A COMPARATIVE STUDY OF INDIVIDUALIZED INSTRUCTION WITH GROUP INSTRUCTION IN THE ACQUISITION OF SPECIFIC BEHAVIORAL OBJECTIVES

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CHAPTER I

INTRODUCTION

For many years science education has aimed at producing more and better technical people. David (1971) points out that it may be that the days of science evangelism are over and we now have the need to teach science to the general public. With the broad range of individual needs in our society, the call for individualized programs is being felt. The Committee on Individualizing Instruction of the Association for Supervision and Curriculum Development (cited by Zahorik, 1969) established some far-reaching goals for releasing potential through teaching. Among these are:

1. Recognizing and accepting different ways of responding, according to learners' individualized styles and needs.
2. Questioning, probing and responding in ways that lead learners to assume responsibility.
3. Standing aside judiciously to let the learner discover and exercise his own resources.
4. Clearing the way, by whatever means, for stretching learners' minds and abilities in creative, self-fulfilling endeavors.

Implementation of an individualized program to effect these goals has met with some difficulty. The following reasons are usually given as why: teachers need more effective instruments to determine the students' readiness for various concepts, there have been no large scale packaged materials and there is some

concern that student initiative would be discouraged (Lunetta and Dyrli, 1971). However, programs have been written and are being tried on an individualized basis. The Winnetka Plan during the 20's and 30's (Washburn, 1932) and in recent years, IPI (Dude, 1971) and ISCS (Burkman, 1970) are examples of large scale programs.

Types of Individualized Programs

Many types of instruction have evolved under the general heading of individualized instruction. These range from programmed learning, which was originally associated with teaching machines, to completely independent study in which the student defines what he is to learn (Stahl and Anzalone, 1970). The major criterion for being classified as individualized instruction appears to be that the students learn the material at their own individual rate.

Quantity of Learned Material

The ability of students to learn from programmed instruction has been shown to be at least as effective as group instruction. Geller (1963) reported no significant difference in the quantity of material learned when comparing programmed (teaching machines) instruction with a lecture course in college freshman organic chemistry. Armstrong (1967) compared programmed instruction with individualized instruction (it is inferred from the publication that by "individualized" instruction he means he taught each student on a one-to-one ratio) and found no significant difference in the amount of material learned. These results have been verified by others (Moriber, 1969 and Siemankowski, 1969).

Several investigators have found that individualized instruction yields mixed or higher results than group instruction. Gibb, Hunt and Fahrman (1968) found that programmed instruction yielded a higher achievement in amount of material learned and a lower achievement on a vocabulary test for a bookkeeping course. DeRose (1968) reported that when using an independent study science program with behavioral objectives, the short range effects were not so different but the long term effects were better for the students in the individualized program.

Fulton (1971) conducted an experiment that compared two approaches to teaching BSCS biology. The results of the study showed a significantly greater gain in all of the areas under consideration (achievement in BSCS biology, understanding of science and critical thinking ability) for the individualized groups. In comparing individualized with group study on the third grade level, Gallagher (1971) concluded that the instructional method should be designed for the outcome sought. For example: use individual instruction for enabling students to generalize across several exemplars of interaction and use group instruction for teaching the identifying interacting diads when describing interactions.

Results of experiments attempting to demonstrate the superiority of individualized study over group study are inconclusive. Some investigators report no difference between the two while others report individualized instruction to be better.

Long Term Effect

In considering the long term effects of an individualized program, Milton (1962) conducted a study two years after the end of the experimental period and found no significant difference between the individualized and group taught classes. DeRose (1968), however, found that there was a significant difference with the individualized students doing better.

The results are inconclusive with some investigators reporting no difference while others report a significant difference with the individualized classes doing better.

Attitude

The attitude of students toward individualized programs vary according to the program. Siemankowskis' (1969) Auto-Paced Teaching Process caused the students to have a significantly better attitude toward science than those students taught the conventional way. Geller (1963) reported no significant difference in the desire of students to study more organic chemistry even though the students learning from the machine found the subject to be more superficial and less interesting. The students liked the program even though they did not like the teaching machines.

Milton (1962), analyzing follow-up data two years after the end of the course, found that there was no significant difference in the drop-out rate and there was no significant difference in the enrollment for the second half of the course. Fulton (1971) found that students taught individually gave a higher rating to

the teacher's ability to make material understandable.

Most investigators report little difference in the attitude of the students toward either type of instruction. However, students apparently feel that the instruction is made more understandable when individualized.

Statement of Problem

The purpose of this investigation was to examine the possibility of there being differences between individualized instruction and group instruction in each of the following areas:

1. Is the amount of material learned affected by the instructional method?
2. Is long-term retention of learned material altered by the instructional method?
3. Is student attitude toward the course affected by the instructional method?

CHAPTER II

MATERIALS AND METHODS

Experimental Design

Group Instruction

Group instruction will be defined as that method of instruction in which the students of an entire class are presented the objectives at the same time and attempt to demonstrate their mastery of these objectives at the same time. The teacher may use experiments, demonstrations, films, worksheets, lectures, reading assignments, lab assistants or anything else that might come to mind in order to bring about the acquisition of the objectives.

There were two teachers from USD 512 assigned to conduct the group instruction. Each had six classes of seventh grade life science with an average of 26 students in each class. The teachers were given a list of 36 behavioral objectives (Appendix I) written by myself in the format described by Walbesser et al. (1971). The instructions to the teachers were that they must teach toward the acquisition of these objectives, they must keep the students together as a group and they were limited to the first nine-week period of school. They were allowed to use any other aids (including two lab assistants) as they saw fit.

Individualized Instruction

Individualized instruction will be defined as that method of instruction presented in such a way that the student can proceed

through the material, from one objective to another, as he is able to demonstrate to the instructor that he has gained the knowledge or skill designated in the previous objective. The student may seek help from the written instructions, the instructor, fellow students, lab assistants or any other place he can find it.

The individualized instructional material for this study was written by myself as course work for Graduate Project 609 under the direction of Dr. Harold Durst (Appendix II). The outline that was followed was based on that initiated by the Biology Department of K.S.T.C. in their preparation of Biology 303 (Science - A Process Approach, 1968).

A variety of activities were offered in the instructional material (e.g. experiments, reading material, oral reports) to break the monotony of doing the same thing day after day.

