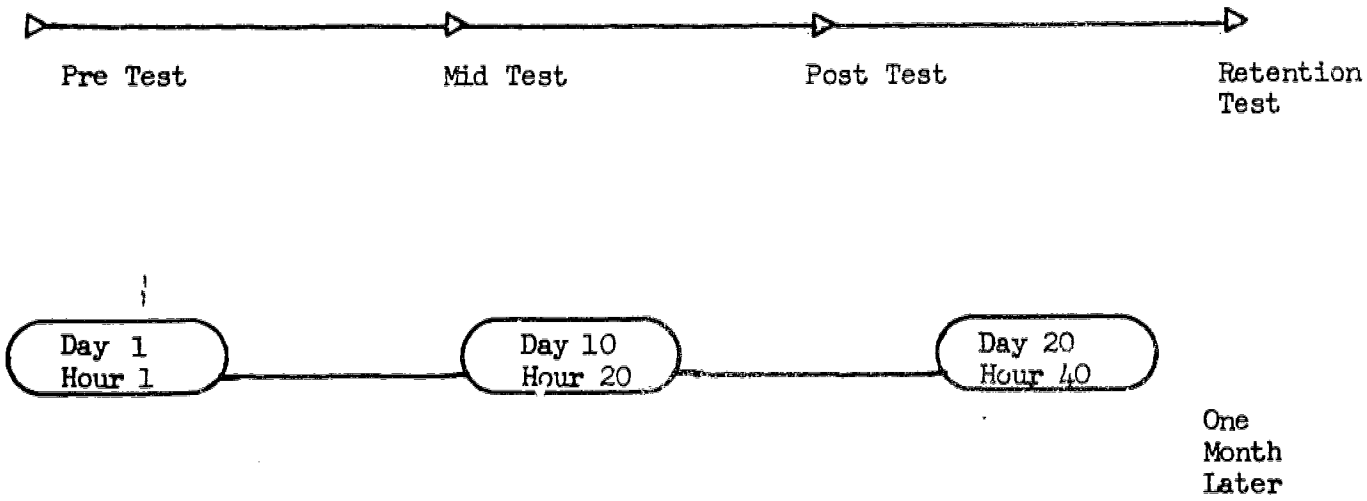
DESCRIPTIVE STATISTICS ON SAMPLE

.strict	Experimentals N	Controls N	District Type, Size	General SES Level	Reading Percentile PEP Statewide Reading Ability Test For Both E and C
1	115	31	Inner City Public New York City	Lower	20
2	64	66	Inner City Public Rochester	Lower	30
3	125	26	Inner City Public New York City	Lower	38
4	51	45	Suburban Central Public Albany Suburb	Upper Middle Upper	60
5	124	50	Central District Public Nassau County Long Island	Middle	60
6	103	28	Central District Public Mid-state	Middle	61
7	107	54	Central District Public Nassau County Long Island	Middle	65
8	126	47	Independent Union Free Nassau County Long Island	Upper Middle	65
9	86	38	Parochial Nassau County Long Island	Upper Middle Upper	65
	901	385			

Figure 1

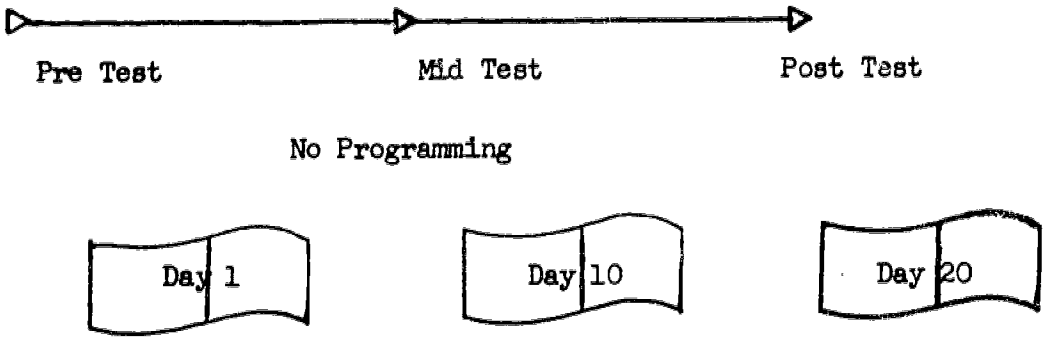
Testing Design

Experimental Groups



Place of Doors Programming

Control Groups



Regular Classroom Instruction

TABLE 2

Frequency Distributions of Difficulty Levels of Items: Four Place of Doors Achievement Tests

