DOCUMENT RESUME

ED 088 182 EA 005 915

AUTHOR Schwer, William E.
TITLE An Evaluation of the Effects of an Open Space Program on Selected Seventh Grade Pupils and Their Teachers.
PUB DATE Jun 73
NOTE 98p.; Practicum Report in partial fulfillment of requirements for National Ed.D. Program for Education Leaders, Nova University

EDRS PRICE MF-$0.75 HC-$4.20
DESCRIPTORS Basic Skills; Cognitive Measurement; *Comparative Analysis; Doctoral Theses; Facility Planning; *Grade 7; *High School Design; Junior High School Students; *Open Plan Schools; Senior High Schools; Student Attitudes; Teacher Attitudes; *Traditional Schools

ABSTRACT

The author, working with a 4-member teaching team, sought to determine how a group of pupils and their teachers would respond to an open space program proposed for a new senior high school building. A test program was conducted in temporary quarters with an experimental group of 25 randomly selected seventh grade students and a control group of 25 students from the regular junior high school building. The Comprehensive Tests of Basic Skills, administered to both groups, showed no significant differences in cognitive achievement between the groups. An attitude test, drawn up by the teaching team and administered to the experimental group only, showed a high level of favorable student attitude. The teachers found both advantages and disadvantages in the open space arrangement, but that the disadvantages were largely of a nature to respond to corrective measures. Those people involved in planning, implementing, and evaluating the open space program concluded that it warranted expansion into the new building, but that study of the concept should be continued, using additional methods of evaluation. (Author)

NOVA UNIVERSITY COLLEGE AVENUE, FORT LAUDERDALE, FLORIDA 33314 • 305/587-6660

NATIONAL ED.D. PROGRAM FOR EDUCATIONAL LEADERS

AN EVALUATION OF THE EFFECTS OF AN OPEN SPACE PROGRAM ON SELECTED SEVENTH GRADE PUPILS AND THEIR TEACHERS

by

William E. Schwer
Administrative Assistant in Charge of Secondary Education
Pennridge School District, Perkasie, Pennsylvania

Practicum report, submitted in partial fulfillment of the requirements for the degree of Doctor of Education, Nova University

June 1973

TABLE OF CONTENTS

ABSTRACT

The purpose of this practicum was to attempt to determine how a group of pupils and their teachers would respond to an open space program. By means of testing, the attitude and the cognitive achievement of pupils were investigated. The open space teaching team drew up a list of advantages and disadvantages of open space after they had experienced a year of teaching in this type of environment. This was used to evaluate teacher response. Results of the testing show no significant difference in cognitive achievement between students in the experimental and the control groups. Attitudes of students in open space were highly favorable. Teachers experienced mixed reactions.

INTRODUCTION

As a result of overcrowding in the Pennridge secondary schools, a former factory building was purchased. It was decided that an open space program for four sections of seventh grade pupils would be carried on in the building, known as Central Annex.

An experimental group of 25 students in the annex and a control group of 25 students in the regular junior high school building were selected at random for testing purposes. To evaluate cognitive achievement the Comprehensive Tests of Basic Skills were used. No significant differences were found.

To evaluate student attitudes in an open space program the teaching team drew up an attitude test which was given to all students in the annex program. Results showed highly favorable student attitudes.

The reactions of the four teachers involved in the seventh grade open space program were solicited. The teachers found open space to have both advantages and disadvantages, but the disadvantages they enumerated were largely of a nature that would yield to corrective measures.

Other factors besides the open space environment undoubtedly affected both student and teacher reactions. The effect of the

experimental situation itself no doubt played a part in the results of the investigation. Open space should continue to be studied with improved methods of evaluation. As time goes on the newness of the program will no longer influence reactions of teachers and pupils, making studies more reliable.

Those involved in planning and carrying out both the open space program itself and the evaluation of it feel satisfied that it is a sound and worthwhile educational program. They look forward to expanding it in the proposed new senior high school building.

AN EVALUATION OF THE EFFECTS OF AN OPEN SPACE PROGRAM ON SELECTED SEVENTH GRADE PUPILS AND THEIR TEACHERS

by William E. Schwer[1]

OVERVIEW

Background

The Pennridge School District has had three buildings for the education of secondary school students since the opening of a second junior high school building in 1965. All three buidings--the senior high school, South Junior High School, and Central Junior High School--have been overcrowded for the past few years. To alleviate the problem, particularly severe in the senior high building, the Pennridge Board of Education has begun taking the steps necessary to build a second senior high school building. Until it could be ready for occupancy, however, the problem of overcrowding remained.

Fortuitously, a girdle factory, located next to Central Junior High and not far from the senior high school, was for sale. Purchase of this building seemed to be one answer to the immediate overcrowding. Legal procedures were instituted to purchase the factory, and plans were made to determine the type of educational program that would be carried on in it.

[1]Administrative assistant in charge of secondary education, Pennridge School District, Perkasie, Pennsylvania. Pupil population: 7500.

Because of the proximity of the factory to both Central Junior High and the senior high school, it seemed logical to use it to house some students from Central and some from the senior high. It was to be known as Central Annex.

The administrators, teachers, and school board were seriously considering using the open space concept in the planned new senior high school. Central Annex seemed to present the opportunity to "try out" open space. Business education students from the senior high school and several sections of seventh grade students would take part in the program at Central Annex. This paper will deal only with the seventh grade program.

One large room in the former factory was to be used for the seventh grade open space program. The room had been a cutting room and contained approximately 3000 square feet of space. To prepare the room for use as a school, Peabody space dividers were purchased, carpeting and furniture were installed, and the room was painted.

The Central Junior High School faculty played an important part in making plans for the seventh grade annex program. Four teachers, all of whom had had several years of successful teaching experience, were selected to make up the annex teaching team. They were recommended by the principal of Central and department chairmen after

expressing an interest in teaching in the open space environment.

With funds provided by the board of education, this team of four teachers spent three weeks during the summer planning the curriculum for the annex program. In essence, what they tried to do was to articulate their concepts of what an open space program is and how they would like to see it implemented in Central Annex. As part of their planning activities they visited a number of schools where open space is in operation and did wide reading on the subject.

The decision was made by the administration to assign approximately 127 seventh grade students to the annex building. Because this was to be a new program at Pennridge, the number of students was to be limited so that the teaching team would have a good opportunity to get to know their pupils.

The attempt was also made to keep the group fairly homogeneous. Nine sections of seventh grade students were to enter Central Junior High School. Sections A and B were the so-called "top" sections and sections G, H, and J the "bottom" sections. Pupils are assigned to sections on the basis of their test scores on I. Q. tests and on achievement tests, as well as on the basis of their past performance in subject areas as reflected by their report card grades. With this method being followed, the students assigned to sections C, D,

E, and F would be the so-called "average" achievers. These four sections were assigned to the annex for the open space program. The object was to rule out the extremes of very high and very low achievers.

The four teachers chosen for the annex program have already been referred to in this report as the "teaching team," for it was the intention that they would operate in just such a cooperative fashion. One member of the team was elected by the team to be the leader, serving as the chief liaison between the Central Junior High School administration and the annex teachers.

As already noted, the teaching team met for several weeks before the school term began to make extensive plans. They were given a good deal of freedom to build their daily schedules. Every attempt was made by the administrative assistant in charge of secondary education, the principal of Central, and the department chairmen to cooperate with and to assist the team.

Statement of Problem

Many of the parents of students in the Pennridge School District view the program being carried out in the annex as innovative. It does, indeed, represent a different approach to secondary education at Pennridge. Fortunately, very little opposition was voiced; on

the contrary, widespread interest in and support of the program was expressed.

However, the recurrent questions asked by parents and others in the community were: What is being done differently, and how much better is the innovative program than the conventional one?

In an attempt to answer these questions the following problem statement evolved: What effect does open space program have on the attitude toward school of the pupils and what effect on their achievement?

Objectives

The specific objective of this practicum is to evaluate how attitudes and cognitive achievement of a selected group of seventh grade students in the annex open space program compare with those of a selected group of seventh grade students in the main junior high school building, which is a conventional setting.

A secondary, but also important, objective is to seek the reactions of the four teachers comprising the annex teaching team to an open space program.

The administration and the school board felt a keen interest in attempting to determine what contribution this program could make

to education in the Pennridge School District.

SIGNIFICANCE OF STUDY

The concept of open space education and the significance it holds for learning and positive changes in attitudes have received widespread attention. Critics charge the conventional type school with having a negative effect on the child's spirit, spontaniety, and joy in learning, as well as on creativity and sense of self.

Furthermore, detractors say that too many schools are "grim, joyless. . . oppressive and petty. . . intellectually sterile and aesthetically barren. . . lacking in civility. . . ."[2]

It is within this context that open space programs have begun to take root. Open space education seems to hold considerable promise since it implies that a serious re-examination is being made of many of our basic education assumptions. The public usually demands instant success of its schools, but such success is not likely to ensue without concentrated efforts in evaluating the process and the product.

An article in The New York Times Magazine stated that openness

[2]Charles Silverman, Crises in the Classroom, New York: Random House, 1970, p. 10.

provides opportunities for brighter children to assist the less bright, for children to conduct independent study, and for children to progress at their own rate.[3] Open space provides for child-initiated activity; it integrates the curriculum and encourages the teacher to function as a facilitator of the learning process.