When a student felt that he had learned the material he was given a practice test that had a question similar to those asked on the competency measure. If he completed this to his satisfaction he was allowed to take the competency measure. A student was allowed to continue to take different competency measures over the same material until he passed. The various measures for each objective tested for transfer to insure that the student did not memorize the answers to a previous test. If a student correctly answered the minimum required, it was recorded in the grade book as a "pass." No record was kept as to how far above or below the minimum standard the student achieved, pass or fail.

The students were advised that the number of objectives passed

would be the determinant for their grade. This was to insure that they would have a reason to work and to move through the material as fast as their ability would let them (Engel and Jorgenson, 1970). However, students were not allowed to proceed to the next unit until they had passed all the objectives in the previous unit. This minimized their trying to rush through the material without gaining any real understanding of the material. The students were limited to the first nine-week period of school to master the objectives.

Testing

Quantity of Learned Material

Test items were selected on a random basis (except for one item which was used to assess retention) for both the pre-and post-test. These items were written in the same style as the competency measures for the behavioral objectives (Appendices III and IV).

In scoring the test, the items were judged to be either correct or incorrect with no partial credit given on any item. Some of the items had several answers (e.g. item number one) and the student had to meet the minimum standard for acceptance.

The pretest was given to determine if there was a significant difference between the individualized classes and group instructed classes at the outset of the year. A posttest was given at the completion of the nine-week term and matched with the pretest taken by each student. The gain scores were calculated and the mean, standard deviation and t values were determined for both groups. For comparison of individually taught classes with group taught classes

the following t test was used (Popham, 1967).

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1}{n_1} + \frac{s_2}{n_2}}}$$

Where:

$\bar{X}_1$ = the mean score for the individualized class.

$\bar{X}_2$ = the mean score for the group instructed class.

s_1 = the standard deviation for the individualized class.

s_2 = the standard deviation for the group instructed class.

n_1 = the number of students involved in individualized study.

n_2 = the number of students involved in group study.

Retention of Material

Question one on the pre- and posttest required the students to complete similar test items for the same objective. As this objective was the first to be encountered at the beginning of the school year each student should have been exposed to it. The following z test was used to compare the number of students successfully completing

question one on the pretest to determine homogeneity of the two groups. The same test was applied to the posttest score to determine the retention of both groups (Forgunson, 1971).

$$z = \frac{P_1 - P_2}{\sqrt{\left[\left(\frac{f_1 + f_2}{n_1 + n_2}\right)q\right]\left[\left(\frac{1}{n_1}\right) + \left(\frac{1}{n_2}\right)\right]}}$$

Where:

P_1 = the proportion correct for one group.

P_2 = the proportion correct for the other group.

$q = 1 - \frac{f_1 + f_2}{n_1 + n_2}$

f_1 = the frequency correct for one group.

f_2 = the frequency correct for the other group.

n_1 = the number in one group.

n_2 = the number in the other group.

Attitude

The attitude of the students toward the course was evaluated by

Finch's (1968) Shop and Laboratory Attitude Inventory (Appendix V). Of the forty-seven statements on the inventory about half were stated in a positive manner toward the course (i.e. if the student agreed with the statement than he LIKED something about the course) and the other half were stated in a negative manner toward the course (i.e. if the student agreed with the statement then he DIDN'T LIKE something about the course).

There were five responses to each statement ranging from "I strongly agree with the statement" to "I strongly disagree with the statement." Each of the responses was assigned a numerical value as follows:

Statements written in a positive manner:

Strongly Disagree = 1

Disagree = 2

Neutral = 3

Agree = 4

Strongly Agree = 5

Statements written in a negative manner:

Strongly Disagree = 5

Disagree = 4

Neutral = 3

Agree = 2

Strongly Agree = 1

A completely neutral attitude for an individual would be a total score of 141 or an average score of three. The mean of these average scores will be referred to as "average means." Anything

above an average mean of three would indicate a positive attitude toward the course and anything below an average mean of three would indicate a negative attitude toward the course.

Each statement was then placed into one of eight categories (Appendix VI). The mean for the entire attitude test was determined as well as the average mean for each of the eight categories. These means were subjected to the t test stated previously (Popham, 1967).

Statistical Analyses

For the purpose of statistical analyses, the following null hypotheses were stated:

H_o^1 - There is no difference in the mean gain scores of the two instructional methods.

H_o^1 - There is no difference in the retention of subject matter of the two instructional methods.

H_o^1 - There is no difference in the mean attitude scores of the two instructional methods.

The null hypotheses for the eight categories of the attitude inventory were stated as follows:

H_o^{3a} - There is no difference in the average mean of those statements concerned with the students' knowledge of the subject and how they felt it would help them with their future study.

H_o^{3b} - There is no difference in the average mean of those statements concerned with the students' impression of

other peoples (e.g. the teacher) attitude toward them and how they treated them.

H_o^{3c} - There is no difference in the average mean of those statements concerned with the students' feelings of encouragement or discouragement.

H_o^{3d} - There is no difference in the average mean of those statements concerned with the students' attitude toward their own mastery of the material.

H_o^{3e} - There is no difference in the average mean of those statements concerned with the enjoyment that the students found toward the course.

H_o^{3f} - There is no difference in the average mean of those statements concerned with the desire of the students to have more material presented in this way.

H_o^{3g} - There is no difference in the average mean of those statements concerned with the students' feelings toward the amount of time available to do the work.

H_o^{3h} - There is no difference in the average mean of those statements concerned with the ease with which the students were able to understand the directions for the material they were to learn.

Variables

The possibility of variables existing unknown to me is admitted.

CHAPTER III

RESULTS

Total Pretest and Posttest Means

Of a possible ten correct responses on the pretest, the group instructed students achieved a mean of 1.93 ($\pm$ 1.52). The pretest for the individually instructed students yielded a mean of 2.14 ($\pm$ 1.69). The resulting t value of 1.24 was not significant. Of a possible ten correct on the posttest, the group instructed students achieved a mean of 2.28 ($\pm$ 1.51). The posttest for the individually instructed students yielded a mean of 3.57 ($\pm$ 1.88). The resulting t value of 6.96 was significant at the .01 level.

The calculated gain score for each student yielded a mean of .48 ($\pm$ 1.42) for the group instructed students and 1.54 ($\pm$ 1.54) for the individually instructed students. The resulting t value of 6.55 was significant at the .01 level (Table 1).

The null hypothesis of equal means is rejected in favor of the individualized class.

Long Term Retention

The proportion of the group instructed students answering item number one correctly (.68), when compared with the proportion of the individually instructed students answering the same question correctly (.58) on the pretest yielded a z value of 2.08 which is significant at the .019 level. This is in favor of the group instructed students. At the conclusion of the experimental period, the pro-

Table I. A comparison of attitude scores, subject matter pretest scores, posttest scores and gain scores for the individual and group instructed students.