Test / p-Level	1		2		3		4	
	f	%	f	%	f	%	f	%
0 - 10							1	4.8
11 - 20			1	4.8			2	9.5
21 - 30	1	4.8	2	9.5	1	4.8	1	4.8
31 - 40	2	9.5	6	28.6	4	19.0	5	23.8
41 - 50	2	9.5	4	19.0	2	9.5	4	19.0
51 - 60	8	38.1			8	38.1	3	14.3
61 - 70	4	19.0	4	19.0	5	23.8	4	19.0
71 - 80	4	19.0	2	9.5	1	4.8	1	4.8
81 - 90			2	9.5				
91 - 99								
Total	21	100.0	21	100.0	21	100.0	21	100.0
Median	0.57		0.44		0.55		0.54	

TABLE 3

Frequency Distributions of Biserial Correlation Coefficients For Items Contained in Four Place of Doors Achievement Tests

Test / r_b	1		2		3		4	
	f	%	f	%	f	%	f	%
.00 - .20	1	4.8			1	4.8		
.21 - .40	2	9.5	3	14.3	3	14.3	6	28.6
.41 - .60	10	47.6	9	42.8	11	52.3	7	33.3
.61 - .80	8	38.1	9	42.8	6	28.6	8	38.1
.81 - .99								
Total	21	100.0	21	100.0	21	100.0	21	100.0
Median	0.48		0.49		0.47		0.47	

TABLE 4

Hoyt Reliability Coefficients
For Four Place of Doors
Achievement Tests

Test	r_{tt}	$SE(r_{tt})$	F
1	0.77	1.97	79.43*
2	0.79	1.90	163.56*
3	0.80	1.98	49.18*
4	0.75	1.95	136.62*

$p < .01$.

TABLE 5
Analysis of Variance Summary Table
Using Scheffe's Approximation: Schools
By Test Administration (9x4)
(N =)

Sum of Squares	df	MS	F	Source
462,876.00	3441			Total SS
373,252.60	1			Correction due to Grand Mean
89,623.39	3440			Corrected SS
8,180.31	8	1022.54	47.99**	SCHOOLS
5,588.03	3	1862.68	87.61**	TESTING
2844.04	24	118.50	5.57*	SCHOOLS x TESTING
72,381.44	3405	21.26		ERROR

*. $p < .01$.

** $p < .001$.

TABLE 6

Duncan's Values Based On Comparisons Of
Mean Overall Test Performance For Each Of
Nine Place of Doors Experimental Schools

School	Mean Performance	P.S. 140	P.S. 16	P.S. 76	Levittown	S.V.	S.R.	Hwlt.	Smrs.	Gdrch.
P.S. 140	*39.00%*	-								
P.S. 16	41.43	5.04	-							
P.S. 76	41.52	5.06	.02	-						
Levittown	47.81	18.81*	10.99	10.43	-					
Spring Valley	50.00	19.26**	11.56	11.16	2.93	-				
St. Raymonds	55.52	30.98**	20.51**	19.85**	11.11	7.20	-			
Hewlett	56.09	37.31**	25.75**	24.63**	14.34*	9.19	.90	-		
Somers	57.95	42.88**	30.43**	29.01**	18.38**	12.39*	3.98	3.40	-	
Goodrich	61.20	50.17**	36.28**	34.61**	24.20**	23.62**	9.34	9.37	6.13	-

* $p < .05$.

** $p < .01$.

TABLE 7

Duncan's Values Based on Comparisons of
Mean Overall School Performance for Each of
Five Test Administrations

Test Administration	Overall School Performance	1	2	3	4
1 PRE	40.05%	-			
2	49.09	55.71**	-		
3 POST	57.09	87.07**	40.86**	-	
4 FOLLOW-UP	52.09	61.52**	15.32*	25.54+	-

* $p < .05$.
** $p < .001$.
+ $p < .01$.