This practicum is an attempt to collect information and data about the open space program and its direction in affecting the cognitive skills and the attitudes of students. The significance of the study lies in its relevance to what appears to have occurred between pupils and teachers within an open space educational program.

DEFINITIONS OF TERMS

Attitude. Attitude is defined in this report as the emotional state of an individual as he sees himself in relation to a particular situation or learning activity, and in relation to other people.

Cognitive achievement. Cognitive achievement means the intellectual skills and abilities of pupils in the subject areas. In this study the four subject areas are English, social studies,

[3] Winthrop Griffith, "A Daring Educational Experiment--The One-Room Schoolhouse," The New York Times Magazine, May 30, 1971, 15.

mathematics, and science.

Open space program. Open space program as defined by the educators of the Pennridge School District means the carrying on of education in an open environment where the following techniques, among others, may be employed: team teaching, large group instruction, independent study, individualized instruction, pupil-initiated activities, individual learning packets. Open space eliminates the conventional walls separating classrooms, allowing for greater flexibility of instruction.

Teaching team. In this report teaching team refers to the four teachers who carried on the instruction in Central Annex.

PROCEDURE

Population and Sample

Of the 260 seventh grade pupils enrolled in Pennridge Central Junior High School, 127 were assigned to Central Annex, which housed the open space program. The remaining 133 attended classes entirely in the main junior high school building, a conventional setting.

Of the nine student sections or groups making up the seventh grade, two in the main building were identified as top sections; three groups in the main building were designated as bottom sections. This meant that the remaining four sections of seventh-graders

would be assigned to the annex program. These pupils were considered to be at the middle level of the grouping process.

Since intact class groups were used, a random sample was selected from both groups for this study. Economy, feasibility, and pupil-teacher-counselor morale were considered to be paramount when this sampling technique was used.

Program Description

The four teachers selected for the annex program were to be a team. The team leader would serve as the liaison between the team and the administration. The team teachers met frequently both before the school term opened and during the course of the term for planning, exchanging ideas, and informally evaluating progress.

The pupils were scheduled into the annex for the first nine "mods" of the school day. Mod ten was their lunch period. They then went to the main building, Central Junior High School, for mods 11, 12, 13, and 14 to take their so-called minor subjects--art, music, physical education, home economics and industrial arts. During this time the teaching team was able to hold meetings to develop plans and to discuss problems and ideas.

The curriculum evolved from plans developed by the teaching team during the summer preceding the opening of school. For the

complete record of the curriculum developed by the teaching team, please refer to Appendix A of this report.

A procedure for evaluating skills and attitudes grew out of a series of meetings of the teaching team, the administrative assistant in charge of secondary education, the principal and guidance counselors of Central Junior High School, and the assistant director of Intermediate Unit 22 of the Bucks County Schools. The evaluative instruments will be described in the next section entitled "Research Design."

The annex teaching team developed a series of objectives and goals as they conceived of them for the annex program. The following is a listing of these goals exactly as the teachers articulated them:

I. Why are we doing what we're doing?

   A. A new learning experience is being offered.

   B. An autonomous situation exists for those involved.

   C. New concepts in education are being introduced.

   D. A new effort to improve learning is being made.

   E. New attitudes toward school, subjects, and teachers are being fostered.

   F. Student and teacher self-responsibility is being emphasized.

G. Greater peer reinforcement exists for teachers.

II. What are the goals for teacher and student?

A. Goals for teachers

1. To become more "student oriented."
2. To motivate students in all subject areas.
3. To promote a more energetic attitude toward school.
4. To stimulate learning and new learning situations.
5. To create a "happy" school atmosphere.
6. To increase teacher empathy for student problems.

B. Goals for students

1. To achieve greater self-discipline.
2. To be able to adjust to changing situations.
3. To adjust to greater freedom in a school situation.
4. To experience more interaction with student and teacher.
5. To have more time for studies and special attention to areas of need.
6. To improve responsibility toward learning.
7. To have a better attitude toward school.
8. To develop a better attitude toward authority.
9. To develop a healthy competitive attitude.
10. To become more involved in all aspects of school.
11. To perform with maturity with less forced teacher control.

12. To become more understanding of other students.

13. To have less student absenteeism.

III. Is learning being improved?

A. Learning methods improved through the following:

1. Discovery-inquiry method

2. Critical thinking

3. Logical, productive thinking

4. Convergent-divergent thinking

5. Deductive-inductive reasoning

6. Creativity

B. Methods of a critical thinking system:

1. Analysis

2. Synthesis

3. Evaluation

IV. What is meant by learning?

A. Learning as a process is hard to define.

B. Possibilities

1. Ability to learn how to learn

a. Self-directed study

b. Self-respect

2. Respect for authority

a. Teacher

b. School

c. Subject

3. Learning subject material

Comments about the above listing will be made in the section entitled "Summary and Conclusions."

The room used by the seventh-graders in the annex has already been described as containing approximately 3000 square feet of space. It was painted and carpeted. Peabody room dividers were used whenever the activities to be carried on warranted such partitioning. Furniture was moved about and arranged in the same way; i. e., whenever a particular arrangement was needed or desired, it was done. Those who visited the seventh grade program periodically usually found the furniture arranged differently every time they visited.

Sometimes large groups were instructed simultaneously; at other times individual learning stations were set up, separated by partitions, and independent study was carried on or individual tutoring was given.

The team approach was used for the disciplines of English and social studies and for science and mathematics whenever it was

deemed advisable.

Books and other reference and research materials were gathered into a satellite library in the annex. Because of the closeness of the annex to the main building, there was never any problem in getting whatever library materials would be needed. The same was true for various audio-visual aids and equipment.

The annex teachers, who were free from scheduled classes in the afternoon, frequently permitted students to come back into the annex at that time for individual help. The students were in the main building for their afternoon classes, but whenever they had a scheduled study hall they could request permission to return to the annex to do individual work or to get help. This was also a time when abler students could help other students who were having some sort of difficulty.

RESEARCH DESIGN

To evaluate the open space project, a pre-experimental design, which Campbell and Stanley in their monograph on designs for research describe as a static group comparison,[4] was used.

[4]Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs for Research, Chicago: Rand McNally and Company, 1972, p. 12.

This is a design in which a group has experienced a specified type of treatment and is compared with one which has not had the treatment. In this report, one group is exposed to open space education; another group has no exposure to open space.

It must be noted that, in contrast to a true experimental design, there are in such static group comparisons no formal means of certifying that the groups would have been equivalent if there would have been no special treatment applied to one of them. This points up a need for control of the selection or recruitment of persons making up the groups. The two groups might well have differed anyway, without the occurrence of an open space treatment. Covariance using the I. Q. as a covariate in analyzing the test results in achievement is an attempt to minimize the pre-experiemenal differences known to exist, but which cannot be fully controlled in most cases.

Data Instrumentation and Collection

To attempt to evaluate the open space project two tests were given. An achievement test was given to a random sample of students from the annex and a random sample from the main building. An attitude test that was drawn up by the teaching team was given to all students in the annex program.

The attitude test was carefully developed and written by the four teachers in the annex. It was then submitted to the administrative assistant in charge of secondary education and the principal of Central Junior High School for their approval. Next it was sent to an external evaluator consultant from Intermediate Unit 22 of the Bucks County Office of Education. The consultant, after careful study of the questionnaire, gave his opinion that it was valid and should be used.

The test attempted to uncover several types of attitudes--first, attitude toward peers; second, the attitude of pupils toward school; third, the attitude of pupils toward the annex as open space; and finally, the attitude of the students toward their teachers. The teaching team, the administrators, and the evaluative consultant all felt that the test was well-constructed and, most importantly, that it contained built-in checks. Please refer to Appendix B of this report for a copy of the attitude test.

To measure student achievement the Comprehensive Tests of Basic Skills, California Testing Bureau, were administered. The areas tested are reading, language, arithmetic, and study skills. The reading tests included vocabulary and comprehension; three subtests--mechanics, expression, and spelling--constitute the language section; computation, concepts, and applications are

tested in the arithmetic section; and ability to use reference materials and graphic materials are tested under study skills.

Classroom teachers worked along with curriculum specialists to write the original test items of the CTBS tests. Extensive pretesting was carried on to establish the desired gradients in the levels of difficulty of test items. Validity and reliability determinations follow closely the 1966 APA recommendations for psychological tests. The Bloom taxonomy for the cognitive domain provided a basis for the classification of the objectives, each of which is stated in terms of student behavioral patterns. A complete classification of the objectives for each test is shown in the Test Coordinator's Handbook.

Twenty-five names were drawn at random from students in the main building and 25 drawn at random from students in the annex to take the above achievement test.

The attitude test was administered to all annex students by the external evaluator on April 12, 1973. The achievement tests were given by teachers on May 4, 1973, and the reactions of the teaching team to open space were submitted to the administrative assistant in charge of secondary education on May 10, 1973.

Data Analysis

Results of achievement tests: For the analysis of the achievement tests scores of students in the annex open space group (experimental group) and students in the main building (control group), achievement tests and I. Q. scores were analyzed by the analysis of variance and covariance. The data are presented in Table 1.

