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ABSTRACT

This volume contains four papers concerned with various aspects of the implementation and evaluation of a curriculum innovation. The innovative curriculum was developed by ERIE to provide science instruction, based on behavioral objectives, for elementary students. The first paper introduces ERIE's study of the innovation installation. The next two papers provide some positive aspects and some negative facets of the science curriculum. The final paper discusses some factors that determine the relative success or failure of curriculum innovations. (RA)

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a series of related papers presented at the 1970 Annual Meeting of the National Science Teachers Association by staff members of the Eastern Regional Institute for Education

An evaluation of a two-year installation of Science--A Process Approach

EVALUATION OF CURRICULUM INSTALLATION

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March 1970

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FOREWORD

During the 16th annual meeting of the National Science Teachers Association, in Washington, D.C., March 1968, a plea was raised for evaluative studies on recently developed innovative curricula in science. With the exception of reports by the developers of curricula, such studies, large or small in scope, have been scarce.

The Eastern Regional Institute for Education (ERIE) has used Science--A Process Approach as a vehicle for investigating factors influencing the successful installation of an innovative curriculum. During a two-year effort, ERIE has gathered evaluative information on both installation strategies and the curricular vehicle. The purpose of the series of papers in this volume is to share some of ERIE's findings and to offer suggestions that might be useful in future installation endeavors.

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AN INTRODUCTION TO ERIE'S STUDY OF INSTALLATION

William C. Ritz

INTRODUCTION

The Eastern Regional Institute for Education (ERIE) is one of a network of regional educational laboratories in the United States established under Title IV of the Elementary and Secondary Education Act of 1965. Fifteen educational laboratories are funded by the United States Office of Education. All of the laboratories work on both a regional and a national basis toward improving the quality of elementary and secondary education.

Although the specific programs of the laboratories vary greatly, these institutions share a common goal. It is not secret that one of the major impediments to programs in education is what some have termed an "educational lag." There is a great gap between research activity on the one hand and school practice on the other. This time lag is expensive. Some critics claim that this lag costs us some 50 to 100 years. In addition, all-important in-between steps such as development, field testing, and demonstration usually have been left to chance. The authors of Title IV of ESEA saw a need for a group of institutions whose chief function would be to bridge the gap between educational theory and school practice. Thus, the creation of the regional educational laboratories.

Regionally, ERIE serves a geographical area encompassing northern and western Pennsylvania and all of New York State except for metropolitan New York City, although it is hoped that ERIE's programs will have national impact as well. The Institute has chosen as its specific commitment a program for fostering "process-oriented" education in elementary schools. To this end, ERIE is currently engaged in activities involving the elementary school curriculum--segments such as science, social studies, reading, and readiness programs. The curricular components with which the Institute staff deal are considered to be process-promoting components. ERIE is concerned about and involved in a wide variety of activities revolving about these curricula and their potential impact in schools. Four aspects of process education are receiving particular emphasis in the ERIE program plan--foundations, teacher education, assessment, and curricula installation. Although ERIE is currently engaged in installing process-promoting curricula in several subject areas, the papers presented below are limited to a number of preliminary results obtained from ERIE's study of the installation of a process-promoting elementary science curriculum.

ERIE'S STUDY OF INSTALLATION

Four major goals have been established for the ERIE installation study. They are:

1. To install process-oriented science curricula, K-6, in elementary schools of diverse characteristics. Currently, this involves one curriculum--Science--A Process Appoach--only.

2. To develop a variety of strategies for the installation of proce. s-oriented science curricula.

3. To activate other agencies and educators to demonstrate, install, and/or support such installations.

4. To produce a series of products designed to assist others to install such curricula.

Although much time, money, and talent has been devoted to the production of "new" curriculum products, almost no attention has been given to the problems of installing such programs. Lacking clear guidelines, schools have used a variety of practices to install new curricula. Perhaps the most naive of these practices has been the "we-bought-all-the-books-and-materials; therefore-we-now-have-BSCS-in-our-school" type. Others have conducted more elaborate installation procedures. The fact remains, however, that there has been very little examination of what actually happens when a new curriculum is introduced or of what factors influence its success or failure.

Among other things, ERIE's study of installation has been attempting to determine whether or not traditionally held assumptions--the "conventional wisdom," if you will--are valid. A list of 15 assumptions was prepared, and procedures based upon those assumptions have been followed.

A carefully-selected new curriculum was then introduced into a variety of schools, and data are being collected to assess what is happening.

It is not the purpose of this paper to describe in detail each of these assumptions. Instead, some of the more significant installation procedures which evolved from those assumptions are discussed.

To begin, why did ERIE select Science--A Process Approach as a vehicle for installation? Obviously a "mature" curriculum was needed--one that had been rather fully developed and widely field-tested. Among the several emerging elementary science curricula examined, Science--A Process Approach appeared best to meet this test. In addition, Science--A Process Approach was the most comprehensive K-6 curriculum available. Characteristics enhancing the acceptability of this program included the following:

1. A carefully developed "Hierarchy of Behavioral Objectives."

2. Instructional materials and equipment which approved to lead themselves to such modern concepts as emphasis on "inquiry" and small group instruction.

3. Reliable and validated tests of pupil proficiency.

Without doubt, at the time of ERIE's initial installation effort in the spring of 1967, Science--A Process Approach was the most appropriate and complete vehicle available for installation as an up-to-date elementary science curriculum.

In order to obtain data from a wide variety of school settings, ERIE selected 21 pilot schools for its installation effort and study. An additional 32 demonstration schools were brought into the installation network this year. (See maps on following page.) These school settings are indeed diverse. They range all the way from an upper-middle class "bedroom" community near a large city to an inner-city school serving disadvantaged pupils. Their per-pupil expenditures for instruction vary from $293 to $720. The percentage of fathers in professional occupations ranges all the way from zero to a high of 65 percent.

The working relationship which ERIE has established with the pilot schools is such that virtually identical services have been provided each of them during the three years of study. In return for relevant research data, ERIE agreed to provide the following:

1. Informational services, including pre-installation conferences with teachers and administrators.

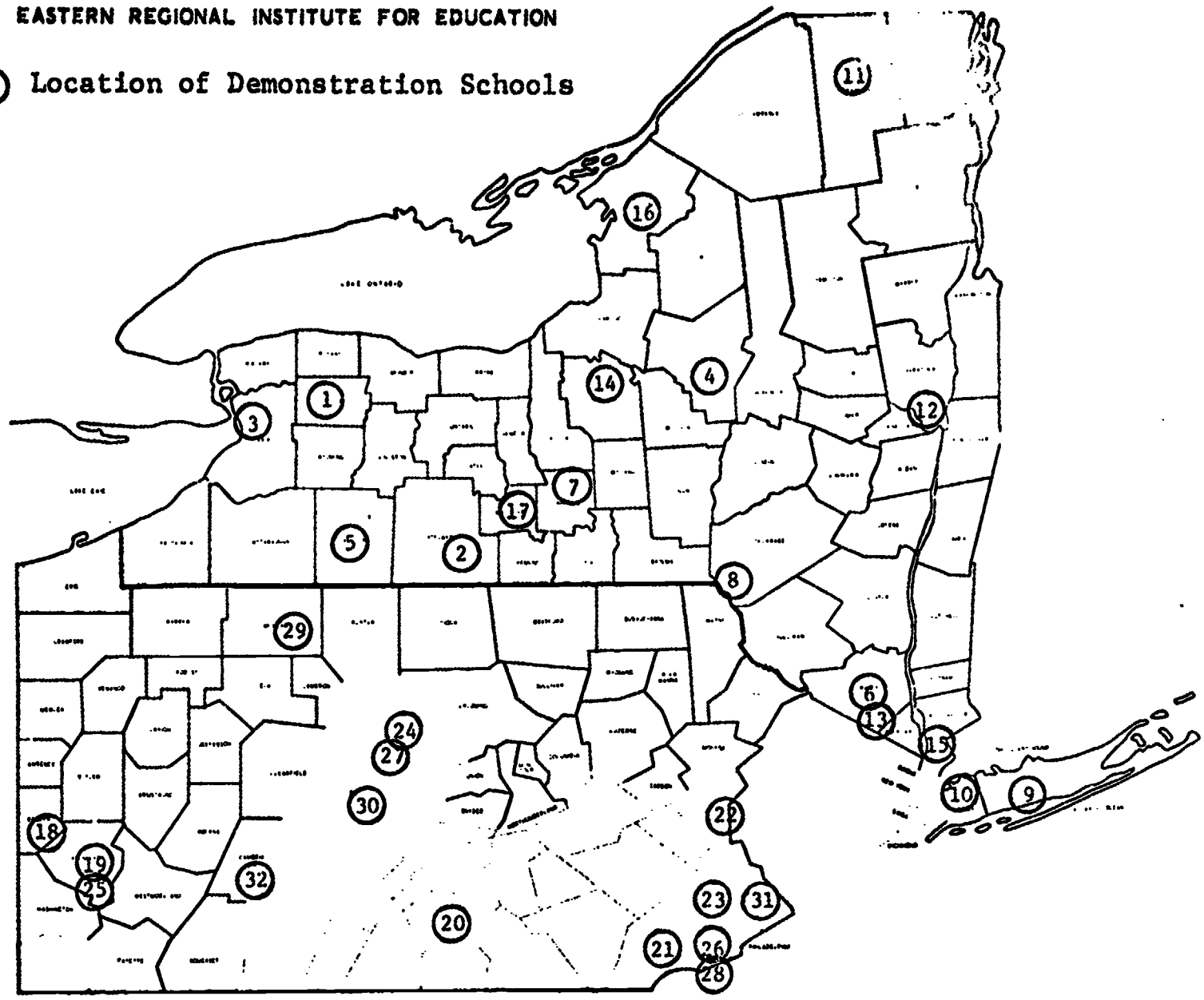
2. Inservice training for both teachers and administrators. This took the form of full-week summer workshops conducted at Ithaca College during the summers of 1967, 1968, and 1969.

3. All necessary Science--A Process Approach materials.

4. Regular consultant visits by ERIE science consultants.

EASTERN REGIONAL INSTITUTE FOR EDUCATION

○ Location of Demonstration Schools



NEW YORK

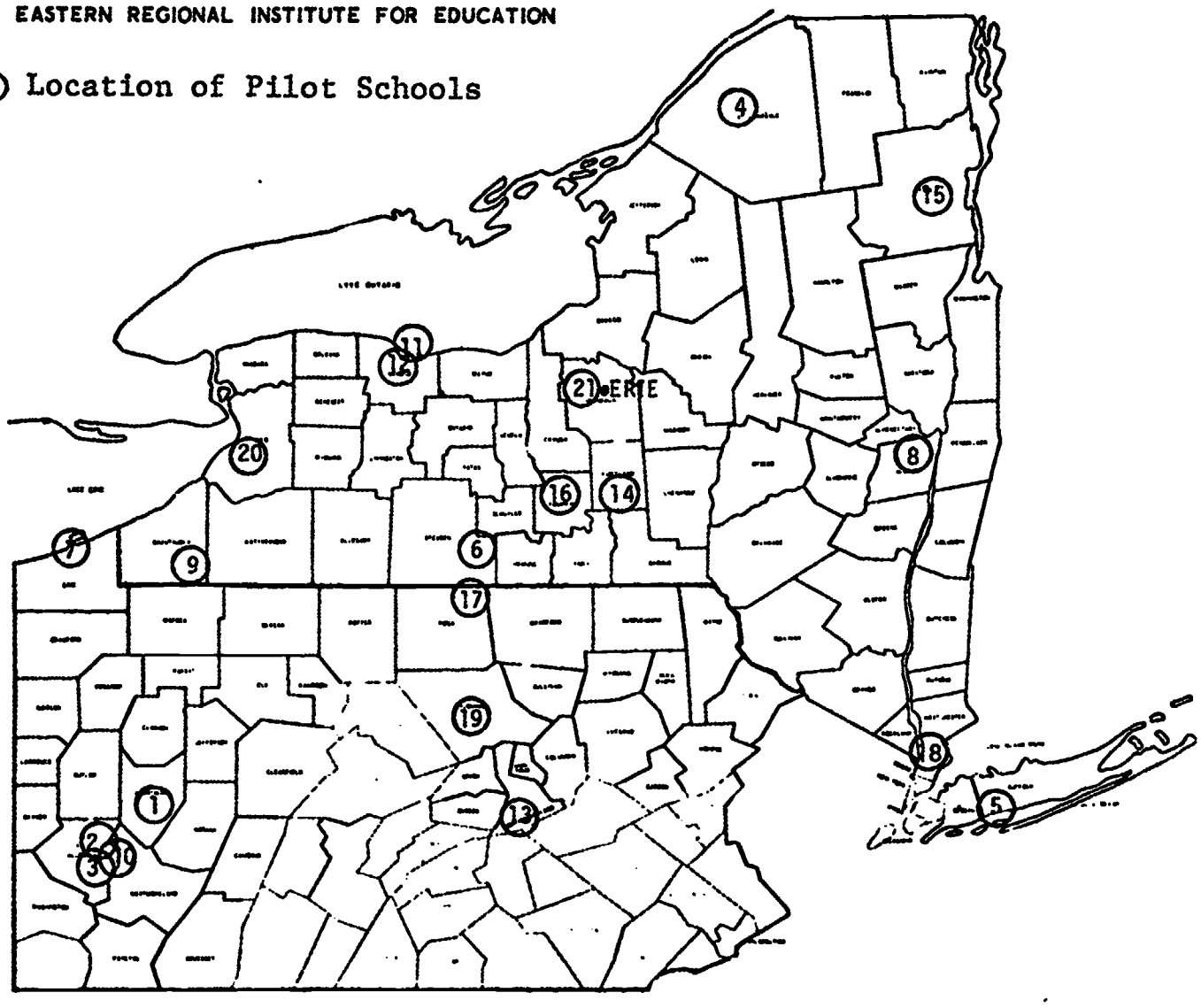
1. Batavia
2. Campbell
3. Cheektowa
4. Clinton
5. Friendshi
6. Goshen
7. Groton
8. Hancock
9. Kings Pa
10. Levittow
11. Malone
12. Scotia
13. Sloatsbu
14. Syracuse
15. Tarrytow
16. Watertow
17. Watkins G