Figure 2

Mean Test Performance for
Experimental and Control Groups across Test Occasion

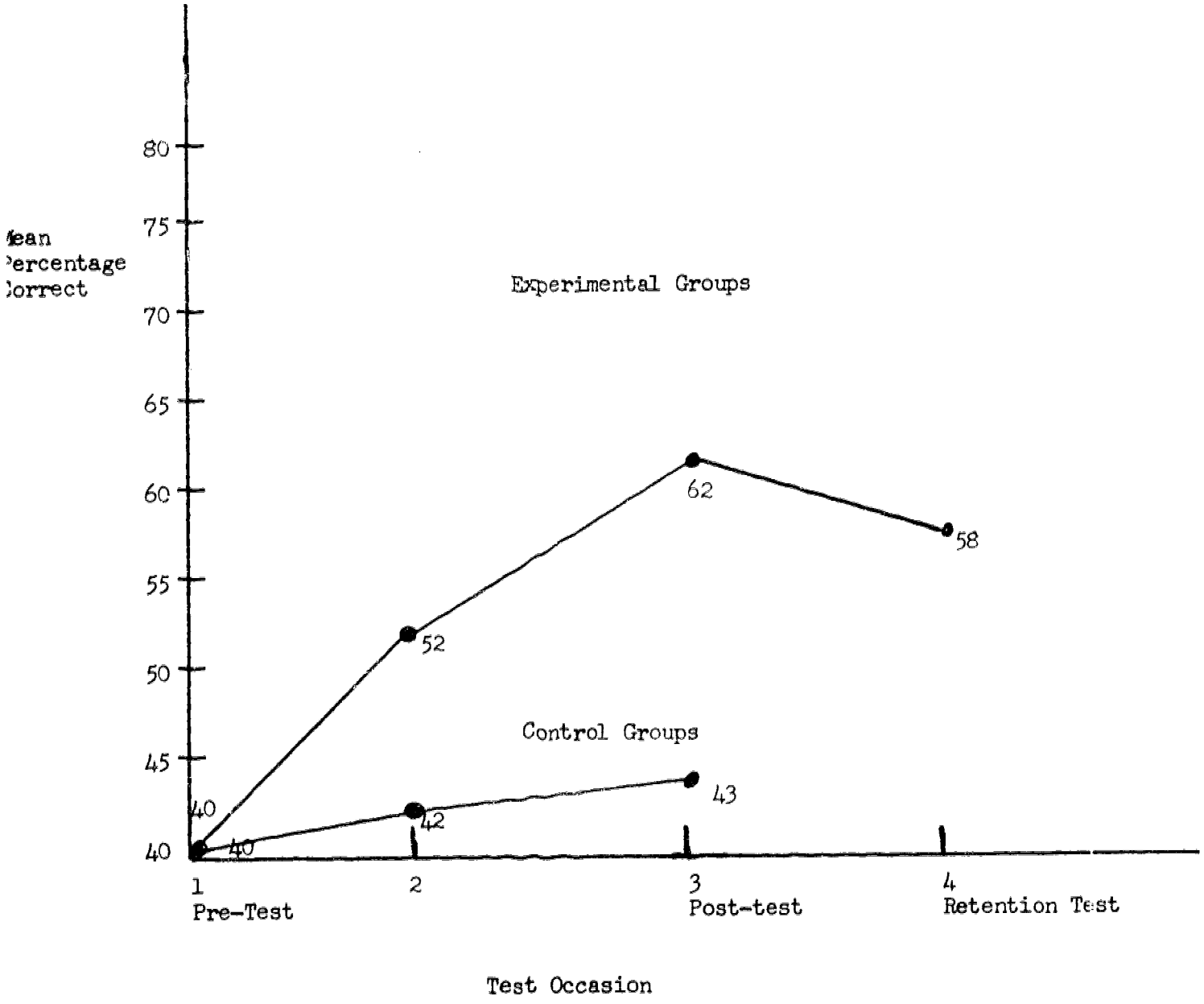


TABLE 8

One-way ANOVA: Statistics:
Experimental vs. Control Groups,
Four Test Administrations