TABLE 1

Mean Scores
I. Q. and Achievement

	I. Q.	Arithmetic	Study Skills	Reading	Language
Control Group	95.52	62.92	28.44	45.64	47.28
Experimental Group	110.32	64.60	31.68	58.48	54.60

The mean I. Q. score for the experimental group was 110.32 and the mean for the control group was 95.52. In the analysis of variance of the I. Q. scores it was determined statistically that they were significantly different at the .005 level. The analysis may be found in Table 2.

TABLE 2

Analysis of ANOVA I. Q.

Source of Variation	df	ss	ms	f
Treatments	1	2738	2738	10.17
Within	48	12925.68	269.29	
Total	49	15663.68		

For 1, 48 df the f table value at the .005 level is 8.68 significant beyond the .005 level.

The mean arithmetic score for the experimental group was 64.60; the mean score for the control group was 62.92. Using the I. Q. as a covariate, the analysis of covariance of the arithmetic raw scores was not found to be statistically significant. The data appear in Table 3 below. Although a simple analysis of variance was not carried out, it can be seen that it would not have been statistically significant without using the covariate.

TABLE 3

Analysis of Covariance
Total Raw Scores for Arithmetic

Source of Variation	df	$\leq X^2$	$\leq XY$	$\leq Y^2$
Treatments	1	2738	310.80	35.28
Within	48	12925.68	5729.24	9061.84
Total	49	15663.68	6040.04	9097.12

Note: X = I. Q. Y = Arithmetic Scores

Source of Variance	df	ss	ms	f
Treatments	1	245.65	245.65	1.77
Within	47	6522.38	138.77	
Total	48	6768.03		

The mean study skills score for the experimental group was 31.68; the mean for the control group was 28.44. Using the I. Q. as a covariate, the analysis of covariance of the study skills scores was also found not to be statistically significant. It can be seen that these scores are also not statistically significant using a simple analysis of variance. See Table 4.

TABLE 4

Analysis of Covariance
Total Raw Scores for Study Skills

Source of Variation	$\leqslant df$	$\leqslant X^2$	$\leqslant XY$	$\leqslant Y^2$
Treatments	1	2738	599.40	131.22
Within	48	12925.68	4402.84	3191.60
Total	49	15663.68	5002.24	3322.82

Note: X = I. Q. Y = Study Skills Scores

Source of Variance	df	ss	ms	f
Treatments	1	33.47	33.47	.93
Within	47	1691.87	35.99	
Total	48	1725.34		

The mean reading score for the experimental group was 58.48; the mean for the control group was 45.64. Using the I. Q. as a covariate the analysis of covariance for reading scores was found to be statistically significant at the .05 level. If a simple analysis of variance were performed on the reading scores it would probably be significant beyond the .005 level. See Table 5.

TABLE 5

Analysis of Covariance
Total Raw Scores for Reading

Source of Variation	df	$\leq X^2$	$\leq XY$	$\leq Y^2$
Treatments	1	2738	2375.40	2060.82
Within	48	12925.68	7359.84	6414
Total	49	15663.68	9735.24	8474.82

Note: X = I. Q. Y = Reading Scores

Source of Variance	df	ss	ms	f
Treatments	1	200.30	200.30	4.23
Within	47	2223.90	47.32	
Total	48	2424.20		

The mean language score for the experimental group was 54.60; the mean for the control group was 47.28. Using the I. Q. as a covariate the analysis of covariance for language was not found to be statistically significant. See Table 6. If a simple analysis of variance were performed on the language scores it would probably be significant beyond the .05 level.

TABLE 6

Analysis of Covariance
Total Raw Scores for Language

Source of Variation	df	$\leq X^2$	$\leq XY$	$\leq Y^2$
Treatments	1	2738	1354.20	669.78
Within	48	12925.68	5105.56	4995.04
Total	49	15663.68	6459.76	5664.82

Note: X = I. Q. Y = Language Scores

Source of Variance	df	ss	ms	f
Treatments	1	22.41	22.41	.35
Within	47	2973.38	63.37	
Total	48	3000.79		

Results of attitude test: The Annex Attitude Test questions fall into four main categories. These are: attitudes toward peers, attitudes toward school and learning, attitudes toward the annex as an open space learning environment, and attitudes toward the annex teachers.

The test consists of "test" questions and "check" questions.

The purpose of the "check" questions, which are inverses of the "test" questions, was to improve the validity of the test.

The percentage of favorable responses to the questions was used to determine the results of the test. If 80 to 100% of the answers in a particular category are favorable, the attitude is rated as "excellent." In the same manner, 60 to 79% is considered "good"; 40 to 59% is considered "fair"; and 20 to 39% is rated "poor." The response percentages are listed in Table 7.

TABLE 7

Summary of Attitudes

Category of Attitude	Excellent	Good	Fair	Poor
Toward Peers	72%	14%	14%	0%
Toward School	40%	60%	0%	0%
Toward Open Space	33%	45%	0%	22%
Toward Teachers	55%	36%	0%	9%
Total	49%	41%	2%	3%

Reactions of teachers to open space: The administrative staff and the school board were most interested in the reactions of the teaching team to working in an open space environment. Accordingly, as the school term drew to a close, the four teachers involved were asked to list what they honestly felt to be the advantages and the disadvantages of open space as they had experienced it in the annex program.

The following are the advantages exactly as listed by the teaching team:

1. Flexibility in the utilization of available time and space.
2. Ability to form large and small instruction groups.
3. Greater opportunity for supervised independent study.
4. Use of team teaching techniques enables a greater correlation among subject fields.
5. Ability to give extra time in afternoon to help students.
6. Mutual support by other members of the team as far as student relationships are concerned.
7. Free time at the same time enables team members to discuss problems which arise during the day and possible solutions.
8. Use of help in typing materials.
9. A more cheerful atmosphere, more conducive to learning.

The disadvantages exactly as listed by the teachers are:

1. Noise.

2. Teacher difficulty in having relaxed classroom atmosphere because of the proximity of other students and teachers.

3. Over-exposure to students.

4. Need for totally uniform discipline.

5. The fact that more freedom for students (of this age) involves the existence of more rules.

6. To properly make use of the open space principle, more space is needed. (Too many students.)

7. Friction between the annex and the main building.

8. Teacher cannot be himself as far as style is concerned.

9. Need for paraprofessional help.

Comment about the above listings will be made in the section entitled "Summary and Conclusions" below.

SUMMARY AND CONCLUSIONS

To summarize, the following key points can be made:

1. A decision was made to house 127 seventh grade pupils in an open space program in the annex building. These students would be taught by a team of four teachers.

2. The children selected for the annex comprised four sections of roughly "homogeneous" students, in terms of achievement.

3. The annex group spent nine "mods" of the day at the

annex, and then went to the main building for their "special" subjects--art, music, physical education, and home economics or industrial arts.

4. An evaluative procedure was developed by the teaching team and members of the administrative staff, along with the assistant director of Intermediate Unit 22 of the Bucks County Schools.

5. The testing process was accomplished in two steps. First, the Comprehensive Tests of Basic Skills were given to two groups of 25 pupils each--one group from the main building, the other group from the annex. Both groups were randomly selected. Secondly, the annex teaching team devised an attitude test to be administered to all pupils at the annex.

6. The results of the CTBS are about as could be anticipated. The variance in reading scores is apparently caused by the fact that the I. Q. scores of the children in the annex program averaged 15 points higher than those of the pupils in the main building.

7. The results of the attitude questionnaire seem to show that the open space program was well received by students. Their attitudes, in the four areas tested, were largely positive.

8. Teachers found open space to have both advantages and

disadvantages. The disadvantages do not seem to be insurmountable.

It can be readily observed that except for achievement in reading, no significant results in the area of cognitive achievement were apparent. This is neither too surprising nor alarming, since comparative studies of alternatives in education usually end in a finding of "no significant difference."[5]

The fact that reading achievement was superior in the open space treatment may be partially attributed to the pre-experimental differences in the ability of the students to handle academic instruction, as reflected in their I. Q. scores. The informality of the learning atmosphere and the independence encouraged in an open space environment may have been the catalyst that caused the experimental group to use better their capacity to learn from the printed word. The results might also be attributed to the heightened interest generated by self-direction and independent study, both prevalent in the open space program.

Of great interest is the impact of the open space program on attitudes. This study shows that the attitudes of students in the open space program were quite positive. However, the "halo" effect

[5]PDK National Study Committee on Evaluation, Educational Evaluation and Decision Making, Itasca, Illinois: F. E. Peacock Publishers, Inc., 1971, p. 7.

could well have played some part in these results. School administrators everywhere are aware that when students are placed in a special treatment group they may regard themselves as being indeed "special." This could account for their positive attitude toward the situation. Teachers may also be affected by this type of situation, consciously or unconsciously "knowing" that favorable reactions are expected. The novelty of the program probably also played a part in the overall enthusiasm of both students and teachers.

The advantages and disadvantages of open space as viewed by the teaching team deserve comment. It is interesting to note that three of the advantages listed (numbers 2, 3, and 4: page 24) seem to fulfill, at least to some extent, some of the goals for teachers that the team had formulated, notably goals 2 and 4: page 11. The advantage numbered 6 (mutual support by teachers in student relationships) meets the first goal listed by the teachers (page 11). The last item listed under advantages meets goal number 5 (page 11).

The disadvantages will be dealt with one by one:

1. Noise: The only acoustical treatment given to the room was the installation of floor carpeting. In the planned new senior high school building provisions will be made for acoustical treatment on the walls and ceilings as well as the floor, greatly lessening this

problem. Some of the noise in the annex was also due to fans which ran constantly over the heads of the pupils and teachers. During the summer a study will be made of ways to alleviate this condition.