H_o $\mu_g - \mu_i = 0$	CRITICAL REGION	$\alpha = .01$	$n_g = 310$	
H_1 $\mu_g - \mu_i \neq 0$	$R = \lvert t \rvert \geq 2.62$		$n_i = 130$	

Instrument	Approach Group (g) Individualized (i)	Mean	Standard Deviation	t
Pretest	g	1.93	1.52	
	i	2.14	1.69	1.24
Posttest	g	2.28	1.51	
	i	3.57	1.88	6.96*
Gain Score	g	.48	1.42	
	i	1.54	1.54	6.55*
Attitude Inventory	g	151	26.26	
	i	162	30.57	3.72*

* Significantly different at the .01 level.

portion of the group instructed students answering item number one correctly on the posttest (.61), when compared with the proportion of the individually instructed students answering the same item (.94) yielded a z value of 7.16 which is significant at the .01 level (Table II

This was in favor of the individually instructed students and the null hypothesis of equal retention was rejected.

Table II. Proportion of students answering item number one on the pretest and posttest correctly.

Instrument	Proportion Correct Group (g) Individualized (i)	z	Level of Significance
Pretest	g = .68		
	i = .58	2.08	.019
Posttest	g = .61		
	i = .94	7.16	P $<$ .0013*

Significant at the .01 level.

Attitude

The attitude inventory, administered at the end of the experimental period, yielded a total score of 141 points for a perfectly neutral attitude toward the course. The highest favorable attitude would give a score of 235 and the lowest unfavorable attitude would give a score of 47. The mean for the group instructed students was 151 ($\pm$ 26.26) and the mean for the individually instructed students was 162 ($\pm$ 30.57). A calculated t value of 3.72 was significant and the

null hypothesis of equal means was rejected in favor of the individualized course (Table I).

The average mean for each category of the attitude inventory would be three for a perfectly neutral attitude toward the course. The highest favorable attitude would have an average mean of five and the lowest unfavorable attitude would have an average mean of one.

Category one: For those statements concerned with the students' knowledge of this subject and how they felt it would help them with their future study, the group instructed class had an average mean of 3.32 (± .55) and the individually instructed class had an average mean of 3.56 (± .63). The calculated t value was 3.64 and was significant in favor of the individually instructed class. The null hypothesis was rejected.

Category two: For those statements concerned with the students' impression of other people's (e.g. the teacher) attitude toward them and how they treated them, the group instructed class had an average mean of 3.08 (± .56) and the individually instructed class had an average mean of 3.39 (± .62). The calculated t value was 5.00 and was significant in favor of the individually instructed class. The null hypothesis was rejected.

Category three: For those statements concerned with the students' feelings of encouragement or discouragement, the group instructed class had an average mean of 3.18 (± .54) and the individually instructed class had an average mean of 3.32 (± .60). The calculated t value was 2.12 and was not significant. The null hypothesis was accepted.

Category four: For those statements concerned with the students' attitude toward their own mastery of the material, the group instructed class had an average mean of 3.18 ($\pm$ .50) and the individually instructed class had an average mean of 3.42 ($\pm$ .63). The calculated t value was 3.64 and was significant in favor of the individually instructed class. The null hypothesis was rejected.

Category five: For those statements concerned with the enjoyment that the students found toward the course, the group instructed class had an average mean of 3.23 ($\pm$ .53) and the individually instructed class had an average mean of 3.53 ($\pm$ .62). The calculated t value was 4.42 and was significant in favor of the individually instructed class. The null hypothesis was rejected.

Category six: For those statements concerned with the desire of the students to have more material presented in this way, the group instructed class had an average mean of 3.31 ($\pm$ 49) and the individually instructed class had an average mean of 3.44 ($\pm$ .59). The calculated t value was 1.96 and was not significant. The null hypothesis was accepted.

Category seven: For those statements concerned with the students' feelings toward the amount of time available to do the work, the group instructed class had an average mean of 3.07 ($\pm$ .52) and the individually instructed class had an average mean of 3.38 ($\pm$ .59). The calculated t value of 4.70 was significant in favor of the individually instructed class. The null hypothesis was rejected.

Category eight: For those statements concerned with the ease with which the students were able to understand the directions for the material they were to learn, the group instructed class had an

average mean of 3.05 ($\pm$ .51) and the individually instructed class had an average mean of 3.18 ($\pm$ .62). The calculated t value of 1.94 was not significant. The null hypothesis was accepted.

Table III. Different categories from the Attitude Inventory, calculated means and t values.

$H_o = \mu_g - \mu_i = 0$	Critical Region	$\alpha = .01$	$n_g = 310$
$H_1 = \mu_g - \mu_i \neq 0$	$R = \lvert t \rvert \geq 2.62$		$n_i = 130$

Category	Approach: Group (g) Individualized (i)	Mean	t
1	g	3.32	
	i	3.56	3.64*
2	g	3.08	
	i	3.39	5.00*
3	g	3.18	
	i	3.32	2.12
4	g	3.18	
	i	3.42	3.64*
5	g	3.23	
	i	3.51	4.42*
6	g	3.31	
	i	3.44	1.96
7	g	3.07	
	i	3.38	4.70*
8	g	3.05	
	i	3.18	1.94

* = Significantly different at the .01 level

CHAPTER IV

DISCUSSION

Quantity of Learned Material

The overall disparity in the results of this study when compared with other studies suggests that a variable other than the broad concept of individualization of instruction enters into the picture. Studies by Geller (1963), Moriber (1969) and Siemankowski (1969) suggest that students can learn material at least as well by working on their own as students being led as a group by a teacher. On the other hand, this study and a study by Fulton (1971) indicate that students can learn better in an individualized situation. This apparent confusion suggests several possibilities:

1. Unknown variables are present in these experiments and have not yet been identified.
2. In experiments that show greater mean scores for the individually instructed students, the group instructed students were not taught toward the data being sought whereas the individualized class was.
3. Individualized instruction is in actuality a superior method of instruction when written in terms of behavioral objectives and allowance is made for some form of variation in learning modes.

With some methods of individualization, the option is available for the student to choose the method of instruction more nearly suited to his needs (i.e. he can learn the material directly from the

written instruction, by asking questions of the instructor, his friends or the lab assistants or by simply watching other people do the experiment). The idea of various instructional modes available in an individualized situation being the cause of greater mean scores is supported by those programs that offer only one type of instruction (e.g. teaching machines). These types of courses yield equal means for the different groups (Moriber, 1969; Armstrong, 1967; Geller, 1963). Courses that offer more than one mode of instruction have yielded higher mean scores than group instructed students studying the same material. Fulton's (1971) study supports the hypothesis that having various instructional modes available contributes to greater mean scores for individually instructed students.