Schools Compared	Test Administration	F	Significance Level
Hewlett vs. Woodmere	1	.02	NS
	2	21.64	$p < .001$
	3	24.31	$p < .001$
	4	no data	
PS 16 vs. PS 16	1	.14	NS
	2	24.72	$p < .001$
	3	31.46	$p < .001$
	4	7.04	$p < .01$
Somers vs. Somers	1	no data	
	2	13.31	$p < .001$
	3	27.41	$p < .001$
	4	no data	
Goodrich vs. Southgate	1	7.82	$p < .01$
	2	19.66	$p < .001$
	3	42.91	$p < .001$
	4	no data	
PS 140 vs. PS 140	1	.48	NS
	2	4.61	$p < .05$
	3	31.37	$p < .001$
	4	no data	
Spring Valley vs. Spring Valley	1	3.46	NS
	2	4.77	$p < .05$
	3	3.02	NS
	4	no data	
Levittown vs. Levittown	1	3.27	NS
	2	.69	NS
	3	7.59	$p < .01$
	4	no data	

TABLE 8
(Continued)

. Raymonds /s. ıg Beach	1 2 3 4	.00 1.23 8.52 no data	NS NS $p < .01$
. 76 /s. . 97	1 2 3 4	5.53 no data 2.84 no data	$p < .05$ NS

Figure 3

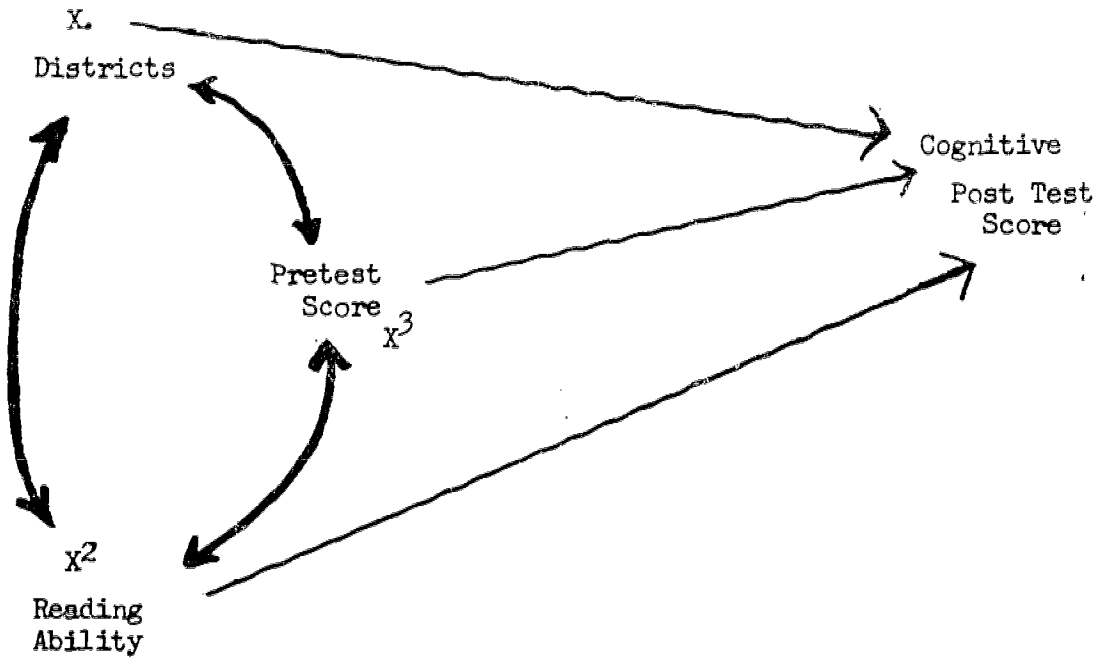

X.
Districts
Cognitive
Post Test
Score
Pretest
Score
X3
X2
Reading
Ability

TABLE 9A

Zero-order Correlation Coefficients
Between Test Administrations 1-2, 3;
PEP Read Scores; and Flowermouth
Rating Scores

	TA 1	TA 2	TA 3	PEPR	FLWMTH
TA 1	-				
TA 2	.55	-			
TA 3	.52	.65	-		
PEPR	.47	.56	.56	-	
FLWMTH	-.09	-.02	-.04	-.15	-

TABLE 9B

Multiple Regression Statistics:
Four Predictors (Test Administrations
1-2, PEP Reading Score, Flowermouth
Evaluation Score) and One Criterion
(Test Administration 3)

F*	S.E. of Regression	R^2 Coefficient of Determination	R
86.10+	3.17	.50	.71

* 4 and 339 degrees of freedom.

+ $p < .001$.