PENNSYLVANIA

18. Beaver
19. Ben Avon
20. Carlisle
21. Downingto
22. Easton
23. Lansdale
24. Lock Have
25. McKeesport
26. Media
27. Mill Hall
28. Norwood
29. Smethport
30. State Col
31. Warminste
32. Windber

EASTERN REGIONAL INSTITUTE FOR EDUCATION

○ Location of Pilot Schools



1 Ford City, Pa.
2 Pittsburgh, Pa.
3 Pittsburgh, Pa.
4 Canton, N.Y.
5 Commack, L.I., N.Y.
6 Painted Post, N.Y.
7 Fairview, Pa.
8 Guilderland, N.Y.
9 Jamestown, N.Y.
10 Pittsburgh, Pa. (Paroc
11 Rochester, N.Y.
12 Rochester, N.Y.
13 Shamokin, Pa.
14 Cortland, N.Y.
15 Ticonderoga, N.Y.
16 Trumansburg, N.Y.
17 Wellsboro, Pa.
18 White Plains, N.Y.
19 Williamsport, Pa.
20 Williamsville, N.Y.
21 Syracuse, N.Y. (Parochia

Since it is doubtful that the transition from "new program" to "installed program" can ever occur in one monumental step, it may be best to visualize the change as proceeding through a series of phases. These constitute a kind of continuum along which a complete curriculum installation seems to take place. The earliest phase is one we call the Installation Decision phase. During this phase, a school or school system identifies a curricular area in need of strengthening and/or updating. Working collaboratively, the school administration names the innovative program which is to be installed, and administrators and staff mutually accept the installation task. This decision is made only after all available and appropriate programs have been carefully examined. Late in this phase, preliminary inservice training is begun.

The provision of extensive inservice training for both teachers and administrators marks the beginning of the next phase of installation--one we choose to call the Installation Tryout. Teachers involved with the new program are volunteers at this point, and they have been provided with all necessary instructional materials. They receive continuing consultant services during this very crucial time. They provide such evaluation data as competency measure results and other feedback information. Since the tryout phase may take several years, inservice training for additional and replacement teachers is provided. As the last stages of the tryout

phase are reached, the school administration and teaching staff carefully examine evaluative data in order to decide either to reject or adopt the program on a broader basis. In addition, they collectively formulate local modifications for the best articulation of the new program into the total curriculum--for example, articulation into the weekly time schedule, with other curricula, and with the secondary school program.

At what point should a curricular installation be considered "complete?" The answers one receives in response to this question are as diverse as are the ERIE pilot schools. In our opinion, however, six characteristics mark a true installation:

1. If the curriculum is a sequential program, it is accepted and used by all of the appropriate teachers. In other words, the program is actually and systematically being taught to all pupils--and the instruction which is being provided is acceptable from the standpoints of both quality and quantity.

2. The school system builds the costs of the program into its ongoing budget. (Continuation of the program does not depend upon outside funding.)

3. The administration and teaching staff have addressed themselves to the problems of articulating the innovation so that it fits well into the total instructional program of the school.

4. The teaching staff has had an adequate opportunity to use the new program. They have collectively decided what modifications (if any) are appropriate and necessary to meet local needs. These modifications do not violate the basic nature of the innovation.

5. The school system has formulated plans for continuing needed inservice training, both for present staff and for "new" faculty members.

6. The inservices of an "outside" installation organization are no longer directly needed.

What happens when a multitude of schools of diverse characteristics are provided with identical resources by an outside installation agency such as ERIE? And, what do these data tell us about the innovation itself? The papers which follow are addressed to these questions. The next paper describes the positive aspects of the ERIE installation of Science--A Process Approach.

REFERENCES

Cole, H.P., Bernstein, S., Seferian, A., et al. Report on the analysis of some process-oriented curricula: an annotated listing. Program Report 101. Syracuse, N.Y.: Eastern Regional Institute for Education, 1969.

Eastern Regional Institute for Education. Installing a new curriculum: Observations and recommendations. Program Report 102. Syracuse, N.Y.: Eastern Regional Institute for Education, 1969.

NOTE: These two reports available from ERIE provide additional information on process curricula and the 15 assumptions underlying the installation procedures used in this study.

SOME POSITIVE ASPECTS OF ERIE'S INSTALLATION OF SCIENCE--A PROCESS APPROACH: A STATISTICAL REPORT

Harold Harty

This report concerns itself with aspects of ERIE's Science--A Process Approach installation effort which appear positive. Supporting data have been incorporated as appropriate. In any curriculum installation endeavor, progress comes very slowly even with the help of an outside agency such as ERIE. The achievements represented by the data did not occur by chance. Much monitoring and guidance by ERIE played a significant role.

This paper is based on data collected over a period commencing September 1967 and terminating in January 1970 During the 1967-1968 school year, Science--A Process Approach was installed in kindergarten through grade three in 21 pilot elementary schools of diverse characteristics geographically distributed throughout the states of New York and Pennsylvania. During the 1968-1969 school year, the process-oriented science curriculum was expanded into grade four.

The sections below focus on those phases of the installation effort in which we discern some degree of success.

Time Commitment

We shall first examine the aspect of time commitment. How much time per week was spent on the teaching of science

before the arrival of Science--A Process Approach, and how much time is now devoted to teaching process science?

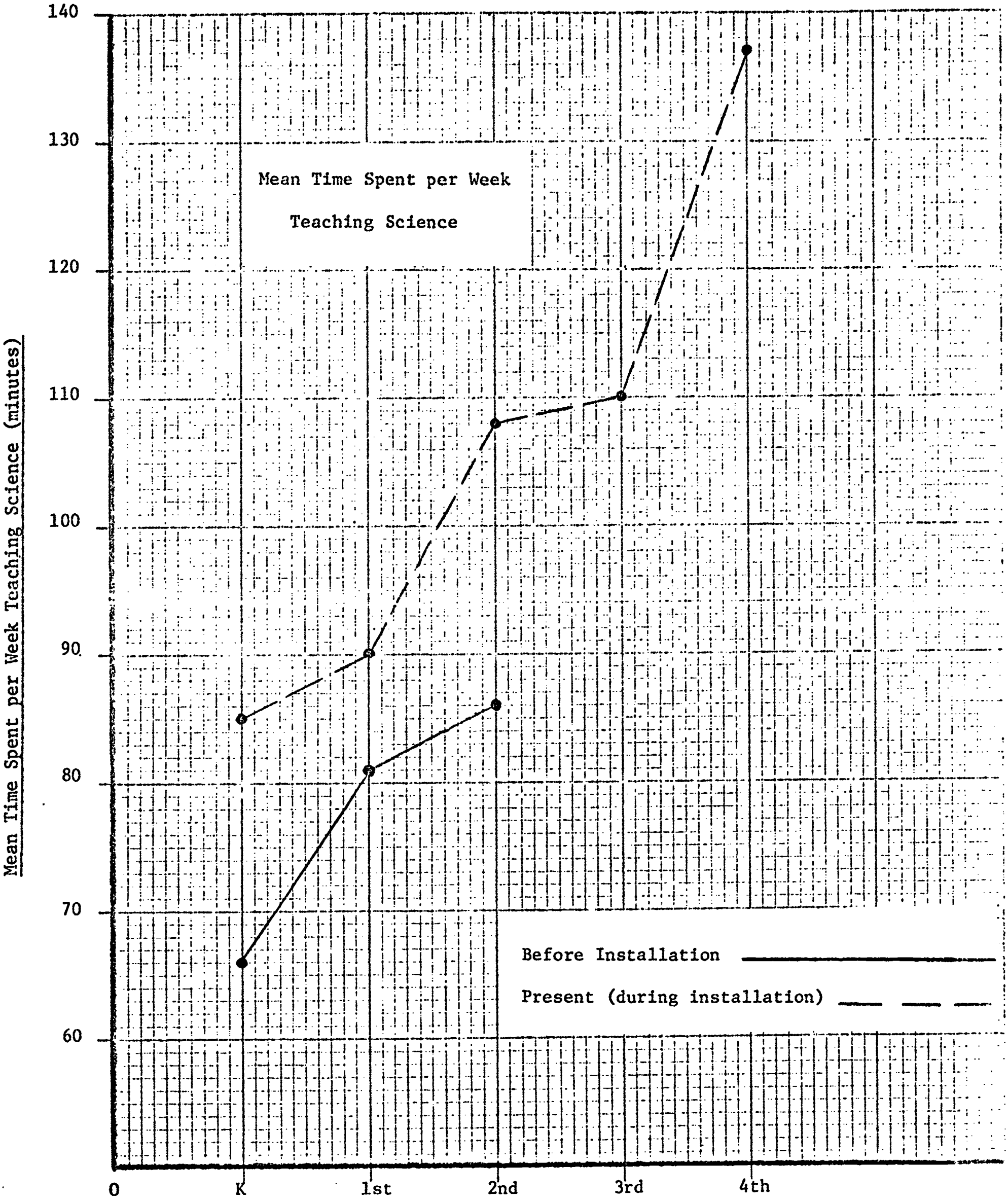
TABLE 1

Mean Time Spent per Week Teaching Science

Grade Levels	Before (Mean Time)	Present (Mean Time)
Kindergarten	66 minutes	85 minutes
First Grade	81 minutes	90 minutes
Second Grade	86 minutes	108 minutes
Third Grade	--	110 minutes
Fourth Grade	--	137 minutes

Table 1 and Graph 1 depict the mean time per week allotted for the teaching of science. The data reveal mean time increases per week at all grade levels (K-2), with the greatest increase occurring at the kindergarten level. Prior to the installation of Science--A Process Approach, the science programs of the pilot schools consisted of a textbook-centered program (49%), an equipment, experimentation, and inquiry-centered program (24%), a local district-built program using little equipment and books (22%), or no program at all (5%). ERIE's experience with installation shows that teaching Science--A Process Approach elicits a "fringe benefit" for the cause of science education--the regular scheduling of time allotments per week for the teaching of science.

Graph 1


Mean Time Spent per Week
Teaching Science
Mean Time Spent per Week Teaching Science (minutes)
140
130
120
110
100
90
80
70
60
0
K
1st
2nd
3rd
4th
Grade Levels
Before Installation
Present (during installation)

Exercises Taught: 1967-1969

Viewing the process science program from a quantity standpoint evokes the question, "How many exercises do teachers actually complete per grade in a given school year?"