Long Term Retention

The apparent ability of the individually instructed students to retain the material for a longer period of time is clouded by the fact that the length of time the students had to retain the material varied. For example: in the group instructed classes the objective was taught at the beginning of the year and they were tested over this objective eight weeks later, while the individually instructed students worked on it for different lengths of time. Some were able to master the objective the first week and others worked till the sixth week. Therefore the length of time they had to retain the material varied from eight weeks to two weeks. This casts some doubt on the validity of the rejection of the null

hypothesis of equal retention.

Attitude

The overall attitude of the students toward both treatments was favorable and very few of the areas examined showed unfavorable means. The statements on the attitude inventory that did show unfavorable means (i.e. statement numbers 6, 8 and 10) were not great enough to change the overall mean.

On closer examination of the categories, the students in the individually instructed classes felt that the course better prepared them for their future, they were treated better on a personal basis, they felt they had mastered the material better, they enjoyed the program more and did not feel as crowded for time.

Neither of the groups felt discouraged by their work and both wanted more instruction in the way they had been taught.

CHAPTER V

INFERENCES, SUMMARY AND RECOMMENDATIONS

Inferences

The following null hypotheses were rejected at the .01 level of significance in favor of the individualized class.

H_o^1 - There is no difference in the mean gain scores of the two instructional methods.

H_o^2 - There is no difference in the retention of subject matter of the two instructional methods.

H_o^3 - There is no difference in the mean attitude scores of the two instructional methods.

The following null hypotheses from the eight categories of the attitude inventory were accepted at the .01 level of significance.

H_o^{3c} - There is no difference in the average mean of those statements concerned with the students' feelings of encouragement or discouragement.

H_o^{3f} - There is no difference in the average mean of those statements concerned with the desire of the students to have more material presented in this way.

H_o^{3h} - There is no difference in the average mean of those statements concerned with the ease with which the students were able to understand the directions for the material they were to learn.

The following null hypotheses from the eight categories of the attitude inventory were rejected at the .01 level of significance.

in favor of the individualized class.

H_o^{3a} - There is no difference in the average mean of those statements concerned with the students' knowledge of this subject and how they felt it would help them with their future study.

H_o^{3b} - There is no difference in the average mean of those statements concerned with the students' impression of other people's (e.g. the teacher) attitude toward them and how they treated them.

H_o^{3d} - There is no difference in the average mean of those statements concerned with the students' attitude toward their own mastery of the material.

H_o^{3e} - There is no difference in the average mean of those statements concerned with the enjoyment that the students found toward the course.

H_o^{3g} - There is no difference in the average mean of those statements concerned with the students' feelings toward the amount of time available to do the work.

Summary

When individually instructed students were given the option of studying and working by themselves, observing others work and do experiments, working and studying with friends or asking questions of the instructor, they were shown to have higher scores in nearly all of the areas under consideration than the group instructed students.

The individually instructed students learned more of the material presented during the nine-week period and they were able to retain material better after they had learned it. However, this is questioned due to the short time demanded for retention on the part of some students. The attitudes of both groups of students were favorable toward their own course but the individually instructed students had a more favorable attitude than did the group instructed students.

The individually instructed students felt that the course better prepared them for their future study in science and that they had mastered the material better than did the group instructed students. An analysis of the data supports the latter attitude of the students. They also felt that they were treated better on a personal basis, that they were not as crowded for time and that they enjoyed the course more than did the group instructed students.

Neither of the two classes felt discouraged by their work, both wanted more instruction in the way they had been taught and both groups of students were able to understand the instruction given to them by the teacher.

Recommendations

If we are to accept the hypothesis that the individually instructed students did better than the group instructed students because they had the option of selecting their own instructional method, then more research should be done in this area to determine

exactly what options a student should have available.

Research needs to be done to determine if individually instructed students working with just the printed material and not having the option of asking questions, studying with friends or observing other students do experiments would learn as much material as individually instructed students without these restrictions. One-to-one student-teacher conversation should be analyzed to determine if there is an increase in conversation in individually instructed classes over group instructed classes.

If we are to accept the hypothesis that the individually instructed students did better than the group instructed students because of unknown variables then research should be done to try and identify these variables. Two possible variables would be teacher personality and teacher understanding of what was required. An experiment in which teachers would each teach half of their classes on an individualized basis and the other half on a group basis should help determine if these two variables did exist.

The confusion over retention of learned material could be resolved by a one to two year follow-up study in which selected students, having at one time acquired a mastery of the objective under one of the two methods of instruction, were retested.

LITERATURE CITED

LITERATURE CITED

Armstrong, William H. 1967. An Experimental Investigation of the Instructional Effectiveness of Published Programmed Instruction Materials vs. Individualized Instruction in Area Vocational-Technical Schools. PhD Thesis Abstract. Florida State Univ. Univ. Microfilms. Ann Arbor, Mich. (Diss. Abstr. 28.03A.0983).

Burkman, E. 1970. ISCS: An Individual Approach to Science Instruction. The Sci. Teacher. 37(9): 27-30.

David, Edward E. Jr. 1971. Reflections on the Objectives of Science Teaching. The Sci. Teacher. 38(5): 23-25.

DeRose, J. 1968. The Independent Study Science Program of Marple Newton High School. The Sci. Teacher. 35(5): 48-49.

Dude, M. J. 1970. Critical Analysis of Individually Prescribed Instruction. Ed. Tech. 10(Dec.): 47-51.

Engel, D., and Jorgenson, K. T. 1970. Individual Science with Behavioral Objectives. The Sci. Teacher. 37(8): 22-23.

Finch, Curtis R. 1968. Shop and Laboratory Attitude Inventory. Dept. of Vocational Education. The Penn State Univ. Misc. Publ. 3 p.

Forgunson, George A. 1971. Statistical Analysis in Psychology and Education. McGraw-Hill. New York, New York. 161 p.

Fulton, Harry F. 1971. An Analysis of Student Outcomes Utilizing Two Approaches to Teaching BSCS Biology. J. of Research in Sci. Teaching. 8(1): 21-28.

Gallagher, James Joseph. 1971. A Comparison of Individualized and Group Instruction in Science: Effects on Third Grade Pupils. J. of Research in Sci. Teaching. 7(3): 253-263.