TABLE 10A

ZERO ORDER CORRELATION COEFFICIENTS

		Districts 1	2	3	4	5	6	7	8	Reading	Pretest	Liking	Post-test
Districts N-1 Dummy Variable	1	1.0	-.11	-.14	-.19	-.11	-.14	-.15	-.16	-.39	-.25	.27	-.31
	2		1.0	-.10	-.07	-.10	-.09	-.11	.11	-.26	-.08	-.20	-.12
	3			1.0	-.98	-.13	-.12	-.14	-.14	-.16	-.14	-.15	-.11
	4				1.0	-.10	-.09	-.11	-.11	.06	.16	.10	.13
	5					1.0	-.12	.14	-.15	.08	.04	-.60	.01
	6						1.0	-.13	-.14	.10	.01	-.02	-.00
	7							1.0	-.16	.13	.12	.12	.15
	8								1.0	.20	.09	.08	.19
Reading										1.0	.49	-.02	.57
Pretest											1.0	-.06	.56
Liking												1.0	-.02
Post-test													1.0

TABLE 10B

Means and Standard Deviations
Experimental Groups

District	N = 712 x	SD
1	.1362	.3433
2	.0702	.2557
3	.1124	.3160
4 (Dummy	.0702	.2557
5	.1194	.3245
6 Variables)	.1039	.3054
7	.1320	.3388
8	.1433	.3506
Reading	56.4846	25.2494
Pretest Score	41.3924	15.4201
Program Liking Score	54.2683	33.0216
Post Test Score	62.0118	20.4210

Table 11

Summary of Regression Analyses

Experimental Groups

Post Test on District N = 712

Multiple R	.42264
R^2	.17864
SE	18.61249

F = 19.11*

BETA		Standard Error B	F
District 1	- .32424	2.8110	47.083*
2	- .15503	3.35541	13.615*
3	- .14647	2.94289	10.343*
4	.07752	3.35541	3.404*
5	.03872	2.89929	.707
6	.04985	3.00195	1.233
7	.0800	2.83120	2.902*
8	.10788		

* $p < .01$

Post Test on Reading

Multiple R	.56990
R^2	.32479
SE	16.79199
BETA	.56990

F = 341.526*

SE_B .02494

* $p < .01$

Post Test on Pretest

Multiple R	.56453
R^2	.31869
SE	16.86763
BETA	.56453

F = 332.116*

SE_B .04102

* $p < .01$

Post Test on Program Liking

Multiple R	.01821
R^2	.00033
SE	20.4320
BETA	- .01821

F = .23547 NS

SE_B .02320

F .235 NS

Table 12

Summary of Regression Analyses

Experimental Groups

Step 1

Post Test on Reading and District N = 712

Multiple R	.60047
R^2	.36056
SE	16.43400

F = 43.98187*

Partial Regression Coefficients

	BETA	SE_B	F
Reading	.51885	.02969	199.732*
Dist. 1	-.04331	2.74928	0.878
Dist. 2	.04787	3.17680	1.448
Dist. 3	.02692	2.71669	0.410
Dist. 4	.12751	2.97612	11.708*
Dist. 5	.02618	2.57621	0.409
Dist. 6	-.00362	2.65960	0.008
Dist. 7	.12663	2.50772	9.266*
Dist. 8	.12663	2.45555	9.023*

* $p < .01$

Step 2

Introduction of Pretest Score

Multiple R	.67295
R^2	.45286
SE	15.21262

F = 58.01975

Partial Regression Coefficients

	BETA	SE_B	F
Dist. 1	-.03427	2.54544	0.641
Dist. 2	.02577	2.94518	0.488
Dist. 3	.03778	2.51561	0.942
Dist. 4	.07707	2.77974	4.902*
Dist. 5	.01372	2.38583	0.131
Dist. 6	-.00232	2.46195	0.004
Dist. 7	.09761	2.32692	6.394*
Dist. 8	.11552	2.27383	8.757*
Reading	.35418	.03009	90.626*
Pretest	.35530	.04327	118.248*