2. Difficulty in having relaxed atmosphere because of proximity of other students and teachers: While in the planning stages it was felt that 3000 square feet of space would be adequate for 127 students and four teachers, this did not prove to be the case. The situation is presently being remedied by the addition of two new open space stations in an area formerly used for storage. This will add approximately fifty percent to the available space.

3. Over-exposure to students: Interestingly, at the same time that this was listed as a disadvantage, the teachers listed "ability to give extra time in afternoon to help students" as one of the advantages of the program. The afternoon was to be "free" for the teaching team so that they could meet together to discuss problems and make plans, but they allowed students to return to the annex at that time for individual help. This was fine for the students, but it evidently resulted in mixed feelings for the teachers. They conscientiously wanted to help their students, but at the same time suffered understandable weariness at seeing the same pupils all day.

4. Need for totally uniform discipline: This problem arises even in a conventional school building. Conscientious teachers have long complained that standards are hard to maintain if other teachers are "lax" in discipline. It is probably quite true that it is to every teacher's advantage if there is consistency in disciplinary standards.

5. More freedom for students involves more rules: The fact of more freedom presents an opportunity for maturing on the part of students. They must realize that freedom requires responsibility. They should benefit from an open environment by developing more self-control and self-discipline. Goals for students 1, 3, and 11: page 11, articulate these very ideas. This is not really a disadvantage at all, but rather a great opportunity for learning. It would be interesting to investigate further into why the teachers listed this as a disadvantage. Perhaps rules were being used where responsibility should have been fostered.

6. The problem of space: See number 2 above.

7. Friction between buildings: The friction referred to occurred among teachers rather than students. There is always some rivalry among students in different buildings, but this was not a significant problem. The problem arose among the teachers

because some of those in the main building apparently looked at the schedules of the teachers in the annex and decided the annex teachers had too much free time. This is somewhat ironical in the light of the feeling of the annex teachers that they never got away from their students. The fact is, of course, that the annex team had no more free time than the teachers in the main building. Jealousy and resentment among professionals are always to be regretted but may be inevitable, human nature being as it is.

8. Teacher cannot be himself in style: No doubt a certain amount of self-consciousness was inevitable on the part of the annex teachers, all of whom had taught in conventional classrooms before and were unused to being so close to other students and teachers, not to mention the great many visitors who came into the annex. Proximity to others should not really inhibit anyone from using his own teaching style. As teachers become more accustomed to being in a "fishbowl", and become more self-confident, this problem should eliminate itself.

9. Need for paraprofessional help: Teachers throughout the district are making this same plea. A volunteer paraprofessional program is in fact underway in the Pennridge schools, so that this need will undoubtedly be met in the near future.

The data collected in this study indicate that the achievement of students in an open space environment is at least as good as the achievement of students in a conventional setting. The attitudes of students in open space are definitely positive. In fact, many of the goals listed by the teachers as desirable ones for students were apparently met. (See "Goals for students": page 11.) While, as already noted, some of this good effect may be due both to the novelty of the program and to the students' feeling of being an elite group, it is not necessarily inevitable that favorable attitudes will lessen appreciably as open space becomes more the general practice in the future.

Teachers have mixed reactions to open space, but the advantages they acknowledge seem to outweigh the disadvantages. It would no doubt be helpful for the teachers involved to review the goals they listed at the onset of the program, to see what revisions, if any, they would make.

RECOMMENDATIONS FOR FUTURE RESEARCH

Student achievement and student and teacher reactions to open space should continue to be tested in ensuing school years. It will then be possible to make comparisons with the findings of this study. Students should be given the opportunity to work along with their teachers to develop student goals.

It would seem to be helpful and relevant to the study of student attitudes if a comparison were made between the attitudes of students in an open space program and the attitudes of students in a conventional setting. To do this, control and experimental groups would be set up and would be given the same test. Such a test as the Tennessee Self Concept Scale,[6] for example, could be used. Another is the School Interest Inventory.[7]

Quite possibly a seventh grade group is not the best one to use in studying attitudes. The first year in a secondary school presents many problems of adjustment, such as meeting many new students, adjusting to more than one teacher, learning one's way around a different building, to name a few. This is also a time when many children are undergoing physiological and emotional changes and growth, both of which can affect their personalities and behavior. Effects of a school setting on attitudes might be more reliably studied at some other grade level, perhaps grade eleven.

The study of current literature in the field of evaluation yields many ideas for methods of evaluating the cognitive achievement of students. One research design of promise is the Solomon

[6]Published by Counselor Recordings and Tests, Nashville, Tennessee.

[7]Published by Houghton Mifflin Company, Boston.

Four-Group Design as described by Stanley and Campbell.[8] With this design, two control groups and two experimental groups are randomly selected. One experimental and one control group are given both a pre-test and a post-test; the other two groups take a post-test only. Validity, both external and internal, is high in this research design.

Of further help in determining whether or not open space makes a difference, those seventh grade students who were in the annex program this past school year should be the subjects of careful follow-up. Several questions come to mind: How will they perform in the eighth grade in the conventional program? Will their good attitudes, as reflected in the study of attitudes, carry over next year? Will they adjust well to a change in setting next year? Will they retain habits of independent study and self-discipline?

There is no question that studies should continue on the effects of open space. As the novelty of the setting wears off in future years, test results should be more reliable. Teachers and students should be less self-conscious and less likely to regard themselves as "guinea pigs" or special in some way.

[8]Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs for Research, Chicago: Rand McNally and Company, 1972, p. 24.

In the opinion of the administrators most closely concerned with the program at the annex, the four teachers involved did an excellent job. They displayed great enthusiasm and dedication, along with sincere concern for their students. On the whole, in the opinion of those who observed the classes, the students gave every indication of enjoying school and of profiting from it. These are, of course, subjective observations and conclusions; but they are a source of satisfaction to those concerned.

APPENDIX A

Open Space Curriculum

The following material is reproduced exactly as it was developed by the four teachers in the open space program.

ENGLISH

I. Introduction to Grammar

A. What is it? Grammar produces the sentences of a language. It is the basis and structure of language, and language separates man from beast.

B. Why study it? We study grammar so that we may understand and be understood--to be able to communicate effectively.

C. How to begin the study of grammar? We should study grammar to be able to communicate with each other--to understand and be understood.

(A few games may be used here, to show the importance of communication. A student would be given an idea to communicate to the class, but would be restricted to non-verbal techniques. The "idea" would deal with prehistoric man, under study in history at this time.)

II. Syntax--study of the sentence

General Comments:

We intend to group certain concepts that the book presents, but not in the order that the book presents them. It is felt that this approach will solve some of the questions that arise when the Roberts is followed in a page-by-page manner.

A. Kinds of sentences

1. Statement
2. Question
3. Exclamation
4. Request or command

B. Structural forms

1. Kernal sentence
2. Transform

C. Grammatical rules

1. S = NP + VP
2. Noun phrase rules
   a. NP = determiner + noun (D + N); proper noun (P.N.); personal pronoun (P.P.N.); indefinite pronoun (in. P.N.)
   b. Determiner = article
   c. Article = definite (the); nondefinite (a or an, some, null)
   d. Common noun - count (plus plural); noncount

3. Verb phrase rules

   a. VP = auxiliary + be + noun phrase, adjective, adverbial of place; auxiliary + verbal

   b. Auxiliary = tense + (M) + (have + part) + (be + ing)

   c. Tense = past or present (form, not time)

   d. Verbal = VI (Verb Intransitive), VT (Verb Transitive), VS (Verb Seem) + adjective, VB (Verb Become) + NP or adjective, Verb-mid + NP

   e. Modal - can, could, may, might, shall, should, will, would, must (ought to, used to)

   f. Particles - words that combine with VT and VI to alter meaning

4. Transformations

   a. Passives

   b. Relative clause

   c. Deletion transform: delete relative pronoun + tense + be

   d. Noun modifiers: adjective, adverbial of place, "ing" verbs, participles

   e. Possessive

   f. Adverbials as modifiers: adverb of place, adverb of manner

   g. Insert and matrix sentences

D. Morphology

1. Inflectional morphemes--plural, possessive, comparative, superlative, past, present, ing, participle

2. Derivational morphemes--noun-making: ment, ness, ence,

cy, ful - 2
verb-making: en, be (un, re)
adj-making: ly - 2, ful - 1, less, y, en, able, ent, ic (in, im, un)
adv-making: ly - 1

3. Morpheme "ic" change stress

III. Literature (from Roberts)

General Comments:

The literature in Roberts lends itself to a three-section division. We will teach it in these three blocks.

A. Man's Reflection on Man

1. Gulliver in Lilliput (brief reference to satire)

a. Composition--"What accommodations would have to be made if, one morning, you woke to find everyone was seven feet tall?"

2. Steamboatmen

3. Stranger Within Our Gates

4. The Burning of Njal

B. Man's Achievement of Success

1. The Drawing of the Sword

2. The Summit

3. The Labors of Hercules

C. Man's Obedience to God

1. Noah and the Ark

IV. Poetry (from Roberts)

General Comment:

The poetry selections can also be blocked for more effective learning.