TABLE 2

Mean Number of Exercises Taught per Year

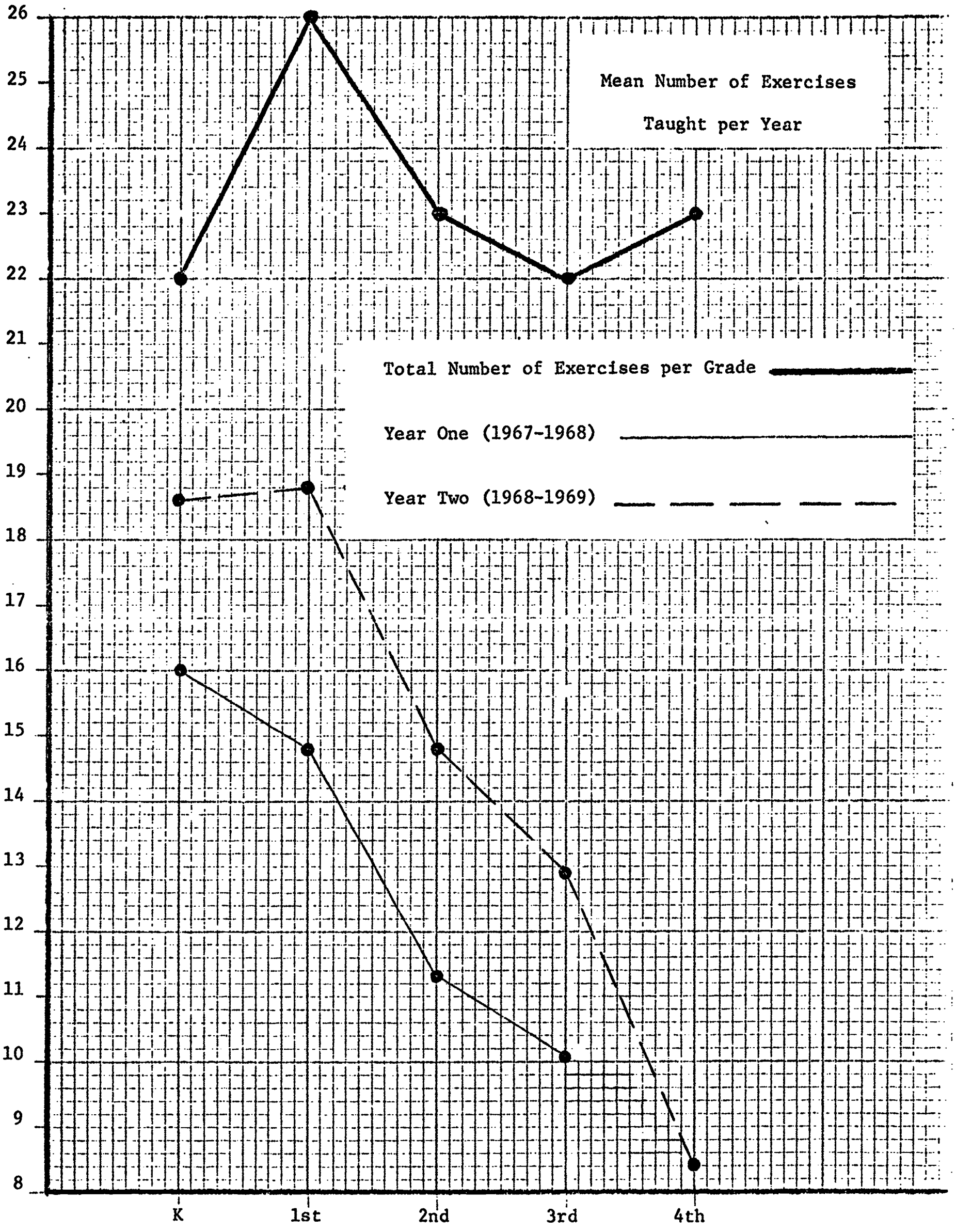
Grade Levels	Total Number of Exercises per Grade	Mean Number of Exercises Taught per Year	
		Year 1 (1967-1968)	Year 2 (1968-1969)
Kindergarten	22	16.0	18.6
First Grade	26	14.8	18.8
Second Grade	23	11.3	14.8
Third Grade	22	10.1	12.9
Fourth Grade	23	--	8.4

Mean Number of Exercises Taught by All Teachers (K-4)

Year 1 - (1967-1968) = 12.8 exercises

Year 2 - (1968-1969) = 14.8 exercises

Table 2 and Graph 2 exhibit the mean number of exercises taught per grade per year. The data reveal a promising trend with increases in the number of exercises taught at all grade levels from Year 1 to Year 2. These data reflect kindergarten and first grade teachers achieving a greater degree of success than second, third, and fourth grade teachers.


Mean Number of Exercises Taught per Year
Total Number of Exercises per Grade
Year One (1967-1968)
Year Two (1968-1969)
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
K
1st
2nd
3rd
4th
Grade Levels

The results pose the question, "Why were more exercises completed in kindergarten and first grade than in second, third, and fourth grades?" Experience with installation leads to the following speculative explanation:

Possible Notions

1. Exercises in Part A (K) and Part B (first) lend themselves more readily to the pragmatic environment and background of the children, whereas in Part C (second), Part D (third), and Part E (fourth), exercises tend to lean toward the realm of the working scientist and "sciencing."

2. Exercises in Part C (second), Part D (third), and Part E (fourth) involve greater student mental manipulation of cognitive structures and patterns, thus creating a need for more "thinking" time.

3. Exercises in Part C (second), Part D (third), and Part E (fourth) depend on more prerequisite lessons. If "carry-over" does not occur, teachers may have to review or in some instances reteach previous lessons.

4. Exercises in Part C (second), Part D (third), and Part E (fourth) depend much more on the teacher's background in the areas of science, science education, and philosophy of science. Many elementary teachers and principals lack sophistication in these areas.

5. Exercises in Part C (second), Part D (third), and Part E (fourth) are more time consuming and may progress over a period of days or even weeks.

6. Exercises in Part C (second), Part D (third), and Part E (fourth) mandate the use of more elaborate equipment with which most elementary teachers and principals are not familiar.

7. Exercises in Part C (second), Part D (third), and Part E (fourth) call for materials and supplies which many schools have not been able to procure from commercial vendors.

In an attempt to update the quantity data, Table 3 and Graph 3 provide the number of exercises completed for each of the first half-years (1968-1970). These data make it possible to compare previous results with the current year's results. Increases have occurred at all grade levels, especially when comparing the current year's results with those of the previous year in the third and fourth grades.

Pupil Acquisition of Behaviors

The data concerning pupil acquisition of process-oriented behaviors reflect interesting and perhaps unexplainable observable events. Table 4 and Graph 4 furnish data concerning pupil performance on tasks in individual competency measures located at the end of each exercise. The data represent mean percent correct among items administered to pupils per grade level (K-4) for the two and one-half year period.

The data tend to indicate rather favorable results in the kindergarten, first and second grades with all mean percentages above the 80 percent level. Mean percentages for third and fourth grades are slightly below the anticipated level. Percentages tend to oscillate slightly per grade from year to year, probably because of sampling variances.

TABLE 3

Mean Number of Exercises Taught per First Half of Year

Grade Levels	Half of Total Number of Exercises	Mean Number of Exercises Taught (1) Half Year Jan. 31, 1968	(2) Half Year Jan. 31, 1969	(3) Half Year Jan. 31, 1970
Kindergarten	11	4.5	7.2	8.7
First Grade	13	5.2	6.7	9.9
Second Grade	12	3.6	5.1	7.6
Third Grade	11	3.7	4.8	7.7
Fourth Grade	12	---	1.7	7.5

Mean Number of Exercises Taught by All Teachers (K-4)

Year 1 - First Half Year - (Jan. 31, 1968) = 4.2 exercises

Year 2 - First Half Year - (Jan. 31. 1969) = 4.9 exercises

Year 3 - First Half Year - (Jan. 31, 1970) = 8.1 exercises

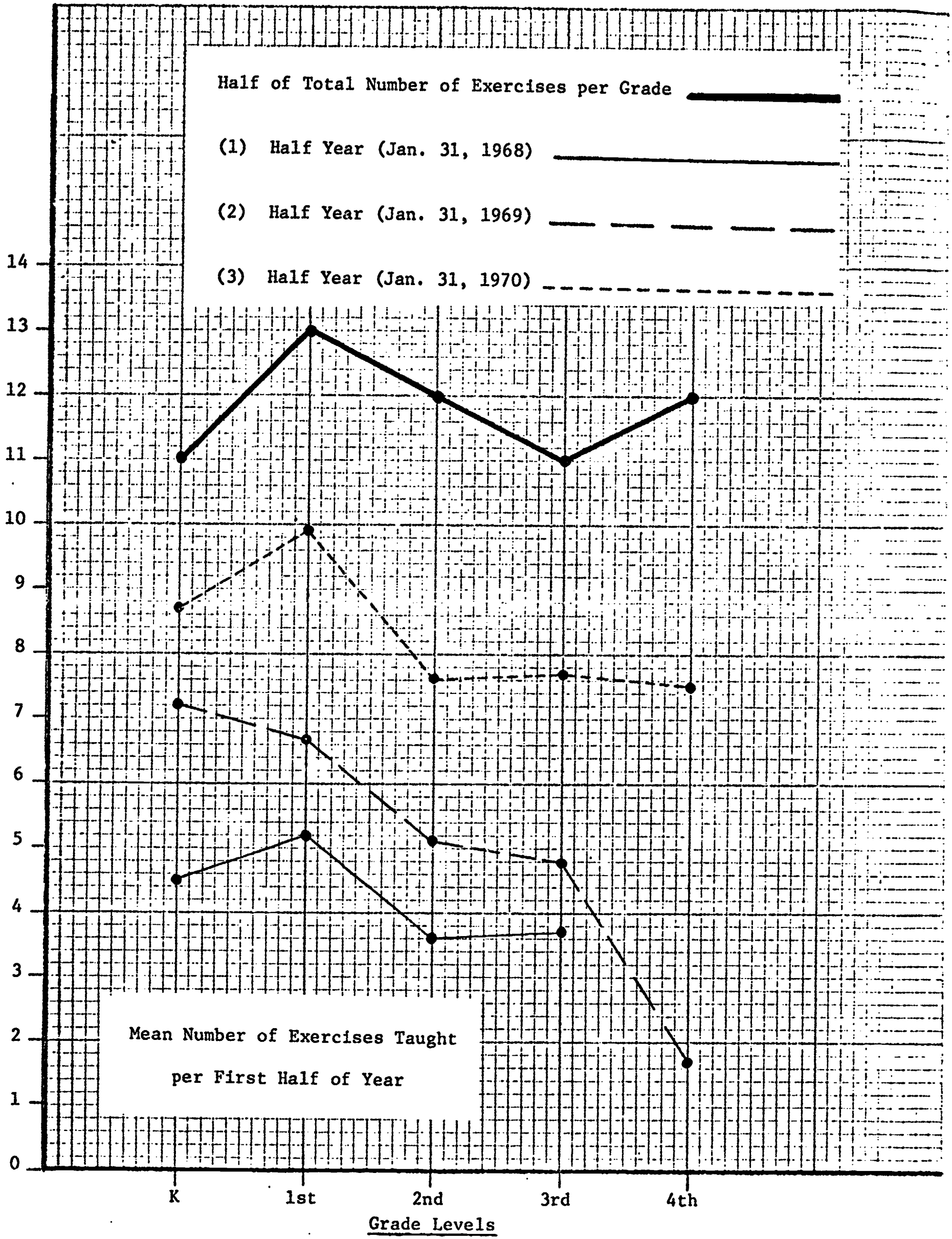
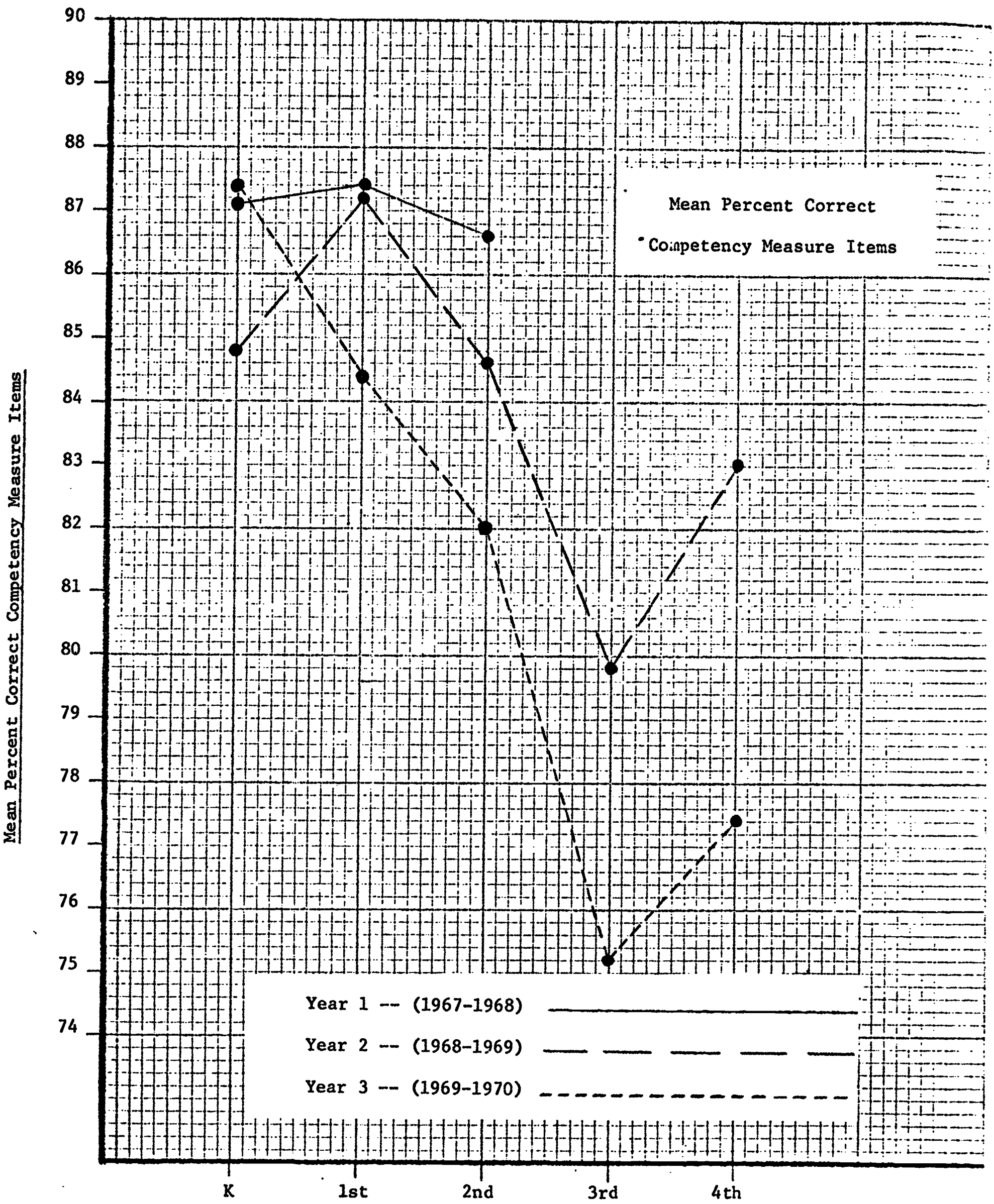