* $p < .01$

Table 13

Summary of Regression Analyses: Control Groups

Control Groups N = 324

Post Test Score on District

Multiple R	.42225		
R^2	.17829	F = 8.54358*	
SE	25.32085		p < .01

Partial Regression Coefficients

	BETA	SE_B	F
Dist. 1	-.40757	6.85349	44.261
Dist. 2	-.50162	5.40949	49.983
Dist. 3	-.23553	6.75149	14.586
Dist. 4	-.27807	5.77164	17.009
Dist. 5	-.34548	5.51159	24.467
Dist. 6	-.24315	6.33922	14.610
Dist. 7	-.23006	5.66368	11.325
Dist. 8	-.30435	5.69809	19.999

Post Test Score on Pretest Score

Multiple R	.82991		
R^2	.68875		
SE	15.41355		
BETA	.82991		
SEB	.02937	F = 712.535*	p < .01

Post Test on Reading Score

Multiple R	.08928		
R^2	.00797	F = 2.5873 NS	
SE	27.51753		
BETA	.08928		
SEB	.07493		

Table 13B

Comparison of Experimental and Control

Control Group

Post Test on Pretest and District

Multiple R	.85229
R^2	.72640
SE	14.63426

F = 92.62757* $p < .01$

	BETA	SE_B	F
Dist. 1	-.18048	4.08846	24.389
Dist. 2	-.21463	3.24587	25.416
Dist. 3	-.09311	3.95125	6.656
Dist. 4	-.08174	3.40238	4.230
Dist. 5	-.10327	3.27533	6.191
Dist. 6	-.10402	3.70524	7.826
Dist. 7	-.04538	3.35365	1.275
Dist. 8	-.11452	3.35365	8.175
Pretest	.77832	.02931	629.030

Experimental Group

Post Test on Pretest and District

Multiple R	.61816
R^2	.38212
SE	16.154

F = 48.24*

*p .01

	BETA	SE_B	F
Dist. 1	-.191	2.49	20.754*
Dist. 2	-.098	2.93	7.097*
Dist. 3	-.057	2.58	2.042
Dist. 4	-.031	2.92	.70
Dist. 5	-.028	2.52	.479
Dist. 6	-.028	2.61	.523
Dist. 7	-.061	2.46	2.216
Dist. 8	.101	2.41	5.932*
Pretest	.482	.042	231.196*

TABLE 14A

Summary Table Content

Content	$\bar{x}$	N = 712 SD
Health Pretest	58.3567	34.5308
Health Post Test	68.3287	32.2244
Ecology Pretest	40.7022	23.6491
Ecology Post Test	58.8202	26.8509
Science Pretest	42.1348	22.8587
Science	63.0150	24.6702
Social Studies Pretest	34.1643	24.7229
Social Studies Post Test	55.3020	26.9620
Consumerism Pretest	39.1152	25.6941
Consumerism Post Test	67.9775	29.0166

TABLE 14B

2 X 5 ANOVA (TESTING X CONTENT)

Source	df	SS	MS	F
Content	1	11733.29	2933.32	27.28 *
Testing	4	31882.91	31882.91	296.61 *
Testing X Content	4	27338.81	6834.70	63.58 *
Error	310	33322.30	107.49	
	319			

* $p < .01$

TABLE 14C

Pairwise Comparisons (Duncan's Multiple Range Test)

Pre-test, Posttest Mean Differences		Health	Ecology	Science	S. Studies	Con
Health	9.97	—	—	—	—	—
Ecology	18.12	8.15	—	—	—	—
Science	20.88	10.91*	2.76	—	—	—
Social Studies	21.14	11.17*	3.02*	.26	—	—
Consumerism	28.86	18.89*	10.74*	7.98*	7.72*	—

*$p < .01$

TABLE 15

Summary of Regression Analyses: Content Parts A, B, C, D, E

Experimental Groups N=712

A. Health Content

Step 1: Districts and Reading on Health Post Test Score

Multiple R	.39823
R^2	.15858
SE	29.74793

F 14.70*

* p < .01

Partial Regression Coefficients

	BETA	SE_B
Dist. 1	.00042	4.97660
2	.08981 *	5.75048
3	-.01168	4.91760
4	.08688 *	5.38721
5	-.00121	4.66331
6	.01430	4.81427
7	.0080	4.53934
8	.03825	4.44490
Reading	.38692 *	.05375