A. Reflections of nature (deal with sense impressions)
   1. "Velvet Shoes"
   2. "Echoing Green"
   3. "Mending Wall"
   4. "Spring is Like a Perhaps Hand"
   5. "Loveliest of Trees"
   6. "Fear No More the Heat of the Sun"
   7. "Cape Ann"

B. War and military
   1. "Sir Joseph's Song"
   2. "St. Crispin's Day"
   3. "The Man He Killed"
   4. "Dule Et Decorum Est"
   5. "Soldier, Rest"

C. Sense impressions
   1. "The Walrus and the Carpenter"
   2. "The Height of the Ridiculous"
   3. "Exile"

D. Man's view of himself
   1. "Warty Bliggens"

V. Composition

General Comments:

A diagnostic "test" will be given to check pupil's knowledge. Brief reviews will be individually grouped and worked out (one leader--advanced--per group) until all class is at the same level. We will progress from here.

A. Mechanics of Writing

1. Capitalization: proper nouns and adjectives, titles, book titles, names on maps and calendars

2. Punctuation

   a. Apostrophe: possessive, contractions, plural of numbers and signs

   b. Period: end punctuation and abbreviations

   c. Comma: series, dates, addresses, direct address, introductory words, before conjunctions in compound sentences, with quotations.

   d. Colon: in time (8:00)

   e. Exclamation point: after statements of strong feeling

   f. Hyphen: to divide a word at the end of the line

   g. Underline: major works, book titles, newspaper, magazines, plays, movies, television series, long poems, trains, operas

   h. Quotation marks: small works, poems, newspaper and magazine articles, chapters from books, song titles, segment of television series

3. Errors in structure

   a. Avoid fragments and run-on sentences

4. Paragraphing

   a. Topic sentence

   b. Develop single paragraph from strong topic

   c. Develop into several paragraphs

   d. See short story section

5. Letter Writing

   a. Friendly letter--proper form

   b. Content is as important as form

   c. In conjunction with science and history, we will write "Letters to the Editor" on subjects relating to the work.

6. Reports

   a. Discourage plagiarism

   b. Multiple sources

   c. Variety of reports throughout the year

7. Outlining

   a. Orderly list of most important information

   b. Teach form--complete to six levels.

   c. Outlines may be required for oral presentations.

   d. Outline of history or science reading assignments.

8. Encourage creative writing whenever and wherever possible.

9. Cryptology and decoding, also origins of alphabet, in correlation with study of Egypt in social studies.

10. We will be doing a scene from a tomb, including symbols and figures. (6' - 8' X 4' - 5' tomb writing)

VI. Spelling - Vocabulary

General Comments:

The above two terms are to be considered synonymous, the meaning and use of the word to be included in its correct spelling. Weekly lists from the science, math, and social studies departments will compose the vocabulary.

A. Vocabulary

1. Give brief, diagnostic test to find levels of competence.
2. Tie in with other areas of student work.
3. Study in relation to prefixes, roots, suffixes
   a. Science lists of prefixes needed to be studied will be injected here
4. Stress use of words in meaningful sentences.
5. Stress words in context.

B. Infiltration of French, German, Latin words into the language through the early conquests of England.

VII. Literature

General Comments:

The object of this series of literature, in addition to the basic background and principles, is to involve the

students in the enjoyment and appreciation of reading.

A. Short story

1. Introduce with Poe's definition of a short story.

2. Elements of a short story--four short stories will be used as examples of the various elements.

   a. Plot - The Tell Tale Heart - Poe

   b. Setting - The Sire de Maletroit's Door - Stevenson

   c. Character - Ricki-Tikki-Taoi - Kipling

3. Relate each story to Poe's theory, to check applicability of theory to story.

4. Class projects--for the most part this work will be done in groups.

   a. On an overhead projector, show a paragraph description of a character. Have the class find the most descriptive words--show as adjs.

   b. Delete adjectives--dullness of paragraph should show importance of adjectives.

   c. As individual assignments, each student will develop the description of a classmate. This assignment will involve three rewritings. The first will be a very basic description. Each draft will be based on the preceding one, and finally all three drafts will be compared, so that students can see their progress.

5. Group projects (four to a group)

   a. Make a filmstrip of a short story.

   b. Stage a short story for closed circuit TV.

c. Write an original short story.

d. Using two short stories, analyze each one according to plot, setting, characters, and theme.

e. Develop a character through three situations in which you show his personality (oral or written).

f. As an oral presentation, characterize one historical figure you have studied this year.

B. Mythology

General Comments:

English class will be studying mythology as history class covers Crete, Greece, and Rome. Correlating activities will include tracing trails of trade routes (sea and land), outdoor theater models, skits, class oracle, The Iliad, trial of Brutus and other conspirators, plus reports, outside reading.

1. Began as a result of need to explain natural phenomena. The people attributed the unexplainable to gods and goddesses they believed lived in the heavens.

   a. Discuss people's need for myths.

   b. Analysis of myths as a form of religion.

   c. Similarities between Greek and Roman mythological characters.

   d. Greek and Roman legends to be studied.

      (1) Natural phenomena

         (a) Echo and Narcissus

(b) Ceres and Persephone

(c) Arachne

(2) People's Need for Hope

(a) Pandora's Box

(b) Prometheus

(3) General

(a) Rivaling the gods: Daedalus and Icarus; Midas and the Golden Touch

(b) Ulysses and Circe (record)

(c) Cupid and Psyche

(4) The Iliad

General Comments:

Since the Odyssey is taught in tenth grade, we decided to deal with the war itself, and historical aspects of Troy.

(a) Background of Paris, his mother's dream, Aphrodite's promise, his abduction of Helen.

(b) Portray the major characters before beginning text

(c) In this section we are using individual work to study the minor characters. The abler students will research major characters, in addition to various philosophies.

(d) Volunteer committee will study interrelationships of various characters, to be presented to class.

C. Poetry

General Comments:

Poetry should be taught for enjoyment at this level. Imagery and sense impressions should be stressed, and the mechanics minimized.

a. Types

(1) Narrative (story poem)

(a) "Paul Revere's Ride"

(b) "Annabel Lee"

(c) "The Pied Piper of Hamelin"

(2) Lyric

(a) "The Runaway"

(b) "On the Grasshopper and Cricket"

(c) "Ring Out, Wild Bells"

(d) "When I Have Fears"

(3) Light Verse

(a) Selections of Ogden Nash

(b) "The Python"

(c) Limericks

(4) Free Verse - Blank Verse

(a) "Sonic Boom"

(b) "Catalogue"

(c) "Why Nobody Pets the Lion at the Zoo"

(d) "Ounce"

(5) Oriental Poesy

(a) Visual, sensual poetry that is easy for students to create.

(1) Haiku

(2) Tanka

(3) Cinquain

(4) Sijo

(6) Grooks

(a) Began as coded messages and defiant verses to Danes during Nazi occupation.

(b) Form

(1) Short, humorous, meaningful

(2) May rhyme

(7) Diamante

(a) Strict form

(b) Poem will be diamond-shaped at conclusion.

b. Interpretation

(1) Limited, by Carl Sandburg

(a) Analysis of poem at various levels to show importance of reading between the lines and drawing conclusions.

(b) Three level study guide: literal, interpretive, abstract concepts.

c. Satire as a literary form

(1) Defined human vices as ridiculous or silly

(2) Parody as a part of satire

(3) Comparison of satire and parody

(a) "Casey at the Bat" (satire)

(b) "Vogel at the Line" (parody)

(4) Subtlety of satire

(a) Mark Antony's speech

(b) Parts of Animal Farm

D. Biography

General Comments:

The purpose of this unit is to stress human achievement in overcoming great difficulties--the facing of problems yesterday, today, and tomorrow.

1. Discussion

a. Ethan Allen, Helen Keller, Matthew Henson

2. A speaker exemplifying one who has overcome a handicap.

E. Plays

1. Committee work including the making of backdrops, and taking responsibility for essential props.

2. Delving into the plays themselves.

3. Writing original plays.

4. Acting out plays in class.

F. Novel

General Comments:

As a class, we intend to read the novel, Animal Farm, as an example of Communism's subtle takeover technique. We will suggest other related novels to students who wish to read on largely on their own. If time permits, we will read a second novel.

1. Brief review of satire (Correlate with history class, which will be studying Communism.)
2. Study of the novel
   a. Comparison (1984, Penguin Island)
   b. Character types
   c. Effect of propaganda on various types
   d. A rewriting of "Beasts of England" into something more appropriate
   e. Single animal analysis
   f. Final project
      (1) Writing a satire on pollution (correlation with science class)

MATHEMATICS

This curriculum plan describes the chief aspects of mathematics instruction at the Central Annex. In particular, scheduling plans, instructional grouping, sectioning, and the course of study are outlined.

The course of study is based on Modern School Mathematics: Structure and Method by Dolciani and others. The textbook provides an assignment guide with a "minimum," an "average," and a "maximum" course. The "average" course is the one which will be followed. The "Spiral" approach is one of the finest features of the Dolciani method and the teacher plans to take full advantage of it.

The 60-page Teacher's Manual is full of useful advice and will be referred to throughout the year. The textbook has an introductory motivating chapter which the students will read on their first day of class.

The book also has an excellent glossary of terms. The definitions are precise and concise. Students will be required to become very familiar with the glossary terms. Three chapters on geometry provide a change of pace, being interspersed among chapters dealing with numbers.