Half of Total Number of Exercises per Grade
(1) Half Year (Jan. 31, 1968)
(2) Half Year (Jan. 31, 1969)
(3) Half Year (Jan. 31, 1970)
Mean Number of Exercises Taught per First Half of Year
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Mean Number of Exercises Taught
per First Half of Year
K
1st
2nd
3rd
4th
Grade Levels

TABLE 4

Mean Percent Correct Competency Measure Items

Grade Levels	Year 1 (1967-1968) Total Number of Pupils Tested	Year 1 (1967-1968) Average Number of Pupils Tested per Exercise	Year 1 (1967-1968) Mean Percent Correct	Year 2 (1968-1969) Total Number of Pupils Tested	Year 2 (1968-1969) Average Number of Pupils Tested per Exercise	Year 2 (1968-1969) Mean Percent Correct	Year 3 (1969-1970) Total Number of Pupils Tested	Year 3 (1969-1970) Average Number of Pupils Tested per Exercise	Year 3 (1969-1970) Mean Percent Correct
Kindergarten	3141	143	87.1	4293	195	84.8	814	74	87.4
First Grade	2853	110	87.4	3893	150	87.2	1516	117	84.4
Second Grade	2115	92	86.6	3350	146	84.6	952	79	82.0
Third Grade	--	--	--	2321	106	79.8	938	85	75.2
Fourth Grade	--	--	--	1575	68	83.0	862	72	77.4


Mean Percent Correct
Competency Measure Items
Mean Percent Correct Competency Measure Items
90
89
88
87
86
85
84
83
82
81
80
79
78
77
76
75
74
Year 1 -- (1967-1968)
Year 2 -- (1968-1969)
Year 3 -- (1969-1970)
K
1st
2nd
3rd
4th
Grade Levels

Teacher Attitude Toward the Curriculum

ERIE has collected data regarding teacher attitudes toward Science--A Process Approach covering a period of one and one-half years. These data come from teachers' responses on the following continuum:

Greatest teacher dissatis-faction	1	2	3	4	5	6	7	8	9	Greatest teacher satisfac-tion

Table 5 and Graph 5 display the mean teacher attitude per grade level for Year 2 and the first half of Year 3.

TABLE 5

Mean Teacher Attitude Toward
Science--A Process Approach

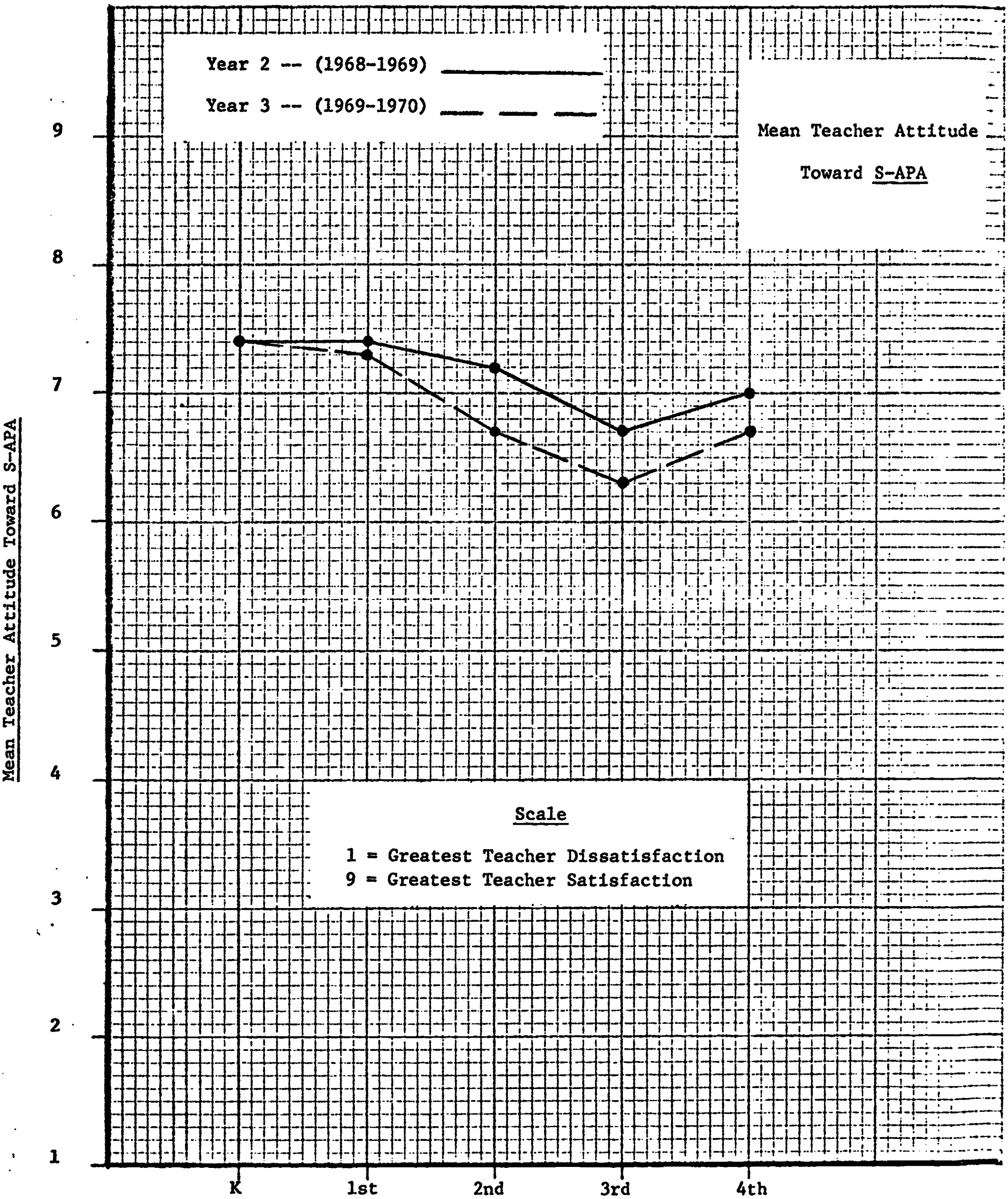
Grade Level	Mean Teacher Attitude	
	Year 2 (1968-1969)	Year 3 (1969-1970)
Kindergarten	7.4	7.4
First Grade	7.4	7.3
Second Grade	7.2	6.7
Third Grade	6.7	6.3
Fourth Grade	7.0	6.7

Continuum Range

1 = Greatest Teacher Dissatisfaction

9 = Greatest Teacher Satisfaction

Graph 5


Year 2 -- (1968-1969)
Year 3 -- (1969-1970)
Mean Teacher Attitude Toward S-APA
9
8
7
6
5
4
3
2
1
Mean Teacher Attitude Toward S-APA
Scale
1 = Greatest Teacher Dissatisfaction
9 = Greatest Teacher Satisfaction
K
1st
2nd
3rd
4th
Grade Levels

Grade three teachers appear to be the most negative feeling group, whereas kindergarten teachers appear the most positive. At all grade levels except kindergarten, the mean teacher attitude dropped slightly during Year 3.

When examining teaching behaviors, ERIE staff has encountered many problems as to what does "good" Science--A Process Approach teaching "look like." In order to deal with these problems, ERIE staff members formulated five "quality teaching" categories for recording observed behaviors. When an ERIE science consultant observes a teacher conducting a Science--A Process Approach lesson, he rates the teacher relative to these five behavioral categories on the following continua:

Continuum Scales for Rating Teaching Behaviors

1. How did the teacher react toward the pupils' responses?

Accepted and encouraged pupils' responses	1	2	3	4	5	6	Rejected and inhibited pupils' responses

2. Did the pupils manipulate the materials provided for the exercise?

Extensively manipulated materials	1	2	3	4	5	6	Did not manipulate materials

3. Were the pupils' and teachers' questions directed at the process objective(s) of the exercise?

Directed at process objectives	1	2	3	4	5	6	Deviated from objectives

4. Did the teacher "tell" or did she "question" or "guide" the students?

She questioned and guided	1	2	3	4	5	6	She "told"

5. Did the pupils communicate using the language of Science--A Process Approach?

Frequently used SAPA terminology	1	2	3	4	5	6	Never used SAPA terminology

Table 6 and Graph 6 reveal the mean numerical ratings per observational category per grade. These data were collected during the first half of Year 3.

The data indicate kindergarten, first grade, and fourth grade teachers exhibit desired behaviors to a greater degree than did second or third grade teachers. The behavior observed to the greatest degree was the "reaction of teacher toward pupils' responses." "Communication using the language of Science--A Process Approach" received the lowest mean numerical rating.

Transfer of Process

In reference to the transfer of processes exemplified in Science--A Process Approach to other areas of the elementary school curriculum, data were collected during Year 2 of the installation. Teachers were queried by means of a written questionnaire. When asked, "How frequently do the processes stressed in Science--A Process Approach lend

TABLE 6

Mean Numerical Rating per Observational Category
Concerning Teaching Behaviors

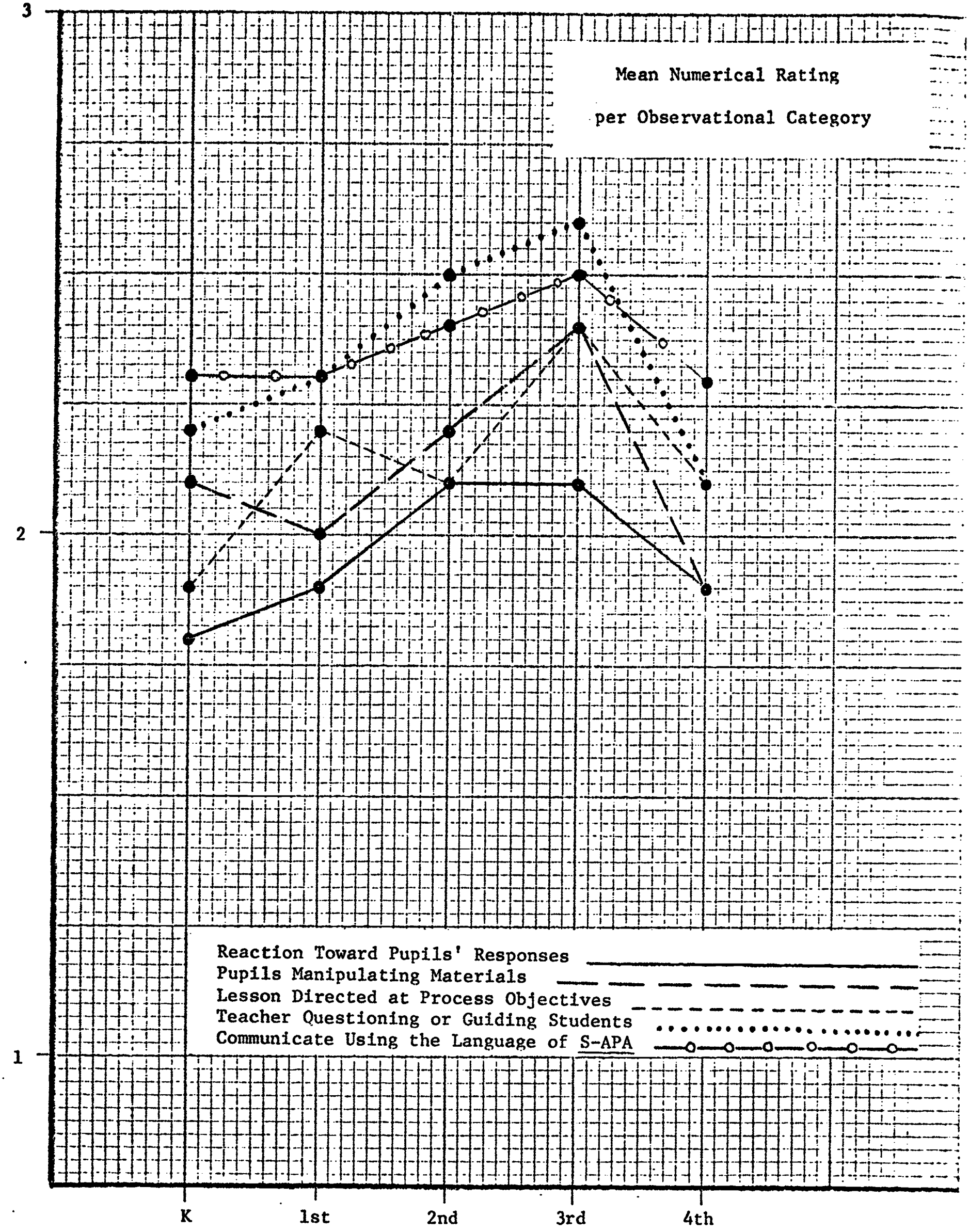
Grade Levels	Number of Teachers Observed	Mean Numerical Rating per Observational Category: Reaction Toward Pupils' Responses	Pupils Manipulating Materials	Lesson Directed at Process Objectives	Teacher Questioning or Guiding Students	Communicate Using the Language of SAPA
Kindergarten	68	1.8	2.1	1.9	2.2	2.3
First Grade	106	1.9	2.0	2.2	2.3	2.3
Second Grade	90	2.1	2.2	2.1	2.5	2.4
Third Grade	85	2.1	2.4	2.4	2.6	2.5
Fourth Grade	94	1.9	1.9	2.1	2.1	2.3