Geller, Molly. 1963. The Measurement of the Effectiveness of a Teaching Machine Program in the Organic Chemistry Area of First Year College Chemistry. J. of Educ. Research. 1(2): 154-161.

Gibb, William., Hunt, Donald L., Fahrman, Bill. 1968. A Comparative Study of Conventional and Programmed Instruction in Bookkeeping. The J. of Eduac. Research. 61(3): 7.

Lunetta, V. N., Dyrli, O. E. 1971. Individualized Instruction in the Science Curriculum. Sch. Sci. and Math. 71(2): 121-128.

Moriber, George. 1969. The Effects of Programmed Instruction in a College Physical Science Course for Non-Science Students. J. of Research in Sci. Teaching. 6(3): 214-216.

Milton, O. 1962. Two-Year Follow Up: Objective Data After Learning Without a Class. Psychological Report. 11(3): 833-836.

Popham, James W. 1967. Educational Statistics. Harper and Roe. New York, New York. 429 p.

Science - A Process Approach: Commentary for Teachers. 1968. American Association for the Advancement of Science. Misc. Publ 38-7. USA.

Siemankowski, Francis T. 1969. An Auto-Paced Teaching Process in Physical Science for Elementary Teacher Preparation: A Pilot Report. J. of Research in Sci. Teaching. 6(2): 150-156.

Stahl, Dona K., Anzalone, Patricia. 1970. Individualized Teaching in Elementary Schools. Parker Publish. West Myack, New York. 233 p.

Walbesser, Henry H., Kurtz, Edwin B., Goss, Larry D., Robl, Richard M., Constructing Instruction Based on Behavioral Objectives. School of Engineering. Oklahoms State University. Misc. Publ.

Washburn, Carleton. 1932. Adjusting School to Your Child. World Book Co. Yonkers-on-the-Hudson, New York. 237 p.

Zahorik, John A. 1969. Individual Instruction and Group Instruction: A Case Study. J. of Educ. Research. 62(10): 453-455.

APPENDIX

APPENDIX I

BEHAVIORAL OBJECTIVES FOR SEVENTH GRADE LIFE SCIENCE

At the completion of each unit of study you should be able to:

Unit I. Observation

1. Distinguish between statements that are observations and statements that are inferences, given a list of statements and a description of an object or event.

2. From a group of five, identify the picture identical to a given sample picture.

3. Name 4 observable characteristics of an object or event using at least three of your senses and name the sense that you made the observation with.

Unit II. Measuring.

4. Construct your own device for measuring objects, given the name of some unit or object to make your comparisons to and demonstrate your ability to use your measuring device.

5. Demonstrate your ability to divide your own measuring device into 6 or more equal parts.

6. Identify an object or line as being closer in length to either a meter, centimeter or a millimeter by extimating.

7. Demonstrate your ability to measure an object to the nearest meter, centimeter or millimeter.

Unit III. Measuring

8. Name points on a number line, given the number line and the location of the point.

9. Construct a number line and record numbers both to the right and left of the zero.

10. Demonstrate your ability to find the total number of whole units and decimal units between two points on a number line, given the number line and the two points. (The points may represent either positive or negative numbers.)

11. State a rule for converting fractions to decimals.

12. Apply a rule for converting fractions to decimals.

APPENDIX I (CONTINUED)

13. Demonstrate your ability to measure partial units in decimals rather than fractions.

Unit IV. Measuring (temperature)

14. Demonstrate your ability to find the temperature of a given object or area, given a thermometer and the area to be measured.

15. Name the freezing boiling, body temperature and normal room temperatures as they would appear on both the Celsius and the Fahrenheit scales.

16. Demonstrate your ability to convert from one scale to another scale by using a graph.

Unit V. Measuring

17. Demonstrate your ability to find the mass of an object, being accurate to the nearest tenth of a gram.

18. Demonstrate your ability to find the volume of a liquid, being accurate to the nearest tenth of a milliliter.

19. Demonstrate your ability to calculate the inside volume of a hollow object (one that will hold water) being accurate to the nearest milliliter.

20. Demonstrate your ability to find the volume of a solid object given the object, a graduated cylinder, a beaker and a pan to the nearest milliliter.

Unit VI. Measuring

21. Demonstrate your ability to calculate the mass of an object contained within another object (animal in a cage, etc.) given the objects together and the outside object (container by itself.

22. Demonstrate your ability to find the amount of increase or decrease in volume of an object, given the object before and after the change in volume.

23. Demonstrate your ability to find the amount of increase or decrease in length of an object, given the objects before after the change in length.

24. Demonstrate your ability to find the amount of increase or decrease in mass of an object, given the object before and after the change in mass.

APPENDIX I (CONTINUED)

25. Order objects from least amount of change to greatest amount of change, given either the objects before and after the change or a description of the objects before and after the change.

Unit VII. Variables

26. Identify a variable, given a description of an experiment and the factors controlled by the experimenter

27. Name reasons why there should be only two variables in an experiment.

28. Identify a manipulated variable, given a description of an experiment.

29. Identify a responding variable, given a description of an experiment.

30. Identify experiments that have three or more variables and name ways that the variables could be controlled.

Unit VIII. Graphing

31. Demonstrate your ability to locate coordinates on an "x,y" axis, given the "x,y" coordinates.

32. Construct a graph using the manipulated variable and the responding variable, given the data collected from an experiment. (You may be required to collect your own data.)

Unit IX. Inferring

33. Identify inferences supported by observations, given a list of inferences about another list or group of observations.

34. When given a list of observations, write an inference that a) is supported by the observations and b) does not contradict any of the observations.

Unit X. Classifying

35. Construct a dichotomous key, given a group of objects or pictures.

36. Identify and name an object or picture, given the object or picture and a dichotomous key that includes the object or picture.

APPENDIX II

A SAMPLE UNIT OF INSTRUCTION

Unit IX

Inferring

After you have studied this unit you should be able to:

33. Identify inferences supported by observations, given a list of inferences about another list or group of observations.
34. When given a list of observations, write an inference that is supported by all of the observations and does not contradict any of the observations

New Words:

No new words.

Rationale:

In unit I you learned to distinguish between inferences and observations so that you could make observations and be sure you were not saying something you just thought was true. At that time you might have gotten the idea that it was wrong to make inferences. This isn't true. In fact, this unit is concerned with teaching you to make your own inferences and to do it right. Inferences are important because it is impossible to make observations about everything you want to know. Nobody has the time, ability or even the desire to spend his life just making observations.