I. Instructional Grouping and Scheduling Plans

Instruction is planned at four different grouping levels.

A. Large Group Instruction : Two sections will be combined for "lectures" once every three days (approximately). The lectures will be followed by a Q-A and worksheet period. Major tests will be given to all four sections at once.

Objectives:

1. To increase the uniformity of course content.
2. To increase the uniformity of testing and grading.
3. To increase the efficiency of teaching.
4. To expose students to the experience of large-group instruction.

B. Section Work: Individual sections will discuss the lecture material in desired detail and complete their worksheets. Oral exercises will follow; then students will carry on small-group work.

Objectives:

1. To assure an understanding of the basic ideas presented in the lectures.
2. To provide a more traditional classroom atmosphere occasionally.

C. Small Group Work: Small groups of about six students each will begin work on the day's assignment. At times, especially when reviewing for a test, the groups will compete with one another for extra credit.

Objectives:

1. To ensure that all students understand their assignments.
2. To provide an opportunity for synergistic

cooperation within a small "task force."

3. To utilize the ability and drive of abler students to contribute to the growth of the less able.

4. To provide an opportunity for healthy competition.

C. Individual Tutoring: Students requiring "intensive care" will receive personal tutoring from time to time, as scheduling permits. This is a very important part of our program.

II. Sectioning

The students have been divided into four sections, roughly homogeneous, or more accurately, balanced. It is hoped that children with less ability and poorer work habits will benefit from being with more capable classmates.

III. Course of Study

Chapter I - Sets and Numbers

General Comments:

Before beginning the work of this chapter, a diagnostic test of arithmetic skills should be administered. Pages 2 and 3 of the textbook contain suitable test problems. Speed and accuracy should both be evaluated. Section work should always open with a two to three minute quiz to ascertain student progress.

The topic of sets is extremely important since these ideas are

the foundation of all logical thought. Care should be taken that all mathematical symbols are correctly read and communicated. Venn diagrams are a very handy tool and deserve full treatment. The English department should correlate with mathematics in teaching precision of language.

Objectives:

1. To review sets and their uses as well as operations on sets.
2. To emphasize the importance of precision when communicating mathematical concepts.
3. To weed out misunderstandings about sets and operations on them.

Large Group Meetings: 3 LGM in the course of eight days

1. Sets and their uses
2. Operations on sets
3. Test on Chapter I

Chapter II - Properties of Addition and Subtraction

General Comments:

Thorough understanding of the ideas presented in this chapter will contribute greatly to clarity of reasoning. The structural aspects of mathematical systems should be stressed: a well-defined set; the properties of a set; well-defined operations on the set; properties of the operations on the set.

Objectives:

1. To define, discuss, and utilize a few basic properties of the set of whole numbers and of their addition and subtraction.
2. To focus attention on understanding by means of studying those properties.
3. To discuss sentences about numbers.
4. To introduce the idea of functions.
5. To label the parts of computations for addition and subtraction.
6. To define, discuss, and work with variables.

Large Group Meetings: 3 LGM in the course of 11 days

1. Using addition.
2. Using addition and subtraction.
3. Test on Chapter 2.

Chapter III - Properties of Multiplication and Division In the Set of Whole Numbers

General Comments:

See Chapter II

Objectives:

See Chapter II

Large Group Meetings: 4 LGM in the course of 13 days

1. Test of arithmetic skills; Using multiplication and division

2. Using addition, subtraction, multiplication, and division
3. Test on Chapter 3.
4. Cumulative test on Chapters 1 to 3.

Chapter IV - Numbers and Numerals

General Comments:

The topic of numeration systems creates interest and gives students a positive attitude towards mathematics. It also provides an opportunity to familiarize students with the mathematics section of the library. Team teaching can be arranged with the social studies teacher.

Objectives:

1. To present the derivation of our positional system through historical development and through comparison of non-positional systems.
2. To define exponential notation.
3. To give students a better understanding of the decimal numeration system through introduction to other numeration systems and bases.

Large Group Meetings: 3 LGM in the course of 16 days

1. Ancient numeral systems and exponents
2. Place-value systems of numeration

3. Test on Chapter 4

Chapter V - Algorithms of Arithmetic

General Comments:

A long-felt shortcoming of the "new" mathematics has been the neglect of computational skill. Chapter 5 helps to solve this problem by both showing why arithmetic procedures work and providing well-designed sets of problems to help develop computational speed and accuracy.

Objectives:

1. To give students an understanding of why the basic arithmetic operations work.
2. To present in simple terms through easily understandable examples how computers can be programmed to perform algorithms.
3. To facilitate understanding of computation in base ten through comparisons with computations in other bases.
4. To provide problems to help develop computational speed and accuracy.

Large Group Meetings: 4 LGM in the course of 12 days

1. Techniques of addition and subtraction
2. Techniques of multiplication and division
3. Test on Chapter 5

4. Review test of arithmetic skills

Chapter VI - Sets and Geometry

General Comments:

This chapter may be taught at the end of the year, along with the two other chapters on geometry. Students must be given a good understanding of what figures really are, i. e., models of reality conceived only in the mind. The science teacher may correlate at this point.

Objectives:

1. To introduce students to the basic geometric figures that can be discussed without introducing measurement.
2. To develop an appreciation of geometry in our daily life.

Large Group Meetings: 4 meetings in the course of 12 days

1. Figures in space
2. Intersections of lines and planes
3. Test on Chapter 6
4. Cumulative test

Chapter VII - Number Theory

General Comments:

This chapter provides a good opportunity for introducing students to the idea of a proof, if you wish to do it at this time. Proofs

can be shown of divisibility rules, and of sums and products of odd and even numbers. It can be pointed out that there is a difference between conjecture and proof. Students should be taught to distinguish between GCF and LCM.

Objective:

1. To examine the elementary concepts of number theory including divisibility, factors, prime and component numbers, complete factorization, greatest common factor, Least Common Multiple, and relatively prime numbers.

Large Group Meetings: 3 LGM in the course of 11 days

1. Divisibility
2. Multiples and factors
3. Test on Chapter 7

Chapter VIII -- Line and Angle Relationships

General Comments:

An early familiarity with basic concepts of geometric space is the aim of this chapter. Visual models, homemade or other, can be used. Students should understand the non-standard nature of symbols used. The English department can correlate.

Objectives:

1. To achieve early familiarity with basic concepts of geometric space through the unifying notion of sets.

2. To acquaint students with the mathematical ideas inherent in geometric figures by appealing to their intuition and visual perception.

Large Group Meetings: 4 IGM in the course of 15 days

1. Days and segments
2. Half-planes and angles
3. Test on Chapter 8
4. Cumulative test on Chapters 7 and 8

Chapter IX - Coordinate Systems on a Line

General Comments:

This presents the very important process of setting up a correspondence between numbers and points of a line. The science department may correlate with the use of experiment charts.

Objectives:

1. To provide students with a clear look at the process of setting up a correspondence between numbers and points of a line.
2. To study visual representations of number operations on a line.
3. To teach students the use of coordinates in problem-solving.
4. To extend the above notions to fractional coordinates.

Large Group Meetings: 2 meetings in the course of 15 days

1. Coordinate systems on a line
2. Test on Chapter 9

Chapter X - Fractions and Rational Numbers

General Comments:

This chapter, in addition to its obvious practical value, is important for focusing attention on the structure of mathematical systems. Comparison of the laws obeyed by this set with those that hold true for the set of whole numbers should result in a better understanding of the structure of both.

Objectives:

1. To study the basic laws of rational numbers.
2. To master the techniques of simplifying fractions.
3. To learn the techniques and operations with rational numbers.
4. To increase understanding of the basic structure of mathematical systems.

Large Group Meetings: 3 meetings in the course of 16 days

1. Enlarging the set of numbers
2. Operations with rational numbers
3. Test on Chapter 10

Chapter XI - Decimals for Rational Numbers

General Comments:

Intensive work with place value charts is highly recommended. This work provides another opportunity to emphasize the distinction between numbers and numerals.

Objectives:

1. To bring about understanding of decimal numeration for rational numbers as an extension of decimal numeration for whole numbers.
2. To establish competence in operating with decimal notation.
3. To provide the vehicle for an economical treatment of topics in measurement.

Large Group Meetings: 4 meetings in the course of 14 days

1. Decimals in addition and subtraction
2. Decimals in multiplication and division
3. Test on Chapter 11
4. Cumulative test on Chapters 9, 10, and 11

Chapter XII - Measurement and Geometry

General Comments:

In this chapter the treatment of geometric concepts is still at the intuitive, practical level. Linear and two-dimensional measures are emphasized; little attention is given to measurement of regions in space.

Objectives:

1. To review the idea and system of measure.
2. To provide experience in measuring segments, angles, and regions.
3. To introduce proper thought processes for converting from one unit of measure to another.

Large Group Meetings: 3 meetings in the course of 17 days

1. Measuring segments and angles
2. Measuring regions in a plane
3. Test on Chapter 12

Chapter XIII - Percentage and Statistics

General Comments:

Percentages are introduced as special cases of ratios, which is good pedagogy. The chapter offers excellent opportunities for estimating.

Objectives:

1. To define, explain, and work with ratios and proportions.
2. To study per cent and its applications in depth.
3. To provide experience in elementary statistics, preparing and interpreting various types of graphs.