Mean per Grade

Kindergarten -- 2.1
First Grade -- 2.1
Second Grade -- 2.3
Third Grade -- 2.4
Fourth Grade -- 2.1

Mean per Behavior Category

Reaction Toward Pupils' Responses -- 1.9
Pupils Manipulating Materials -- 2.1
Lesson Directed at Process Objectives -- 2.1
Teacher Questioning or Guiding Students -- 2.3
Communicate Using the Language of SAPA -- 2.4


Mean Numerical Rating
per Observational Category
Mean Numerical Rating per Observational Category
3
2
1
Reaction Toward Pupils' Responses
Pupils Manipulating Materials
Lesson Directed at Process Objectives
Teacher Questioning or Guiding Students
Communicate Using the Language of S-APA
K
1st
2nd
3rd
4th
Grade Levels

themselves to deliberate and effective transfer to, or application in, other curricular areas (i.e., social studies, English, math, etc.), the teachers responded on the following continuum:

Continuum Scale

These "processes" are constantly taught in other areas 1 2 3 4 5 6 7 These "processes" are seldom taught in ot' areas

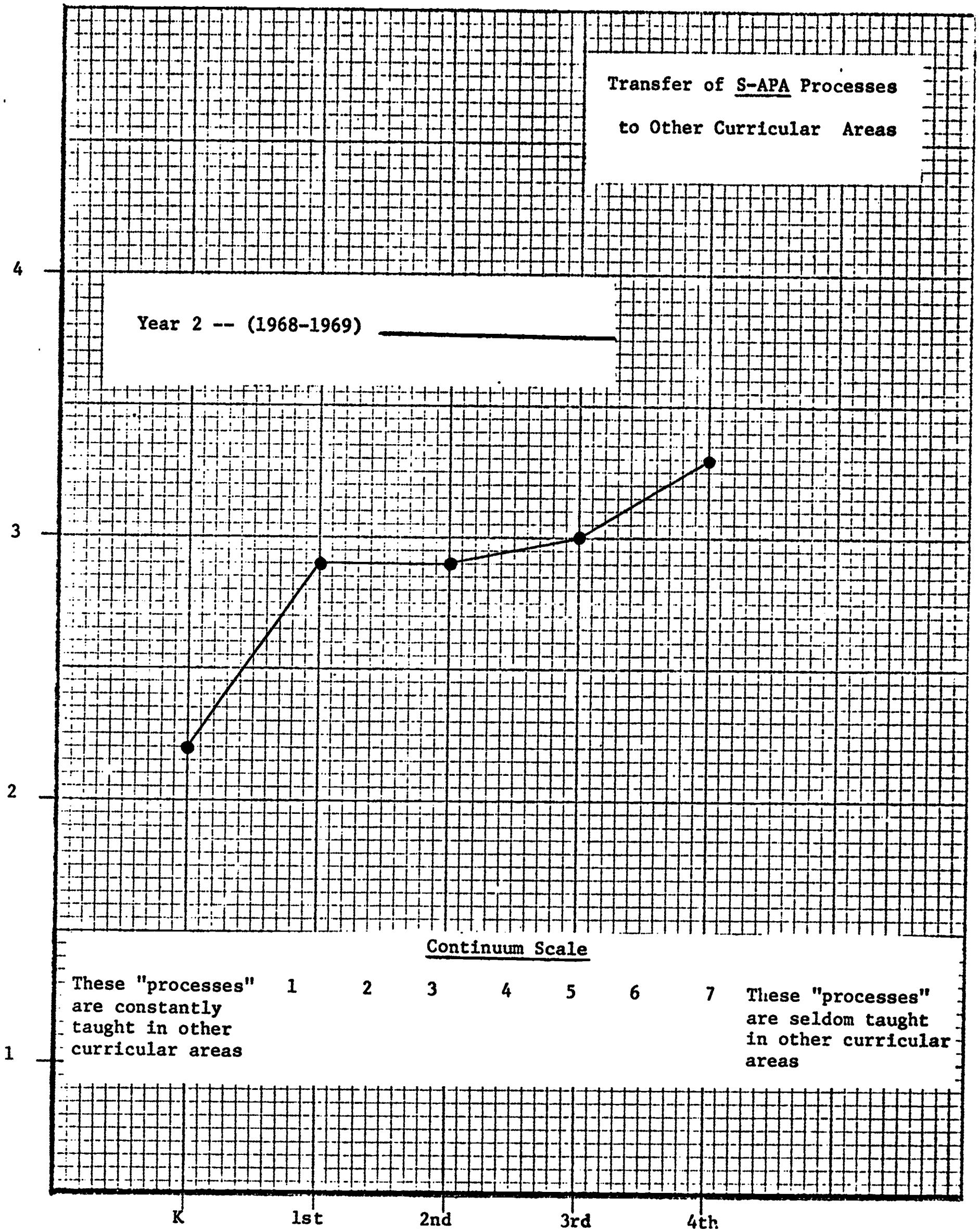
Table 7 and Graph 7 provide the mean numerical r.. nse concerning transfer of Science--A Process Approach to other curricular areas per grade level.

TABLE 7

Transfer of Processes to Other Curricular Areas

Grade Level	Year 2 (1968-1969) Mean Numerical Response	Standard Deviation
Kindergarten	2.2	1.3
First Grade	2.9	1.4
Second Grade	2.9	1.4
Third Grade	3.0	1.4
Fourth Grade	3.3	1.5

Mean (K-4) = 2.9


Transfer of S-APA Processes
to Other Curricular Areas
Year 2 -- (1968-1969)
Mean Numerical Continuum Response
4
3
2
1
Continuum Scale
These "processes" are constantly taught in other curricular areas
1 2 3 4 5 6 7
These "processes" are seldom taught in other curricular areas
K
1st
2nd
3rd
4th
Grade Levels

If a trend is to be noted across grade levels on this item, it would be that kindergarten teachers feel that Science--A Process Approach "processes" lend themselves to transferability to other curricular areas. Perhaps a process-oriented curriculum is viewed by teachers as having more transferability in a less rigid "readiness" program at the kindergarten level than in the more structured program beginning at first grade. Traditionally, the kindergarten program has been less encumbered by formal subject matter barriers such as arithmetic or reading. This makes it possible for kindergarten teachers to present a more unified series of learning experiences to the class than at other grade levels. Teachers from first grade on still tend to look at science instruction solely as science instruction; and, therefore, they usually are not tuned to the idea of applying process skills learned in science to other academic areas.

School District Expansion

With regard to school district expansion, research indicates positive effects on other elementary schools within pilot school districts, and in some instances on schools outside the districts, to the degree that they have adopted the program in their buildings. A recent suvey of districts having a pilot school indicated a high acceptance of the process-promoting program by non-pilot schools.

In fact, of the 184 possible expansion sites within districts having a pilot school, 74 of these elementary schools (40%) adopted Science--A Process Approach during the two and one-half years of the installation. Fourteen of the 21 (67%) pilot schools expanded Science--A Process Approach into one or more elementary school(s) within their district. Three pilot schools reported being the only schools within the system and, therefore, could not expand. Two pilot schools in the same district were counted only once in the data. Four systems could not expand because of fiscal difficulties.

One possible explanation of this expansion, occurring outside of ERIE's direct sphere of influence, is found in the Demonstration and Dissemination Days conducted by the pilot schools. During Year 2 (1968-1969), 14 (67%) pilot schools conducted Demonstration and Dissemination Days, utilizing experienced teachers and assisted by staff from local Title III centers. These Demonstration and Dissemination Days attracted a total of 786 educators from New York and Pennsylvania.

Conclusion

ERIE can only meet its installation objectives when successful installation has occurred within a variety of contexts. The positive aspects which have been elaborated

upon in this paper indicate that some installation objectives have been fulfilled. Whether a successful installation has occurred or not is yet to be seen. The problem of defining a successful installation is treated in a later section of this report.

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NOTE: Unpublished documents and working papers are not available for distribution but may be examined by interested scholars at ERIE.

SOME NEGATIVE ASPECTS OF ERIE'S INSTALLATION OF SCIENCE--A PROCESS APPROACH

Frederick A. Brown

The main purpose of this discussion is to describe the variables that are viewed as having hindered ERIE's installation efforts in the 21 pilot schools located in New York and Pennsylvania.

Three sources of information form the basis for this discussion. These data sources include reports of a questionnaire, a survey, and an oral interview.

The Questionnaire

A questionnaire entitled, "Consultant Observations on Installation" was completed by seven staff associates at ERIE in May and June of 1969. These staff associates served as consultants to the 21 pilot schools during the 1968-1969 school year. The consultants made 12 to 13 visits to each of the schools to which they were assigned. The consultant's role required him to work with the principal, teachers, and pupils as Science--A Process Approach was installed into the school curriculum. While consulting in the 21 schools, the consultants became knowledgeable about the variables that were helping and hindering the installation efforts. They were in a position similar to that of an anthropologist as he studies a culture, in that they were involved in the

installation efforts as participants and observers yet detached from the norms of the school community. This position allowed the consultants to identify the variables that contribute toward a successful installation of the science program and those that hinder the installation of the program. The consultants and the Evaluation Team at ERIE have identified variables that seem to be directly related to the installation effort (see Appendix A).

Two variables were identified as greatly hindering ERIE's installation efforts. First, the consultants named nine schools where they felt curriculum issues hindered the installation effort. Curriculum issues include (1) the acceptance of "process" instruction as compared to "content" instruction, (2) the acceptance of student participation and manipulation of materials when science is taught, and (3) the imbalance of the curriculum where one subject is emphasized more than another, requiring a large block of time in the school day for its teaching (e.g. reading being dominant). In these nine schools some staff members preferred not to teach Science--A Process Approach because they were in disagreement with:

1. Its emphasis on "process."
2. The inquiry method of instruction the teacher must use to teach the program properly.
3. The amount of time that the program takes away from reading or any other subject that has traditionally dominated the school curriculum.

The second variable that the consultants identified as greatly hindering the installation efforts was the instructional leader, the principal of the school. The consultants named nine schools (43% of the pilot schools) in which the principal was viewed as a hindering variable. In these schools, the principal lacked the instructional leadership (i.e. coordinative ability, or communicative ability, or goal setting ability) to facilitate the installation in his school.

The consultants identified two other variables that hindered somewhat ERIE's installation efforts. These variables were not viewed as hindering the installations as severely as the two previously described. The first variable identified in this category is the teacher's attitude toward the joint agreement between ERIE and the local school district. The consultants reported three schools in which teachers were unaware of the contents of the joint agreement and four other schools in which a few teachers would not implement the terms of the agreement by completing reports and questionnaires. This problem was viewed as a somewhat hindering variable in 7 out of 21 pilot schools (33%) (see Appendix B).

The second variable perceived as hindering somewhat ERIE's efforts is the teacher's class load and the related responsibilities. Again, 7 schools out of the 21 identified

this variable as negatively influencing the installation. Large class size with limited amount of kit materials, excessive outside classroom responsibilities and numerous clerical duties were mentioned by the consultants as hindering somewhat the efforts of teachers to teach Science--A Process Approach.

In summary, the results of the questionnaire show that the seven ERIE staff consultants were able to identify four variables that hinder the installation of Science--A Process Approach. Two of these variables, teacher curriculum preference and the principal, were identified as greatly hindering ERIE's installation efforts while two other variables, teacher attitude toward ERIE and teacher class load, were identified as somewhat hindering variables to ERIE's efforts.

The Survey

Dr. James M. Mahan, director of the Installation Component at ERIE, administered a survey to the principals of the 21 pilot schools at a meeting on November 18, 1969. The survey asked principals to identify variables that "greatly hinder," "somewhat hinder," and those that "do not hinder" the installation of Science--A Process Approach in their schools. This survey utilized a prepared list of variables (see Appendix C) similar to those used by the consultants in the "Consultant Observations and Installation" questionnaire.