However, it is important to make sure you do not just make a

APPENDIX II (CONTINUED)

wild guess when constructing an inference. Your inferences should be supported by your observations. This brings us to the heart of this course: You have been taught to observe, measure (and be accurate at it) and record all of this data so that when you do an experiment you can write an inference that explains your data.

This unit will be concerned with practice that should help you make inferences that explain experiments you will be doing.

Objectives 36 and 37

We will now change the definition of inference from "a guess or hunch" to "a reasoned guess or hunch." This means that the observations you make concerning an experiment will be the reasons for making your inference. Remember; an inference explains observations.

The following example might help.

Pretend you made the following observations.

1. Your brother was in the kitchen when you got home.
2. The kitchen light was on at that time.
3. Thirty minutes later you saw your brother in the family room.
4. You then saw that the kitchen light was off.

You could infer from these observations that your brother turned off the light when he left the kitchen. This would be a good inference because each of the observations support that inference. Suppose you had not even seen your brother in the house when you got home, or you didn't see the kitchen light on in the first place. It would be a little silly to infer that it was he who turned the light

APPENDIX II (CONTINUED)

off because you would not have enough observations.

Activity # 1

Pretend that you made the following observations.

1. You saw a man walking away from a lake.
2. You saw him carrying a fish, a fishing pole and a tackle box.

Circle the letter in front of the inference that is best supported by these observations.

(a) The man caught the fish.

(b) A friend gave the fish to the man.

You could have circled either of these and said that you couldn't be sure which was correct and which was not correct. However, one of the inferences is supported more by the observations than the other. You should have circled (a). At some time in your life you have probably seen someone catch a fish from a lake and in this instance you saw a fish being carried by a man walking away from a lake. You also saw him carrying the equipment necessary for catching a fish. These observations support the inference that the man caught the fish.

Now pretend that you made one other observation.

3. You were watching the man when he quit fishing and you saw him leave the lake with his equipment but <u>without</u> the fish.

Would you continue to accept the inference that he had caught the fish? According to this new observation which inference is

APPENDIX II (CONTINUED)

the one best supported by the observations? _____

If you answered (b) you made a good choice. The third observation that he did not have the fish when he quit fishing does not support the inference that he caught the fish. Of course the inference that a friend gave him the fish might not be correct either but of the two choices, it is the better.

Now pretend that you made this additional observation.

4. You saw the man walk into a "Fresh-Fish" store and come out with the fish.

What should your new inference be? Write it on the line below.

If you answered "he bought the fish" you made a good inference. In this activity you did each of the following:

1. You identified an inference that was supported by the observations.
2. You changed your inference when you made new observations.
3. You wrote an inference when you made new observations that made the other inferences wrong.

In other words, you kept making new inferences to fit each new observation. This is what you do every day of your life and probably are not even aware of it. Literally ALL science is built on this kind of thinking. As new observations are made old inferences are

APPENDIX II (CONTINUED)

discarded for ones that fit the new observations. This is the reason scientist like to be so accurate when making their observations and measurements. If some of their observations and measurements are wrong then their inferences would probably be wrong also.

Activity # 2

Pretend that you made the following observations:

1. You heard your friend say "yes" when you ask him to water some plants for you over the summer.
2. At the end of the summer you saw that the soil in the pots had cracks in it and that the plants were brown and laying on their side.
3. You tried watering the plants and they did NOT change colors and they did NOT ever stand up like they were when you left.

Circle the letter in front of each inference that is supported by the observations above.

(a) The plants are dead.

(b) Tha plants are alive.

(c) Your friend did water the plants.

(d) Your friend did NOT water the plants.

(e) The soil has water in it.

(f) The soil has NO water in it.

APPENDIX II (CONTINUED)

Correct Responses:

You should have circled the letters (a), (d) and (f).

(a) This is supported because the plants did not straighten up even after you watered them. They never did change colors either.

(b) This is not supported for the the same reasons that letter (a) is supported.

(c) The soil has cracks in it and if he had watered it, it shouldn't have.

(d) This is supported for the same reasons that letter (c) is not supported.

(e) This is not supported for the same reasons that letter (c) is supported.

(f) This is supported for the same reasons that letter (c) is not supported.

You might have noticed that you had to rely on some inferences and observations from past experiences in order to answer these. This is OK as long as you know what you are doing. For instance; you have probably observed that if soil does not receive water then it develops cracks. It would be all right to use that observation on these inferences.

Experiment 9-1

Purpose: You are to infer how the funnels are connected to the beakers. Record your inference on a sheet of

APPENDIX II (CONTINUED)

paper in the form of a drawing.

Materials:

funnel box

water

Procedure;

1. Pour water in funnel # 1 and record the letter(s) of the beaker(s) that the water runs into.
2. Repeat this procedure for each of the other funnels.
3. Draw how you think the funnels are connected on paper and look in the back of the funnel box to see if you are correct.

Experiment 9-2

Purpose: You are to write an inference that will explain any changes or differences you observe in the balloons.

Materials:

1. Two balloons
2. Two test-tubes
3. 1/4 cake of yeast.
4. Water
5. Sugar (just a pinch)

Procedure:

1. Place about twenty to thirty ml of water in each test-tube.
2. Place <u>All</u> of the yeast in one test-tube.
3. Put a small amount of sugar in each test-tube

APPENDIX II (CONTINUED)

and stir throughly.

4. Place one balloon over the opening of each test-tube.
5. Place the test-tubes in a warm area for twenty minutes.
6. Write down ALL of your observations of the balloons, sugar-water solution and the sugar-water-yeast solution.
7. Write an inference that will explain the observations you just made.

There are several possible inferences that could be correct. An example of a good inference would be: The balloon became larger over the flask with the yeast in it because when yeast, sugar and water are mixed a gas is given off. The underlined portion is the inference that explains the observation written before it. If you have an inference different from this one check with the instructor to see if it is supported by your observations.

Experiment 9-3

Purpose; You are to write an inference that names the gas you exhale.

Materials:

1. A straw
2. A beaker or flask
3. A small amount of bromthymol blue solution.

Procedure:

1. Read the following:

APPENDIX II (CONTINUED)

A scientist observed that when he bubbled CO_2 through a bromthymol blue solution, the solution would change from blue to either green or yellow. Every other gas that he bubbled through it had no effect at all. He inferred that CO_2 reacts with bromthymol blue to turn it green.

2. Exhale your breath through the bromthymol blue solution by using a straw.
3. Write down ALL of your observations.
4. Write an inference that will explain the observations you just made.