Large Group Meetings: 5 meetings in the course of 14 days

1. Ratio
2. Application of percents
3. Statistics
4. Test on Chapter 13
5. Cumulative test

SCIENCE

Curriculum

I. Introduction to Science

A. Superstition and Fact (correlation with social studies)

B. Scientific Method--demonstrations showing use of logical thought

C. Black Box Experiment--using fact and logic to make discoveries

II. Science: Past, Present, Future

A. Past--Fossils (correlations with English and social studies)

1. How fossils are formed
2. The value of fossils
3. Fossil experiment--students will make their own fossils. Density of petrified wood.
4. Field trip.

B. Present

1. Discussion on the problems science helps to solve.

2. Reading--Air and Water Pollution (correlate with English).
3. Projects and reports on ecology

C. Future
1. Man in an ever-changing world
2. Projection: What will man look like and be like in the future? (Correlate with social studies)

III. Biology, the Study of Life
A. Living and non-living substances
1. What is the difference?
2. Discussion and demonstration
B. Tools used to study life--microscope
1. History of the microscope
2. Structure and function of the microscope
3. Use of the microscope (correlate with math)
4. Observation of simple substances
5. Mounting slides

IV. Protozoans--simple one-celled plants and animals
A. What is a protozoan?
B. Types of Protozoans
C. Microscopic study of life cycles of protozoans (correlate with math in experiment involving charts and graphs).

V. Simple Multi-Cellular Animals--Invertebrates

A. Porifera--pore-bearing organisms

1. Microscope study of porifera

2. Value in ecology

B. Coelenterates--hollow-bodied organisms

1. Live study of hydra

2. Value in ecology

C. Flativoims

1. Planaria--live study of trophisms

2. Regeneration--experiment

3. Tapeworm--life cycle

4. Liverfluke

5. Economic value of this group

VI. More Complex Invertebrates

A. Mollusks--soft-bodied organisms

1. Squid and octopus

2. Clams

a. External study

b. Internal study--dissection

3. Production of pearls

4. Economic value

B. Echinoderms--spiny-skinned organisms

1. Starfish--structure and movement
2. Sea cucumber
3. Story of the sand dollar

C. Annelids--segmented worms

1. Earthworms
   a. External study--advantages for environment
   b. Internal study--dissection--organs and systems
   c. Economic and ecological value

D. Arthropods

1. Insects--structures
   a. Great adaptability
   b. Locomotion
   c. Means of protection
   d. Insecticides--DDT--debate on its use
2. Arachnids--structure
   a. Spinning of webs-spiders
   b. Scorpions
   c. Horseshoe crab
3. Centipedes--structure and food-getting
4. Millipedes--structure and food-getting
5. Crustaceans--structure
   a. Live study of the crayfish
   b. Lobster--"Oddball of the Ocean"

c. Crabs

6. Economic and ecological value

VII. Vertebrates

A. Fishes

1. Various species and their adaptions

2. External structure--adaptions for life in water

3. Internal study--dissection--organs and systems

4. Economic and ecological value

B. Amphibians--structure

1. "Double-life" organisms

2. Salamanders and newts

3. Toads and frogs--comparison

4. Frogs

a. External study--land and water

b. Internal study--dissection and filmloops

c. Comparison of frog to man

C. Reptiles--structure

1. Age of Reptiles--dinosaurs

2. Alligators and crocodiles--comparison

3. Snakes

a. Superstitions

b. Kinds

c. Poisonous and non-poisonous--comparison

d. Characteristics

e. Food-getting

f. Types of reproduction

4. Turtles and tortoises

a. Comparison

D. Birds

1. Pennsylvania birds

2. Bird calls

3. Characteristics

4. Reproduction

E. Mammals

1. Characteristics

2. Various orders

3. Primates

4. Man

VIII. Reproduction

A. Asexual reproduction

B. Sexual reproduction

1. Female reproductive system

2. Male reproductive system

C. Development

D. Experiment--embryo development

IX. Genes--the Continuity of Life

A. Study of heredity--Gregor Mendel

B. Dominant and recessive traits

1. Law of dominance

2. Hybrids

3. Laws of proportions--experiments in chance

C. Ratios--Punett squares (correlate with math)

D. Incomplete dominance

E. Sex determination

F. Experiment--mating fruit flies

X. Behavior

A. Trophism

B. Reflex action--class demonstrations

C. Conditional reflexes--Pavlov

D. Instinct--student examples

E. Learning--intelligence (research paper)

XI. Chemical Senses

A. Value of senses

B. Taste and smell interrelated--experiments

C. Touch

D. Sound

E. Sight--optical illusions

XII. Conservation and Ecology of Living Things

A. How do living things interrelate?

1. Constructing a food chain

2. Man's place in nature

B. Natural resources

1. Types of pollution

2. Solution

C. Improvements in Pennridge area

1. Existing problems

2. Student proposals for solutions

XIII. Tobacco, Alcohol, and Narcotics

A. Classification of drugs

B. Tobacco

1. History

2. Smoking machine experiment

3. "Advantages" and disadvantages

C. Alcohol

1. Intoxication

2. Experiment--distillation of Listerine

3. Effects on the body

D. Narcotics

1. Kinds of narcotics

2. Addiction

3. Barbituates

4. Amphetamines

5. Hallucinatory drugs

6. Drugs in our community

7. Speaker--former drug addict

XIV. Health and Safety

A. "Health is taken for granted"--discussion

B. Patterns of growth in teen years

1. Rate of maturation

2. Unevenness of growth

3. The endocrine glands

4. Nutrition and growth

C. Good mental health

1. Changing emotions

2. Getting along with others

3. Understanding personalities

4. Relation of mental and physical functions

D. Maintaining and improving mental health

1. Importance of examinations

2. Dangers of self-medication

3. Daily habits

4. Dental health

E. Safety and first aid

1. Safety in work and recreation
2. Causes and prevention of accidents and injuries
3. First aid procedures and skills

Supplementary Activities

I. Experiments

A. Objectives

1. To supplement ideas and concepts of the curriculum
2. To develop inquiry and logical thought in students
3. To develop good lab techniques
4. To promote a better understanding of the values of science in the world today

B. Types of experiments

1. Large group--Certain experiments will be done by larger groups of students, either entire class or half a class, e. g., microscope study.
2. Small group--Groups of 4 or 5 will be formed. Each group will have a choice of experiments and will work cooperatively. (Each group will have a balance of able and less able students.) Conclusions of experiments will be presented to the class as a whole.
3. Individuals and pairs--For students who have

completed required work and want to go on to something more challenging.

4. Demonstrations--When it is not feasible for the students to do the actual experiment, demonstrations by the teacher will be presented to one or two classes at a time.

D. Examples of experiments

1. Black Box experiment
2. Determining average height by scientific method
3. Bouillon experiment
4. Making fossils with wax paper and carbon
5. Making fossils with plaster of paris
6. Finding density of petrified wood
7. Testing water for various chemicals
8. Microscope work
   a. Comparison of living and non-living substances
   b. Onion cells
   c. Dry-mount slides
   d. Wet-mount slides
   e. Population growth study
9. Food chain study
10. Effect of changing temperature
11. Effect of changing light

12. Experiment with trophisms
13. Regeneration in planaria
14. Chemotrophisms in plants and animals
15. Dissection of clam
16. Determining the age of clams
17. Salt (marine H_2O) water vs. fresh water as an environment
18. Dissection of an earthworm
19. Effect of chemicals on an earthworm
20. Study of external movement
21. Effects of various insecticides
22. External study of insects
23. Insect collecting
24. External and internal study of fishes
25. Breeding tropical fish
26. Dissection of frog
27. Measurement and weight--metric system
28. Digestion, circulation, and respiration of man
29. Study of turtle
30. Embryology--hatching chick eggs
31. Experiments on various life functions of mammals
32. Reproduction in amoebas and paramecium
33. Development of the tadpole into a frog

34. Cell study--osmosis and plasmolysis
35. Breeding fruit flies
36. Crossing fruit flies---simple monohybrid crosses
37. Coin tossing--experiment on chance
38. Phototrophism--simple experiments with plants and light
39. Reflex actions of human beings
40. Learning--hamster and maze
41. Diffusion experiment
42. The tongue and taste
43. Smell and taste
44. The eye
    a. Focusing on near and distant objects
    b. Color vision
    c. Optical illusions
45. Sound
    a. Carrying of sound through various materials
    b. Intensity of sound
    c. Binaural hearing
46. Food chain in a terrarium
47. Food chain in an aquarium
48. Effect of pollution on various food chains
49. Smoking machine

50. Alcohol distillation

51. Effects of alcohol on hamsters

52. Testing various foods for starch, protein, etc.

53. First aid techniques

II. Projects

Various projects such as bulletin boards, research papers, current readings, skits, field trips, and field work will supplement the regular science work.

Correlation

I. General Areas of Correlation

A. English

1. Reading and reviewing newspaper and magazine articles.

2. Library research.

3. Debates and discussions.

B. Social studies

1. Historical data on various areas of science study.

2. Geographical correlation.

C. Mathematics

1. Measurements and weight

2. Geometrical patterns and designs.

3. Process of logical thought

II. Dialogue Teaching and Teacher-Subject Exchanges

III. Student Activities

A. Bottle collection

B. Land clean-up

C. Others

SOCIAL STUDIES

I. Introduction to Social Studies

A. The meaning of geography and history

B. What is to be studied and what is expected.

C. Earth

1. Size: regions

2. Hemispheres; continents

3. Climates

4. Map work

A large local area map will be made by the students, who will locate their homes on it.