The principals were asked to consider each variable in the prepared list and place it in one of the three categories judged appropriate for his school. As a group, the principals were encouraged to add one or more variables to the prepared list. This resulted in the addition of three more variables.

The results of this survey provided a summary of the perceptions of the 21 principals on those variables that hinder and those that do not hinder the installation efforts in ERIE's pilot schools. The variables identified in the survey as "greatly hindering" and "somewhat hindering" ERIE's efforts correlated very closely with the variables identified by the seven ERIE staff consultants in the questionnaire. Five principals (24%) identified curriculum issues as "greatly hindering" the installation efforts in their schools. Twelve other principals (57%) identified this variable as "somewhat hindering" the teaching of Science--A Process Approach. Thus, 17 of the 21 principals (81%) reported curriculum issues as generally hindering installation efforts in their schools. By identifying curriculum issues as a hindering variable, principals were in agreement with ERIE staff consultants who identified nine pilot schools (43%) in which this variable hindered ERIE's efforts.

It seems appropriate to assume that the curriculum-issues variable could be changed into a facilitating variable if the teachers could be sold on process instruction, on the need to teach science in the elementary schools, and on the positive response that pupils have toward Science--A Processs Approach.

ERIE's staff consultants named nine pilot schools (43%) where the principal, the instructional leader, was identified as a hindering variable. Paradoxically, the principals agreed with the ERIE consultants. One principal listed himself as "greatly hindering" the installation effort in his school and 13 principals (62%) listed themselves as "somewhat hindering" the teaching of Science--A Process Approach. Fourteen of the 21 principals (67%) named themselves as "generally hindering" the installation of Science--A Process Approach in their schools. Thus, the principal's instructional leadership is identified by both groups as a variable that hinders the installation efforts of ERIE. The principal's inability to communicate, to coordinate and set school goals is, in fact, a significant hindering variable in ERIE's 21 pilot schools.

A third variable identified by both the principals and the consultants pertains to the workload that teachers must maintain. Both groups perceived the teacher's class load and related professional responsibilities as factors

retarding the installation efforts. Principals in two schools identified this variable as "greatly hindering" and 12 principals (57%) identified this variable as "somewhat hindering" the installation in their schools. A total of 14 principals out of 21 (67%) identified this variable as generally hindering the installation efforts in their schools. As reported earlier in this description, seven ERIE staff consultants identified this variable to be a hindering factor in 7 of the 21 (33%) pilot schools. The perceptions of the consultants and principals imply that high pupil-teacher ratios, excessive demands upon the teachers by the school system and the community, and obligations of the teacher to his profession cause unrealistic pressures upon the teacher's energy and time. This, in turn, directly affects the teacher's performance in the classroom and, particularly, her performance in the installation of the new program.

A fourth variable identified by the principals as hindering the installation efforts in the 21 pilot schools is the competition of other innovative programs introduced when Science--A Process Approach is being installed. One principal identified this variable as "greatly hindering" the installation effort and 12 principals (57%) identified this variable as "somewhat hindering." The heavy demands for teacher preparation time and classroom teaching time,

created when two or more innovations are introduced at the same time, hindered the installation of Science--A Process Approach in 13 of the 21 pilot schools.

A fifth variable identified by the pilot school principals during their conference on November 18, 1969, pertains to the instructional materials used to teach the Science--A Process Approach program. Seven principals (33%) identified the quality of the materials, the promptness of delivery and/or the errors in the teachers' texts as "greatly hindering" installation efforts. Further, 10 principals (48%) identified this variable as "somewhat hindering" installation. Seventeen principals (81%) thus identified the problems associated with the instructional materials as generally hindering the installation efforts in their schools. This variable is particularly significant because the pilot schools had just completed their second year of teaching Science--A Process Approach. Despite the two-year period of time that the commerical vendors had to improve their service, 81% of the pilot school principals identified the inadequate service of these vendors as "generally hindering" installation efforts.

Oral Interview Report

In view of the importance of the instructional materials to the successful installation of Science--A Process Approach, it seems appropriate to report on the teachers' perceptions of this variable.

In the late spring of 1969, the teachers in ERIE's pilot school network were interviewed to obtain new data not previously requested of the teachers and to reconfirm information previously acquired. Structured interviews were conducted with 286 of the 292 teachers (98%) by the seven ERIE staff consultants. These interviews revealed that 179 teachers (63%) had serious problems with the instructional materials. There were 141 teachers (48%) that indicated their problems resulted from late deliveries, incomplete sets of materials and poor quality of the materials that the pupils use. Thirty-eight (15%) teachers indicated that their problems resulted from the teacher text directions and the data sheets that the pupils work with. The teacher text directions were reported to be difficult to understand and sometimes incomplete, and the pupil data sheets did not correspond with the description of the lessons. In some cases the pupil data sheets contained mistakes that the teachers were unable to resolve.

Conclusion

Based on the perceptions of seven staff consultants and 21 pilot school principals as reported in data collected during the spring and fall of 1969, ERIE staff has identified six variables that hinder the installation of Science--A Process Approach. The six variables, summarized below,

represent a global view of those aspects which negatively effect ERIE's installation efforts.* (See Table 1.)

VARIABLE 1: Teacher Load and Related Responsibilities

This variable deals with such matters as record keeping, clerical work, "red tape," community demands on teacher time, extracurricular load, and keeping up to date professionally. This includes large class size, inservice meetings, competency measure administration and other similar activities (PTO: Factor 5).

VARIABLE 2: Curriculum Issues

This variable deals with teacher feelings about the adequacy of the school program in meeting student needs, in providing for individual differences, and in preparing students for effective citizenship. This includes curriculum imbalance--excessive emphasis of one subject, acceptance of "process" as compared to "content," student manipulation of materials and inductive teaching style (PTO: Factor 6).

VARIABLE 3: The Instructional Materials

This variable deals with the general quality of equipment, the promptness of delivery and the errors in the teachers guide supplied by commerical vendors.

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*Statements of the variables are adapted from the Purdue Teacher Opinionaire (PTO).

VARIABLE 4: The Principal's Instructional Leadership

This variable deals with the ability of the principal to communicate, to coordinate, and to establish school-wide goals.

VARIABLE 5: Competing Innovative Programs

This variable deals with the timing and multiplicity of installing new programs. It includes innovations such as reorganizing the graded structure of the school and all new forms of instructional programs.

VARIABLE 6: Teacher Attitude Toward Contractual Obligations

This variable deals with the willingness of teachers to implement the terms of each year's contractual agreement. It also includes the teachers knowledge of the terms of this agreement. The teachers are requested to assist ERIE in its research gathering activities. These activities include completing questionnaires, survey reports, and similar forms used to measure ERIE's installation efforts.

TABLE 1

Consultant and Principals' Perceptions of Hindering Variables in ERIE's Installation of Science--A Process Approach in 21 Pilot Schools After the Second Year

Perceptions	Variable Number	Hindering Categories: Greatly: % of Schools	Hindering Categories: Somewhat: % of Schools
Consultant	1	--	33
Principal	1	10	57
Consultant	2	43	--
Principal	2	24	57
Consultant	3	--	--
Principal	3	33	48
Consultant	4	43	--
Principal	4	5	62
Consultant	5	--	--
Principal	5	5	57
Consultant	6	--	33
Principal	6	--	--

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WHAT IS SUCCESSFUL INSTALLATION?

Charles W. Wallace

A definition of what constitutes success must take into account the goal expectations of the institutions investigating, or involved, with the installation. In the current study, the expectations of each pilot school and of ERIE must be considered in determining success. In an elementary school having had no organized science program before the advent of Science--A Process Approach, the completion of eight to ten Science--A Process Approach exercises at each grade level during a school year might be considered a major success. Likewise, a school which increases its mean science instruction time from 20 to 60 minutes a week might evaluate the installation as being successful. However, a behavioral definition of success based on an increase in the number of exercises taught and on an increase in instruction time devoted to science would be totally inadequate for a school which had already adopted and implemented a valid science curriculum.

Criteria of Success

For ERIE, a long-range criterion for determining success of installation would be to return to the schools two or three years after the direct intervention of ERIE had ceased and observe if Science--A Process Approach is

still a viable component of the school program. If the curriculum is visable, recognizable, utilized to the fullest by each teacher, and referred to by the staff as "our school science program"--it would seem fairly safe to say that the installation had been successful.

Unfortunately, after a short exposure to a new curriculum, many schools drop the program before it can be adequately evaluated to determine its strengths and weaknesses in the local setting. Some curricula have been so radically modified in the local setting that they are no longer recognizable to an outsider.

However, of more immediate concern to both the local school and ERIE are such criteria of success as pupil achievement and attitude, teacher performance and attitude, extent of diffusion of the program, and the solving of problems encountered by the introduction of Science--A Process Approach.

In monitoring the implementation of any curriculum, it is essential that data from both pupils and teachers be collected to evaluate the effectiveness of the installation. The systematic collection of data from classrooms historically has been slow, and often limited to the observation of the teaching act. Currently, more attention is being directed toward change in behaviors of both pupils and teachers.

Pupil Achievement

Standards of pupil achievement, as measured by the ability of pupils to exhibit acceptable skill behaviors for the competency measure tasks at the end of each Science--A Process Approach exercise, have been documented by Walbesser and others, including the ERIE staff. Although there is a wide range in the mean percent of acceptable responses for individual competency tasks with each Part of Science--A Process Approach, the overall pupil achievement on tasks is set at a fairly rigorous level.

Schools entering into Science--A Process Approach may wish to compare the pupil achievement results from their school with others in attempting to determine success of the implementation. Without doubt, the curriculum has assisted pupils in developing process skills relevant to scientific application. While pupil attitude in the primary school grades is difficult to assess in a formal manner, informal indications of pupil attitude are constantly being manifested within the classroom. A perceptive teacher can discern quickly a pupil's attitude toward both the total curriculum and the component segments of the program.

Influence of Teachers

The definition of a "successful installation" must also consider the influence of the teachers. Certainly, for maximum success, it is essential that all teachers who

are supposed to be using the innovation are, indeed, teaching the program. The quality and the quantity of the teaching must be within acceptable limits established by the local school. In a successful installation, the quantity of teaching is directly related to how the program is articulated from one grade level to the next.

To insure success with the curriculum, in terms of quality of teaching, the program must be presented by the teacher to the pupil in an instructional mode consistent with the curriculum design. In teaching Science--A Process Approach the teacher needs to use an instructional method emphasizing inquiry--an open classroom environment that encourages active pupil involvement with materials and concepts, and where the teacher, instead of acting as a provider of ready-made conclusions, serves as a questioner and sustainer of inquiry. In this system the ultimate evaluation of quality of teaching must rest with observable pupil achievement. Teacher attitude toward the innovation must be positive if the installation is to be a success. At the conclusion of a year's work with the program, is the teacher willing to use the program with her pupils the next school year? Or, after a year or more experience with the program, is the teacher now more willing, or less willing, to try and implement the program as she was when she first utilized the program?

School District Expansion

Another criterion to be used in defining the success of an installation is school district expansion under local tax support. If the installation of a curriculum within a pilot school is successful, word of this success should spread through communication channels from principal to principal and from teacher to teacher until all district school staffs are aware of the program and express some interest in introducing the program to their school. With limited funding available to school districts for the introduction of new curricular materials, the impact and value of a specific curriculum, adjudged in a local pilot school setting, serves to justify further financial commitment to the program.

Direct Funding

The district must supply direct funding for equipment needed to expand the program and also to maintain and replace equipment already available. In addition, the district must provide support for the inservice training of new teachers so they can more effectively function with the program. The commitment of a local school district to expand and spread the curriculum within the district must serve as an indicator of a successful installation.

Solving Problems

A final factor in successful installation is to be found in the ability of the school to find a satisfactory solution to problems created by the introduction of the curriculum. Is sufficient time allocated for the program to be taught in the already crowded school day? Is space available for proper storage of equipment? A major problem of articulation arises in working with a sequential hierarchial program such as Science--A Process Approach; is provision made so that the teachers at one grade level can pick up the exercises in sequence--beginning where the lower grade level instructor finished the year before? Is provision made so exercises are not skipped from year to year?

Summary of Success Criteria

In focusing for a moment upon the ERIE-pilot school installation effort, the following generalizations on installation success can be made:

1. THE PUPILS IN THE PROGRAM ARE ACHIEVING THE BEHAVIORAL OBJECTIVES OF SCIENCE--A PROCESS APPROACH AT ACCEPTABLE LEVELS.

   In the 1968-69 school year pupils in the 21 ERIE pilot schools achieved the following percentage of acceptable (correct) responses to competency tasks upon the completion of each exercise:

Part A	Kindergarten	84.9%	Part D	3rd grade	78.8%
Part B	1st grade	87.2%	Part E	4th grade	83.0%
Part C	2nd grade	84.7%			

2. THE NUMBER OF SCIENCE--A PROCESS APPROACH EXERCISES TAUGHT BY A TEACHER HAS TENDED TO INCREASE EACH YEAR DURING THE FIRST TWO YEARS OF THE STUDY.