An example of a good inference would be: When your exhaled breath bubbles through bromthymol blue it turns green because <u>your exhaled breath contains CO_2</u>. The underlined portion is the inference that explains the observation written before it. If you have an inference different from this one check with the instructor to see if it is supported by your observations.

If you feel you are able to write an inference that is supported by the observations at this time then you are ready for the competency measure. If not, ask the assistant for the work sheet or ask the instructor for additional help.

APPENDIX III

SUBJECT MATTER PRETEST

Read the directions for each of the following problems carefully. Write your answers on your answer sheet in the appropriate blanks.

I. Read the paragraph written below. The numbered statements below that are either observations or inferences about the paragraph. If you think the statement is an observation then write an "O" on your answer sheet. If you think the statement is an inference then write an "I" on your answer sheet.

Paragraph:

You walked next to a house and saw a group of boys running in a direction away from the house. You saw one boy carrying a baseball bat over his shoulder leading the group. Several of the other boys were wearing baseball gloves on their hands. When you turned to look at the house you saw a window pane with a jagged hole in it. There was glass on the ground outside the window and some more on the floor inside the window. You could see a baseball on the floor across the room.

Statements:

1. The boys had been playing baseball.

2. The boys threw a ball through the window.

3. The house had a window with a hole in it.

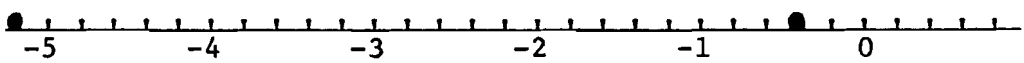
4. Several of the boys had baseball gloves.

5. One of the boys had a ball-bat.

6. The boys were running away from trouble.

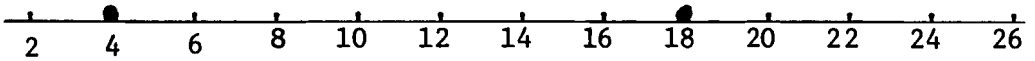
(You will be allowed to miss one.)

II. Find the total number of whole units and decimal units between the two points on each of the following number lines.

(a) 

APPENDIX III (CONTINUED)

(b)



(c)

III. Pretend you were doing an experiment in which you were measuring the amount of growth in carrots. You collected the following data.

Plot #	Beginning height	Ending height
1.	2.3 cm	7.9 cm
2.	1.9 cm	8.6 cm
3.	3.5 cm	12.4 cm
4.	2.7 cm	4.1 cm

Find the amount of increase for each plot and record your answer on your answer sheet. You will not be allowed to miss any.

IV. Look at your answers for # III. Place the plats in order from least amount of change to greatest amount of change.

V. You wanted to find the temperature of the soil at different depths. You conducted an experiment and collected the following data.

Depth into Soil	Time	Date	Temp
5 cm	9:00 am	Nov. 9	2° C
10 cm	9:00 am	Dec. 17	-8° C
15 cm	9:00 am	Dec. 19	-6° C

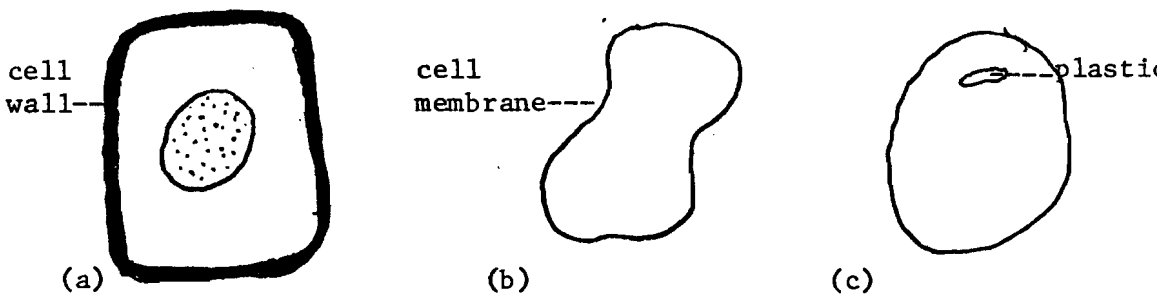
APPENDIX III (CONTINUED)

Write the name of each variable in the above experiment on your answer sheet.

VI. Write the word "element" for those symbols which are elements and the word "compound" for those symbols which are compounds on your answer sheet for each of these examples.

1. H_2O 2. O_2 3. CO_2 4. Pb 5. H_2

VII. Lable each of the following as either a plant cell or an animal cell.



VIII. Write a brief description of the function of each of the following cell parts.

(a) cell wall (b) cell membrane (c) plastid

IX. Name two stages of mitosis.

X. Calculate the surface area of the following cube.

Length = 4 cm
Height = 4 cm
Width = 4 cm

APPENDIX IV

SUBJECT MATTER POSTTEST

Read the directions for each of the following problems carefully. Write your answers on your answer sheet in the appropriate blanks.

I. Read the paragraph written below. The numbered statements below that are either observations or inferences about the paragraph. If you think the statement is an observation then write an "O" on your answer sheet. If you think the statement is an inference then write an "I" on your answer sheet.

Paragraph:

You were doing some diving off the coast of a small island near the equator. While underwater you saw a school of fish swim by rapidly. You also saw three sharks swimming rapidly right behind the school of fish. As the school of fish would dart to one side the sharks would dart in that same direction.

Statements:

1. The fish were afraid of the sharks.

2. The sharks wanted to eat the fish.

3. The fish were swimming in front of the sharks.

4. The sharks were hungry.

5. The fish were leading the sharks to a place where food could be found.

6. Sharks live best near the equator.

(You will be allowed to miss one.)

APPENDIX IV (CONTINUED)

II. Demonstrate your ability to estimate each of the following lines as being closer to either a mm, cm, or a m.

(a) -

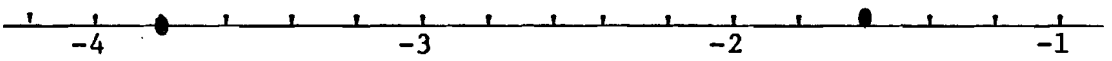
(b) ____

(c) The distance from your finger tips to your shoulder.

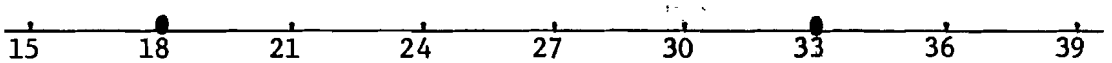
(d) _____

III. Find the total number of whole units and decimal units between the two points on each of the following number lines.