II. Archaeology

A. Introduction--what, how, who, when

B. Theories of origin of man and the world

1. Bible

2. Darwin

We hope to take the students on a dig.

III. Prehistoric Days

A. Beginnings

B. Old and new stone ages

C. Settled life leading to civilization

Movies on primitive man will be used. Also the students will be reading My Side of the Mountain, Robinson Crusoe, and Swiss Family Robinson in English, plus short stories about people being lost, shipwrecked, in airplane disasters, etc.

IV. Ancient Egypt

A. Location; description; climate

B. History and rulers

C. Culture

Extra readings in areas of discoveries would be great here. A scale model of a mummy case and a mummy could be made. "Picture writing" could be put on the walls.

V. Egypt Today

A. Changes in life style--homes, clothes, occupations

B. Industry; agriculture

C. Suez Canal--comparison with Panama Canal

D. Government and related Middle East problems.

While discussing canals, a trip to the Delaware River Canal could be worthwhile.

VI. Ancient Southwest Asia--Mesopotamia

A. Location; climate; geographical features

B. Early people and leaders

C. Life style (culture) of various nations

1. Sumeria

2. Babylon

3. Phoenicia

4. Israel

5. Persia

6. Assyria

D. Contributions to civilization

VII. Southwest Asia Today

A. Israel, Jordon, Syria, Lebanon

1. Geography

2. Culture and occupations

3. Problems

a. Oil

b. Water

c. Boundaries

d. Religion

Simulation-role playing games would be great with study of the Middle East crisis.

Debates and discussions on the Palestine refugee problem and guerilla warfare--may be compared with the Vietcong.

VIII. Greece

A. Crete--civilization

B. Location and geographical features of Greece

C. Culture of city-states: Athens and Sparta

D. Important people

E. Persian wars

F. Pelopponesian War

G. Contributions

H. Alexander the Great

IX. Greece Today

A. Culture--comparison with ancient times

B. Industry and occupations

C. Government and related problems

D. Communist influence

X. Ancient Rome

A. Location; geography: climate

B. Culture of Romans--Republic and Empire periods

C. Influence of Greeks

D. History of republic and empire

1. Leaders

2. Changes

3. Contributions

E. Famous Romans

F. Government and contributions

G. Reasons for fall

Skits on Greece and Rome; comparison of decline with present conditions in U. S.; develop a Roman spectacular--market, homes, arena, etc.

XI. Dark Ages

A. Wandering tribes

B. Culture and contributions

XII. New Way of Living

A. Feudalism

1. Reasons for development

2. Vassalage

3. Chivalry

B. Manorial System

1. Duties of lord

2. Duties of serf

3. Castle-manor set-up

C. Reasons for decline of feudal system

1. Problems of the system

2. Crusades

3. Trade

4. Towns

5. Rise of monarchy

D. Crusades

1. Causes

2. Motives

3. Results

E. Medieval Towns

1. Origin

2. Guild system

3. Commerce

4. Market and fair

5. Town life

Books to be chosen among for reading: Robin Hood, King Arthur, Canterbury Tales, Marco Polo.

Games of medieval days.

An "open market" including guild rules, bartering, entertainment, medieval money.

XIII. Development of Nations

A. England

1. Events; people; progress

2. Growth of government

3. Magna Carta

4. Nationalism

B. France

1. Growth of government

2. Nationalism

C. Spain

Study of rights of people. Trials will be put on to show the growth of the jury system; Brutus will be tried.

XIV. England Today

A. Land; geography; climate

B. Culture

C. Occupations--industry and commerce

D. World problems

Study of problems in Northern Ireland.

XV. France Today

A. Land; geography; climate

B. Culture

C. Occupations

D. World problems

XVI. Scandinavian Countries

A. Land; geography; climate

B. Culture

C. Occupations

D. World problems

We will study organiztions such as NATO, common market, etc., and discuss problems such as Berlin, wars, strikes, communism.

XVII. U.S.S.R.

A. History

B. Land; geography; regions

C. Culture

D. Communist takeover--Russian Revolution

E. World problems

XVIII. Animal Farm

A. Comparison with totalitarian governments

B. Methods of takeover

C. Tactics

XIX. Ancient Orient

A. India

1. Origins

2. Culture

3. Famous people

4. Land; regions

5. Contributions

B. China

1. Origins

2. Land; geography; regions

3. Culture

4. Famous people

5. Contributions

XX. Modern Orient

A. India

1. Regions; geography; climate

2. Culture--comparison with ancient India

3. Occupations

4. Government and world problems

B. China

1. Regions; geography; climate

2. Culture

3. Occupations

4. Communism

5. Government and world problems

C. Indochina

1. Countries

2. Land; climate

3. Culture

4. Problems--Vietnam War

XXI. Religions of the World

A. Christianity

B. Judaism

C. Islam

D. Hinduism

E. Buddhism

F. Other Eastern religions

Visits to local churches.

Objectives for Individualized Study

1. To let students make their own choices of subjects.
2. To have students work at their own pace in their own style.
3. To change the role of teacher from that of lecturer to that of guide.
4. To try out more self-directed methods of instruction.
5. To develop in the students greater confidence, initiative, and self-discipline.

If students excel in a particular area and have enough interest, they many move into a related area of individual work. Some will be choices set up by the teacher: others may be initiated by the students with teacher approval. Students will work independently in individual study areas.

Activities and Projects

1. Making a time line.
2. Going on a dig to a quarry or a cave.
3. Reading related books.
4. Simulation-role playing games.
5. Plays and skits.

6. Listening to records and viewing filmstrips.
7. Radio and television programs.
8. Area maps.
9. Crossword puzzles.
10. Outside speakers.
11. Group reports.
12. Mock trials.
13. Individual learning packets.

APPENDIX B

Annex Attitude Test

Please answer the following questions only as they pertain to your classes in the annex. Do not take into consideration your classes in the main building. Whenever possible answer "yes" or "no"--if this is not possible, answer "sometimes."

1. Do you have more friends in school this year?
2. Do you feel you were a help to other students this year?
3. Do you find it difficult to get interested in activities at school?
4. Do you think your teachers expect too much of you?
5. Do you feel there is too much going on at one time in the annex?
6. Are you bothered by visitors to the annex?
7. Are competitive games a good way of review for you?
8. Do you feel there are too many rules in the annex?
9. Do you feel you are more responsible for your work this year?
10. Do you think many students feel they don't belong?
11. Do your teachers use words, without explaining them, that you don't understand?
12. Do you like working on the floor?
13. Do you think your teachers enjoy teaching?
14. Do you like working in small groups some of the time?
15. Do you like working in small groups all of the time?

16. Do you dislike working in small groups at any time?

17. Do you think your teachers don't make you work?

18. Do students in the other classes distract you?

19. Do you feel left out of things?

20. Did other students help you with learning this year?

21. Do you dislike competitive games as a way of review?

22. Are you looking forward to school next year?

23. Would you like to be back in open space next year?

24. Did you enjoy school this year?

25. Did you learn a lot this year?

26. Was work more enjoyable this year than last year?

27. Was it easy for you to concentrate in open space?

28. Did you feel more at ease this year in school?

29. Do you prefer the relaxed atmosphere of open space?

30. Do you feel the teachers at the annex were too strict on discipline?

31. Do you dislike any of your teachers at the annex?

32. Do your teachers at the annex offer you extra help?

33. Did you return for extra help a lot of times?

34. Did you return for help a few times?

35. If you received extra help, was it useful to you?

36. Do you feel your class was holding you back most of the time?

37. Do you feel your class was progressing too fast for you most of the time?

38. Do you feel that learning in your class was progressing at your own rate of speed most of the time?

39. Would you like large group instruction all of the time?

40. Do you like large group instruction some of the time?

41. Would you rather have no large group instruction?

42. Do you dislike working on the floor?

43. Do you think your teachers dislike teaching?

44. Do you find it harder making friends this year?

45. Do you feel that your teachers at the annex favor some students?

46. Do you feel closer to your teachers this year?

47. Do you feel there are not enough rules in the annex?

48. Did you dislike school this year?

49. Did you learn very little this year?

50. Was work less interesting this year?

51. Was it hard for you to concentrate in the annex?

52. Did you feel less at home this year in school?

53. Do you prefer the more formal atmosphere of the "closed classroom"?

54. Do you feel that most of the teachers at the annex were too easy on discipline?

55. Do you like most of your annex teachers a lot?

56. Do you feel that most of the annex teachers strongly dislike some students?

57. Did you feel less close to your teachers this year?

BIBLIOGRAPHY

Campbell, Donald T., and Julian C. Stanley, Experimental and Quasi-Experimental Designs for Research, Chicago: Rand McNally and Company, 1972.

Griffith, Winthrop, "A Daring Educational Experiment--The One-Room Schoolhouse," The New York Times Magazine, May 30, 1971, 14-20.

PDK National Study Committee on Evaluation, Educational Evaluation and Decision Making, Itasca, Illinois: F. E. Peacock Publishers, Inc., 1971.

Silverman, Charles, Crises in the Classroom, New York: Random House, 1970.