Results from the ERIE Pilot Schools 1967-1969

Grade Level	Part	Number Exercises	Mean Number Exercises Taught 1st year 1967-68	Mean Number Exercises Taught 2nd year 1968-69	% Increase 2nd Year Over 1st Year
K	A	22	16.0	18.6	16%
1	B	26	14.8	18.8	27%
2	C	23	11.3	14.8	31%
3	D	22	10.1	12.9	28%
4	E	23	part not avail.	8.4*	--

*January to June 1969 only.[1]

3. THE PILOT SCHOOL TEACHERS DO DISPLAY FAVORABLE ATTITUDES TOWARD SCIENCE--A PROCESS APPROACH AFTER HAVING TAUGHT THE PROGRAM FOR AT LEAST ONE YEAR.

In May 1969, ERIE-pilot school teachers were asked the question, "Based on this year's experience, how much do you look forward to teaching Science--A Process Approach to another group of pupils next year?" The answer was marked on the following continuum scale:

Very eager to teach 1 2 3 4 5 6 7 Really prefer not to teach

The 270 teachers who responded gave this item a mean rating of 2.58. This seems to indicate considerable eagerness to teach the curriculum again in the future.

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1 The commercial edition of Part E with kit equipment did not reach the pilot schools until January 1969 due to shipping problems of the supplier.

In an oral interview given in May and June 1969, ERIE pilot school teachers were asked if they now felt more willing, as willing, or less willing to try to implement Science--A Process Approach in their classrooms as they were when they first started working with the program; 93% of the teachers interviewed reported they were at least as willing to work with Science--A Process Approach in the future as they were initially. Of the 286 teachers responding, 158 (55%) indicated they were now more willing to work with the curriculum than when it was first introduced; 109 (38%) were as willing; and 19 teachers (6.6%) indicated they were less willing to use the curriculum than they were two years before.

4. THERE HAS BEEN DISTRICT EXPANSION OF SCIENCE--A PROCESS APPROACH EMANATING FROM THE PRESENCE OF A PILOT SCHOOL USING THE CURRICULUM WITHIN THE SCHOOL DISTRICT.

Fourteen of the 21 pilot school districts have introduced Science--A Process Approach into additional schools of the district subsequent to the initial ERIE installation (between September 1967 and September 1969). In three districts the pilot school was the only elementary school--so expansion could not occur.

Recommendations for Successful Installation

Based upon the two-year installation of Science--A Process Approach in the 21 pilot schools, ERIE staff offers the following recommendations on what can be done to enhance the possibilities of achieving a successful installation of Science--A Process Approach.

1. ASSURE THAT THE SCHOOL STAFF PERCEIVES A REAL NEED FOR A NEW SCIENCE CURRICULUM.

Too often a discrepancy exists between teachers and school administrative personnel on the nature of the existing science curriculum and the degree to which the program is being implemented in the classroom. It is advisable to gather baseline data on the effectiveness of the current science curriculum and to carefully evaluate this material before a change in program is contemplated. Through this procedure, the local objectives to be met in changing the science program can more clearly be defined.

2. ASSURE THAT THE SCHOOL STAFF PERCEIVES THE NEW CURRICULUM AS "THE BEST CHOICE."

Many curriculum installations are launched before sufficient time has been allotted to a thorough examination of competing programs by the school staff. The objectives and methods of the new curriculum must be consistent with goals for the local school established by the teachers and principal. Seldom does a school staff take the time and effort needed to establish these goals in advance of the introduction of an innovation.

The Far West Laboratory for Educational Research and Development, a sister laboratory of ERIE, has produced an Integrated Information Unit (IIU) in Elementary Science Curricula, a multi-media kit,* which presents an excellent

*Elementary Science Curricula Integrated Information Unit (IIU) produced by the Far West Laboratory for Educational Research and Development, 1 Garden Circle, Hotel Claremont, Berkeley, California 94705.

survey of the current inquiry-oriented science programs. This type of up-to-date survey material is of considerable value in assisting the local school faculty to make a "best choice" selection. Staff which has participated in a meaningful curriculum decision will be more likely to develop a commitment toward the new innovation.

3. ASSURE THAT THE CURRICULUM INNOVATION BEGINS AS A SMALL-SCALE TRYOUT, WITH GRADUAL EXPANSION.

The sequential-hierarchial structure of Science--A Process Approach requires that, for maximizing the effectiveness, one additional grade should be added to the installation each successive year. Where two or more grade levels are introduced to Science--A Process Approach at the same time, pupils in the upper grade often lack the prerequisite skills which should have been learned the previous year and, thus, retard the pupils' progress and increase the teacher frustration.

4. ASSURE THAT TEACHERS VOLUNTEERING TO PARTICIPATE ARE USED EXCLUSIVELY IN THE INITIAL IMPLEMENTATION OF THE PROGRAM.

Teachers who volunteered to engage in teaching Science--A Process Approach have tended to remain as participating teachers. However, a few administrators have presumptively "volunteered" teachers for the installation. This practice has adversely affected the installation because these teachers are not truly committed to Science--A Process Approach.

Had only volunteers been used the first year, the chances are that initially skeptical teachers might be converted to the program in light of pupil achievement and fellow teacher enthusiasm. By being forced into teaching the program, a teacher is placed on the defensive from the initial contact. Eventually, when the program has been institutionalized within a school, new faculty should be encouraged to teach the innovation because it is "our school science syllabus."

5. ASSURE THAT INSERVICE TRAINING IS AVAILABLE FOR BOTH TEACHERS AND ADMINISTRATORS.

Inservice training for the teachers in the methods and materials of Science--A Process Approach is needed and desired for two reasons. First, it explains the psychological rationale of the curriculum, demonstrates skills in working with the various "processes" of Science--A Process Approach, and provides for a working knowledge of the equipment used by the pupils. Secondly, the training can also provide the teacher the impetus and enthusiasm necessary to successfully transfer the program from the printed page to pupil activity. It has been ERIE's experience that chances of a successful installation are increased when two or more teachers are using the program at the same grade level, working in close proximity. In such situations, teachers are able to share equipment set-ups and compare notes on the progress of the program.

Inservice training for the school principal is equally valid. If the principal is to maintain the role of instructional leader he must be well-informed on the curricula being used in his building. ERIE's data show that the success of the installation of Science--A Process Approach is directly correlated to the leadership, knowledge, support, and active participation of the building principal. The principal must be in a position to give a meaningful pat-on-the-back when the teacher performs well in the program; or to give a necessary occasional prod to the teacher who is moving too slowly. The principal must be willing to listen to problems encountered by teachers and have knowledgeable empathy with them. He must provide the instructional leadership to see that adequate time for teaching Science--A Process Approach is made available; and that the curriculum offerings of the school are kept in balance by the teacher, with no areas being eliminated or receiving an exorbitant amount of time. The principal can only perform his role intelligently if he is fully aware of the program, and this can best be accomplished by giving him some special training on Science--A Process Approach.

6. ASSURE THAT EQUIPMENT AND MATERIALS ARE AVAILABLE.

Innovative inquiry-oriented science curricula such as Science--A Process Approach require manipulative equipment

designed for pupil use. Since ERIE's effort coincided with the commerical release of Science--A Process Approach, the installation has been plagued constantly with the late arrival of equipment. Commercial suppliers should now be sufficiently "tooled up" to provide equipment for Parts A-E with expediency. District personnel responsible for the ordering of equipment are advised to place orders in the spring so materials will reach the school before the opening of the fall semester. Science--A Process Approach requires the use of certain perishable materials (red cabbage for example) that must be purchased when needed. It is recommended that a small petty cash account be set up where teachers can be reimbursed for the purchase of locally supplied, needed materials.

7. ASSURE THAT QUALIFIED CONSULTANT ASSISTANCE IS AVAILABLE.

Teachers tend to be reticent when it comes to requesting assistance in the implementation of a new curriculum. In elementary science, this reticence may be expected because many teachers feel their science background is so poor. ERIE has found that trained college professor consultants can be a most effective resource to elementary school teachers in implementing Science--A Process Approach. Through the financial assistance and support of the National Science Foundation, ERIE has established the Regional Action Network in New York and Pennsylvania--a group of over 50 trained consultants with expertise in Science--A Process Approach.

The National Science Teachers Association is also beginning to set up, on a nationwide level, a clearinghouse of science curriculum consultants.

ERIE has also recorded success with the training and utilization of teacher-leaders, a peer staff member with special expertise in Science--A Process Approach. The teacher-leader can be a potent, local source of immediate continuing support to fellow teachers. The program in schools with teacher-leaders has been most effective.*

8. ASSURE TO LIMIT THE NUMBER OF INNOVATIVE PROGRAMS INTRODUCED DURING THE SAME SCHOOL YEAR AT THE SAME GRADE LEVEL.

Every school program places many demands upon a teacher's time. If a teacher is to do her best with an innovative program, additional time must be devoted to insuring the curriculum is properly presented. In schools where a number of innovations are made the same year, one or all of the new programs can suffer from lack of sufficient preparation time for the teacher. Changes in all areas of the elementary school are occuring with increasing rapidity, yet teachers must work a sufficient time with a program in order to get the real grasp. Many pilot school teachers have mentioned how much more they enjoyed the teaching of

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*The Role of the Teacher-Leader in Curriculum Installation by C.W. Wallace, A.C. Buddle, J.M. Mahan. ERIE Program Report 104, January, 1970.

Science--A Process Approach the second and third years of the study. By then they were beginning to get the feel for "process education."

In conclusion, the authors hope these papers provide some insight into ERIE's installation study using Science--A Process Approach.

Many positive aspects of the installation of Science--A Process Approach have been noted as well as some problem areas. The study of any curriculum effort would uncover some problems. Based upon ERIE's experience with Science--A Process Approach, the authors have attempted to present some suggestions for enhancing the possibilities of achieving successful installation.

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APPENDIX A

DESCRIPTION OF VARIABLES, RENAMED DIMENSIONS, THAT EFFECT ERIE'S INSTALLATION EFFORTS IN 21 PILOT SCHOOLS (From the Wallace and Eltrich Document)

Dimensions 1-10 are the factor descriptions on scale from the Purdue Teacher Opinionaire as taken from the Manual for the Purdue Teacher Opinionaire, Bentley & Rampel, University Bookstore, West Lafayette, Indiana, 1967.

Dimension 1

The teacher rapport with the principal deals primarily with the teacher's feelings about the principal's professional competency, interest in teachers and their work, ability to communicate, and skill in human relations.

Dimension 2

Satisfaction with teaching pertains to the teacher relationships with students and feelings of satisfaction with teaching. Included within this dimension is the fact that satisfied teachers love to teach, feel competent, enjoy students, and believe in the future of teaching as an occupation. Include teacher competence and quality of teacher preservice training.

Dimension 3

Rapport among teachers focuses on a teacher's relationships with other teachers with regard to cooperation, preparation, ethics, influence, interests, and competency of one's peers.

Include activity of strong "peer leader" or "opinion leader" teachers--this could be positive or negative leadership by faculty members.

Dimension 4

Teacher salary pertains primarily to the teacher's feelings about salaries and salary policies. Especially, are salaries based on teacher competency? Are salary policies administered fairly and justly in the development of these policies? Include doing extra work outside the normal hours of a full school day or year at no pay.

Dimension 5 (Variable 1, page 11)

Teacher load deals with such matters as record keeping, clerical work, "red tape," community demands on teacher time, extracurricular load, and keeping up-to-date professionally. Include large class size, inservice meetings, competency measure administration, etc.

Dimension 6 (Variable 2, page 11)

Curriculum issues pertains to teacher's feelings about the adequacy of the school program in meeting student needs, in providing for individual differences, and in preparing students for effective citizenship. Include curriculum imbalance--excessive emphasis. Include acceptance of "process" as compared to "content." Include acceptance of student participation, manipulation of materials by students, inquiry approach, etc. (Teacher methodology).

Dimension 7

Teacher status samples feelings about prestige, security, and benefits afforded by teaching. (Do not confound this Dimension with Dimensions 2 and 4.)

Dimension 8

Community support of education deals with the extent to which the community understands and is willing to support a sound educational program. Include PTA, parents, school board attitudes and actions. Include "financial situation" of the school.

Dimension 9

School facilities and services has to do with the adequacy of facilities, supplies and equipment, and the efficiency of the procedures for obtaining materials and services. Include kit and manual deliveries, quality of kits and manuals, storage space, petty cash, etc.

Dimension 10

Community pressures give special attention to community expectations with respect to the teacher's personal standards, his participation in outside school activities, and his freedom to discuss controversial issues in the classroom. Include any community embedded "conservatism" that might oppose "process," science, inquiry, "group activity" by students, etc.

Dimension 11

Role, attitude, strength of various subject matter specialists or central office administrators (identify position and describe the influence). INCLUDE ATTITUDE OF PRINCIPAL TOWARD SCIENCE--A PROCESS APPROACH.

Dimension 12

Instructional leadership, coordinative ability, communicative ability, and goal coordinating ability displayed by principal.

Dimension 13

Other new programs, instructional innovations, or organizational innovations being introduced in the building.