Step 2: Introduction of Pretest Score

Multiple R	.42915
R^2	.18417
SE	29.31304

F Test on Additional Variance Explained

F 21.98*

* p < .01

	BETA	SE_B
Dist. 1	.00508	4.90477
2	.07807 *	5.67503
3	-.00596	4.84731
4	.06032	5.35624
5	-.00777	4.59724
6	.01499	4.74391
7	-.02329	4.48371
8	.03240	4.38142
Reading	.30022 *	.05798
Pretest	.18707 *	.08338

B. Ecology

Step 1: Districts and Reading on Ecology Post

Multiple R	.49569
R^2	.24571
SE	23.46898

F 25.41*

* p < .01

	BETA		SE_B
District	1	-.00703	3.92618
	2	-.05770	4.53671
	3	.06690	3.87954
	4	.05478 *	4.25012
	5	.05257	3.67902
	6	.01173	3.79811
	7	.15051 *	3.58121
	8	.12783 *	3.50671
Reading		.4203 *	.04240

Step 2: Addition of Pretest Score

Multiple R	.53483
R^2	.28605
SE	22.84908

F = 39.61*

* p < .01

	BETA		SE_B
District	1	-.00106	3.89880
	2	.04300	4.50903
	3	.07408	3.80046
	4	.12143*	4.18889
	5	.04434	4.14767
	6	-.01087	3.70508
	7	.13132	3.50308
	8	.12049	3.41622
Reading		.31145	.04544
Pretest		.23489 *	.06511

C. Science Content

Step 1: District and Reading on Post Science Score

Multiple R	.43993		
R^2	.19354	F 18.72 *	
SE	22.29616		

BETA			SE_B
District	1	-.03116	3.72998
	2	-.04522	4.31000
	3	-.00206	3.68576
	4	-.04637	4.03773
	5	-.00588	3.49517
	6	-.01109	3.60831
	7	.10007 *	3.40225
	8	.06251 *	3.33147
Reading		.36918 *	.04028

Step 2: Addition of Pretest Score

Multiple R	.50513		
R^2	.25516	F = 24.01*	
SE	21.44272		* p < .01

BETA			SE_B
District	1	-.02377	3.58788
	2	-.06328	4.15133
	3	.00681	3.54584
	4	.00515	3.91813
	5	-.01606	3.36292
	6	-.01002	3.47021
	7	.07635 *	3.27987
	8	.05343	3.20505
Reading		.23463 *	.04241
Pretest		.29031 *	.06099

D. Social Studies Content

Step 1: District and Reading with Social Studies Post Test Score

Multiple R	.43907	
R^2	.19278	F 18.63*
SE	24.37887	* $p < .01$

	BETA		SE_B
District	1	.00032	4.07840
	2	.07663 *	4.71260
	3	.09572 *	4.03005
	4	.10692 *	4.41490
	5	.04157	3.82165
	6	.02572	3.94536
	7	.08738 *	3.72006
	8	.14020 *	3.64267
Reading		.39604 *	.04405

Step 2: Pretest Score

Multiple R	.54814	
R^2	.30046	F = 30.11*
SE	22.71084	* $p < .01$

	BETA		SE_B
District	1	.01008	3.80007
	2	.05276	4.39684
	3	.10745 *	3.75554
	4	.05243	4.14985
	5	.02812	3.56180
	6	.02713	3.67544
	7	.05604	3.47384
	8	.12820 *	3.39459
Reading		.21818 *	.04492
Pretest		.38377 *	.06460

E. Consumerism Content

Step 1: District and Reading on Consumerism Post Score

Multiple R	.49404		
R^2	.24408	F 25.185*	
SE	25.38934		*p .01

BETA			SE_B
District	1	-.10466 *	4.24744
	2	.03930	4.90793
	3	-.05995	4.19709
	4	.08130 *	4.59789
	5	.00590	3.98006
	6	-.01719	4.10889
	7	.08661 *	3.87425
	8	.09186	3.79365
Reading		.38076 *	.04587

Step 2: Introduction of Pretest Score

Multiple R	.52718		
R^2	.27792	F 26.981*	
SE	24.83221		

BETA			SE_B
District	1	-.09918*	4.15502
	2	.02591	4.80754
	3	-.05338	4.10634
	4	.05076	4.53748
	5	-.00164	3.89450
	6	.01640	4.01875
	7	.06904	3.79832
	8	.08514*	3.71167
Reading		.28105*	.04912
Pretest		.21514*	.07063