Dimension 14

Social or organizational ills. Disorganization, discipline problems, highly mobile student body, unusual number of holidays and school closings, heavy absenteeism, restrictive teacher organizations or unions. Bureaucratic school structure where "wheels turn slowly," etc.

Dimension 15

ERIE's implementation of the terms of each year's cosigned, contractual agreement with the pilot school and its district.

Dimension 16

Willingness of teachers to implement the terms of each year's contractual agreement (research, competencies, etc.). Teacher knowledge of the terms of the contractual agreement.

Dimension 17

Presence of an ERIE-trained teacher-leader. (Remember that no school had an ERIE-trained teacher-leader in 1967-1968.)

Dimension 18

Characteristics of Science--A Process Approach as a curriculum. (Science--A Process Approach has been successfully installed in some schools. If you feel its characteristics impede the installation in this school, what are the unique characteristics of this school that clash with which characteristics of Science--A Process Approach? SPECIFY.)

Dimension 19

Teacher and/or principal values, attitudes, beliefs.

Consultant, please write in significant applicable dimensions not previously listed.

Dimension 20

Dimension 21

Dimension 22

APPENDIX B

JOINT AGREEMENT FOR 1969-70 SCHOOL YEAR

This agreement is entered into jointly between the Eastern Regional Institute for Education, hereinafter referred to as ERIE, a non-profit organization with offices at 635 James Street, Syracuse, New York, and _____School District with offices at _____. As an amendment to the existing Joint Agreement, this agreement shall remain in effect until June 30, 1970.

Background

During the 1967-68 school year ERIE installed Science--A Process Approach in grades K-3 of _____ Elementary School. This curriculum was installed in the 4th grade (where existent) during the 1968-69 school year while ERIE continued to monitor the K-3 installation. In accordance with the original Statement of Intent and subsequent Joint Agreement drawn by ERIE and accepted by participating pilot schools, ERIE carried out the following functions and activities in the 1967-68 and 1968-69 school years:

1. ERIE paid a stipend of $175 to teachers (summers 1967, 1968) and administrators (summer of 1967 only) for their active participation in a one-week August institute. In addition to the stipend, ERIE assumed expenses for room, board, and travel for the participating teachers and administrators.

2. ERIE has provided the school district with kits of commercially produced materials to carry out most of the activities of the curriculum. ERIE also has supplied expendable materials for the use of K-3 teachers teaching the program for the second year.

3. ERIE has provided consultant service to the school on a regular and continuing basis at no cost to the school district for two consecutive years.

The K-3 inservice education of teachers and administrators and K-3 equipment needs supplied by ERIE for the past two years now become the responsibility of the local district. Consultant service in the pilot school will continue to be financially underwritten by ERIE <u>if the school requests</u> consultant service within the terms of this agreement.

ERIE anticipates extending the Science Curriculum Program to the 5th grades in the participating pilot schools during the 1969-1970 school year and hereby extends and updates the current Joint Agreement to carry out the following functions and activities:

1. TEACHER WORKSHOP

   a. <u>Fifth Grade Teachers</u> - ERIE will pay a stipend of $175 distributed throughout the 1969-1970 year to 5th grade teachers for their active participation in an eight-day institute to be held during August (Friday, August 15 thru Friday, August 22). This workshop tentatively will be held at Ithaca College, Ithaca, New York. ERIE will provide room and board at the college and will reimburse

direct transportation costs for travel to the institute from location of the school district. These teachers must teach Science--A Process Approach during 1969-1970 to be eligible for any of this support.

b. Fourth Grade Replacement Teachers - ERIE will pay a stipend of $175 distributed thoughout the 1969-1970 year to 4th grade teacher replacements of 4th grade teachers who participated in the program during the 1968-1969 installation year and who have terminated employment in the district. Room and board at the college and direct transportation costs for travel to the institute from location of the school district will be provided by ERIE. These replacement teachers must teach Science--A Process Approach during 1969-1970 to be eligible for any of this support and must attend the eight-day institute.

c. Additional Fourth Grade Teachers - ERIE will pay a stipend of $175 distributed throughout the 1969-1970 school year to 4th grade teachers who did not participate in the Program during the 1968-1969 year. ERIE will provide room and board at the college and reimburse direct transportation costs for travel to the institute from location of the school district. These additional 4th grade teachers must teach Science--A Process Approach during 1969-1970 to be eligible for any of this support and must attend the institute.

ERIE will invoice the school district for $128 per teacher to cover the tuition, room, and board of teachers who attend the institute but do not teach Part E (grade 4) or Part F (grade 5) of Science--A Process Approach during 1969-1970. The district will be invoiced for any stipends or travel that these teachers might receive from ERIE also.

No K-3 teachers will be trained by ERIE. (However, ERIE has collaborated with Title III agencies, colleges, and state departments to plan K-3 Science--A Process Approach Workshops at Siena College, Edinboro State College, and State University College at Buffalo. Pilot schools may find these workshops economical sources of inservice training.)

2. ADMINISTRATOR WORKSHOP

Principals who have not attended a previous administrator workshop will be scheduled for critical portions of the teachers' institute and for supplementary sessions. These activities will be held at Ithaca College, Ithaca, New York (tentative). ERIE will provide room and board at the college and reimburse direct transportation costs for travel to the institute from location of the school district. ERIE will not pay a stipend to the participating administrators.

3. MATERIALS FOR SCHOOLS

ERIE has provided the school district with kits of commercially produced materials sufficient to carry out most of the activities in the 4th grade. Additional 4th grade kits will be provided in numbers sufficient for cooperative use by teachers if additional 4th grade teachers join the program. ERIE will provide expendable materials to refurbish the original 4th grade kits. Expendable materials will also be supplied in a quantity sufficient to permit 5th grade teachers to use the original 4th grade kits to complete the teaching of the 4th grade Science--A Process Approach curriculum. In addition, ERIE will provide kits of commercially produced materials sufficient to carry out most of the activities in grade 5 when students have completed the 4th grade curriculum and are ready to begin on 5th grade exercises. Thus, 5th grade kit provision will be directly linked to instructional progress and to demonstrated need for equipment in the pilot school.

4. CONSULTANT SERVICE (optional-must be requested)

At district request, ERIE will continue to underwrite consultant service to teachers and administrators in the pilot school on a continuing basis in grades K-5 at no cost to the school district. Consultant service will be rendered to all Science--A Process Approach teachers whether ERIE trained or locally trained. (Ten to fifteen visits per year) This consultant service is defined to include frequent observation of actual Science--A Process Approach instruction in all K-5 classrooms and joint teacher-consultant evaluation of the "process" achievement of students.

Districts may signify whether this type of consultant service is desired by checking the appropriate box on the final page.

5. FOLLOW-UP

ERIE anticipates extending the program to grade 6 in cooperating schools during the 1970-1971 year of the program, providing that adequate funding is available and, further, that commercially produced materials are available and suitable for introduction at that time.

In order to fulfill its research, development and dissemination mission, ERIE requires that the Board of Education and administration agree to, and make firm provision for, the following:

1. That the administration make available a two hour block of time when the principal and all K-6 teachers of the pilot school will respond to certain research instruments at no cost to ERIE. It is highly likely that members of the ERIE research and evaluation staff will desire to administer research instruments and utilize members of the teaching staff for purposes of

gathering data relevant to the processes involved in curriculum change, particularly with respect to the modification of attitudes and teaching styles and to changes in "process" and "content" knowledge.

2. That all ERIE-trained teachers (K-5) and all consultant assisted teachers will submit, to ERIE, competency measures (an integral part of each Science--A Process Approach exercise), thereby facilitating an evaluation of student achievement and curriculum effectiveness. These cards will be collected by the principal and/or consultant. The data will be analyzed by ERIE and reports made available to the district.

3. That the school district will provide access to cumulative records of students for purposes of evaluation and research and will assist ERIE to collect pupil Science--A Process Approach achievement data at no financial expense to the district.

4. That the administration and teachers will receive visitors in the pilot school from colleges or public schools within the region and will sponsor occasional demonstration days providing opportunities for observing the program and discussing aspects of the program with teachers and/or administrators.

5. That the administration will assist in establishing a consultant classroom observation schedule to maximize consultant effectiveness and to assess the impact of the curriculum on the educational accomplishments of pupils.

ERIE requests that the Board of Education also consider the following provision:

That teachers who participate in the institute and successfully complete a year of working with the program be granted in-service credit toward a salary increment which would be commensurate with that increment which is normally given for a three credit hour college or university course.

ERIE will make sincere efforts to maintain high professional standards in its relations with the school district. It is an expectation that future process-promoting curricular projects may be initiated cooperatively with school districts participating in this initial curricular innovation. However, the Institute reserves the right to withdraw this project from a school district should it feel that the activities and procedures employed are not in keeping with either the concerns of ERIE or the best interests of the school district.

(Return sheet for Letter of Agreement)

A. Check one box.

(1) / / _____ Elementary School will continue to collaborate with ERIE in the installation and monitoring of Science--A Process Approach under the terms of this Joint Agreement.

(2) / / _____ Elementary School no longer desires to collaborate with ERIE.

B. If (1) was checked above, please check the appropriate box below:

(1) / / Regular, ERIE underwritten consultant service to all K-5 pilot building Science--A Process Approach teachers is desired in 1969-1970. Teachers will welcome the consultant into the classroom during science teaching time and will collaborate with the consultant to maximize the contribution of this process curriculum to the intellectual development of students.

(2) / / No ERIE underwritten consultant service is desired in the pilot building in 1969-1970.

_____ Director of Program (ERIE)

_____ Superintendent of Schools

_____ Ass't Director for Operations (ERIE)

_____ Principal of Pilot Building

_____, Director Process Curriculum Installation Activities

APPENDIX C

PILOT SCHOOL PRINCIPALS' OBSERVATIONS ON VARIABLES INFLUENCING THE SCIENCE--A PROCESS APPROACH INSTALLATION EFFORT

In all schools there are some problems associated with introducing a new curriculum and engineering its complete implementation and acceptance by all teachers involved. Science--A Process Approach is no exception. Many factors (variables, conditions) hinder curriculum installation. ERIE is extremely interested in your most candid judgment of the variables that tend to hinder the Science--A Process Approach installation in your school.

Through a ranking technique, you are asked to help ERIE staff to focus on the most important variables. Please begin by filling in the two blanks below and then studying the list of variables given. A discussion will follow whereby variables you feel have been omitted will be added. Finally, instructions for ranking all variables will be given.

Name of School: _____

Principal: _____

Variables That Can Hinder the Success of a Curriculum Installation

1. Rapport between teachers and principal.
2. Teacher satisfaction with the career of teaching, enthusiasm for children, etc.
3. Teacher peer relations (groups, cliques, opinion leaders).

4. Teacher salaries and teacher working conditions.

5. Teacher load--pupil-teacher ratio, school and community demands on time, red tape, etc.

6. Curriculum preferences of teachers, teaching style preferences, curriculum imbalance (i.e. reading very dominant).

7. Teacher status and recognition in the community.

8. Community financial support of education, school board support, availability of local funds to implement new programs.

9. General school facilities, space, equipment, supplies.

10. Community conservatism and strict expectations for teacher performance and type of curriculum used.

11. Influence of subject matter specialists.

12. Instructional leadership and goal coordinating ability of principal.

13. Other innovative programs being introduced at same time.

14. Social and organizational ills--discipline problems, teacher and student turnover, absenteeism, restrictive teacher organizations, bureaucracy.

15. ERIE implementation of the terms (conditions) of each year's contractual letter of agreement.

16. Willingness of teachers to implement the terms of each year's contractual agreement--research, data collection, competency measures, consultant assistance in rooms.

17. Lack of a trained teacher-leader-internal support.

18. Characteristics of Science--A Process Approach as a curriculum--material oriented, inquiry oriented, sequential, process rather than content.

19. Personal attitudes, beliefs, values of principal and teachers.

20. Quality of ERIE consultant service.

21. Provision of specific Science--A Process Approach equipment--quality, promptness of delivery.

22. Teacher opposition to collaboration with anyone for the purpose of modifying teacher classroom behavior. Guarded isolation.

23. Teacher competence--education, social background, experience.

24. Teachers were "volunteered" for program rather than allowed to volunteer.

25. ERIE Inservice Education Workshop.

26. Principals were allowed to volunteer.

27. Building principal must serve more than one school or is a teaching principal.

28. Reaction to performance standards feedback.

A	B	C
Variables That Greatly Hinder Science--A Process Approach Installation in my School	Variables That Somewhat Hinder Science--A Process Approach Installation in my school	Variables That Are Not Important Hindrance to Science--A Process Approach Installation in my School

In space below, Rank the Variables in Column A above in order of greatest hindrance. First variable is greatest hindrance, second variable is second greatest hindrance, etc.

Column A Ranked

#1	_____	#10	_____	_____	
#2	_____	#11	_____	_____	
#3	_____	#12	_____	_____	
#4	_____	#13	_____	_____	
#5	_____	#14	_____	_____	
#6	_____	#15	_____	_____	
#7	_____		_____	_____	
#8	_____		_____	_____	
#9	_____		_____	_____	