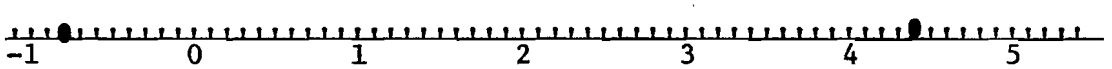
a)



b)



c)



IV. Convert the following temperatures from Celsius to Fahrenheit.

(a) 5° C = ___ ° F. (b) 100° C = ___ ° F.

V. Identify the manipulated variable and the responding variable in the following experiment.

Beginning height	Ending height	Percent of humus in soil
2 cm	8 cm	84 %
2 cm	3 cm	53 %
2 cm	5 cm	34 %

APPENDIX IV (CONTINUED)

VI. Locate each of the following points on the graph on your answer sheet and mark with the appropriate letter.

(a) x axis = 4, y axis = 3

(b) x axis = 1, y axis = 1

(c) x axis = 5, y axis = 3

VII. Construct a dichotomous key for the following pictures.

VIII. Write the word "element" for those symbols which are elements and the word "compound" for those symbols which are compounds on your answer sheet.

1. PbO 2. Fe_2O_3 3. N_2 4. He 5. O_2

IX. Write a brief description of the function of each of the following cell parts.

(a) Nucleus (b) Cell membrane (c) Mitochondria

X. Calculate the surface area of the following cube.

Length = 8 cm

Height = 8 cm

Width = 8 cm

APPENDIX V

SHOP AND LABORATORY ATTITUDE INVENTORY

Department of Vocational Education

The Pennsylvania State University

University Park, Pennsylvania

DIRECTIONS: Below are several statements about the period of instruction which you have just completed. Read each statement carefully and indicate the degree to which you agree or disagree with it according to the following scale:

SD - Strongly Disagree - I strongly disagree with the statement.

D - Disagree - I disagree with the statement, but not so strongly so.

N - Neutral - I am neutral toward the statement or don't know enough about it.

A - Agree - I agree with the statement, but not strongly so.

SA - Strongly Agree - I strongly agree with the statement.

CIRCLE YOUR RESPONSE

1. I would like more instruction presented in this way..SD D N A SA
2. I learned more because equipment was available for me to use .....SD D N A SA
3. This instruction was very boring.....SD D N A SA
4. The material presented was of much value to me.....SD D N A SA
5. The instruction was too specific.....SD D N A SA
6. I was glad just to get through the material .....SD D N A SA
7. The material presented will help me to solve problems SD D N A SA
8. While taking this instruction I almost felt as if someone was talking with me..... SD D N A SA
9. I can apply very little of the material which I learned to a practical situation.....SD D N A SA

APPENDIX V (CONTINUED)

10. The material made me feel at ease.....SD D N A S

11. In view of the time allowed for learning, I felt that too much material was presented.....SD D N A SA

12. I could pass an examination over the material which was presented.....SD D N A SA

13. I was more involved with using equipment than with understanding the material.....SD D N A SA

14. I became easily discouraged with this type of instruction.....SD D N A SA

15. I enjoy this type of instruction because I get to use my hands.....SD D N A SA

16. I was not sure how much I learned while taking this instruction.....SD D N A SA

17. There are too many distractions with this method of instruction.....SD D N A SA

18. The material which I learned will help me when I take more instruction in this area.....SD D N A SA

19. This instructional method did not seem to be any more valuable than regular classroom instruction.....SD D N A SA

20. I felt that I wanted to do my best work while taking this instruction.....SD D N A SA

21. This method of instruction makes learning too mechanical.....SD D N A SA

22. The instruction has increased my ability to think....SD D N A SA

23. I had difficulty reading the written material that was used.....SD D N A SA

24. I felt frustrated by the instructional situation.....SD D N A SA

25. This is a poor way for me to learn skills.....SD D N A SA

26. This method of instruction does not seem to be any better than other methods of instruction.....SD D N A SA

27. I am interested in trying to find out more about the subject matter.....SD D N A SA

APPENDIX V (CONTINUED)

28. It was hard for me to follow the order of this instruction.....SD D N A SA

29. While taking this instruction I felt isolated and alone.....SD D N A SA

30. I felt uncertain as to my performance in the instruction.....SD D N A SA

31. There was enough time to learn the material that was presented.....SD D N A SA

32. I don't like this instruction any better than other kinds I have had.....SD D N A SA

33. The material presented was difficult to understand..SD D N A SA

34. This was a very good way to learn the material.....SD D N A SA

35. I felt very uneasy while taking this instruction....SD D N A SA

36. The material presented seemed to fit in well with my previous knowledge of the subject.....SD D N A SA

37. This method of instruction was a poor use of my time.....SD D N A SA

38. While taking this instruction I felt challanged to do my best work.....SD D N A SA

39. I disliked the way that I was instructed.....SD D N A SA

40. The instruction gave me facts and not just talk.....SD D N A SA

41. I guessed at most of the answers to problems.....SD D N A SA

42. Answers were given to the questions that I had about the material.....SD D N A SA

43. I seemed to learn very slowly with this type of instruction.....SD D N A SA

44. This type of instruction makes me want to work harder.....SD D N A SA

45. I did not understand the material that was presented.....SD D N A SA

46. I felt as if I had my own teacher while taking this instruction.....SD D N A SA

47. I felt that no one really cared whether I worked or not.....SD D N A SA

APPENDIX VI

CATEGORIES OF STATEMENTS TAKEN FROM THE ATTITUDE INVENTORY

	Categories	Statements attributed to each category
1.	Statements concerned with the students' knowledge of this subject and how they felt it would help them with their future study.	4, 7, 9, 18, 22, 40.
2.	Statements concerned with the students impression of other peoples (e.g. the teacher) attitude toward them and how they treated them.	8, 29, 46, 47.
3.	Statements concerned with the students' feelings of discouragement or encouragement.	10, 14, 24, 35, 38.
4.	Statements concerned with the students' attitude toward their own mastery of the material.	2, 12, 16, 36, 41, 45.
5.	Statements concerned with the enjoyment that the students found toward the course.	3, 5, 6, 15, 37, 19, 20, 21, 25, 28, 32, 33, 34, 39, 43.
6.	Statements concerned with the desire of the students to have more material presented in the way they were taught.	1, 26, 27.
7.	Statements concerned with the students' feelings toward the amount of time available to do the work.	11, 31.
8.	Statements concerned with the ease with which the students were able to understand the directions for the material they were to learn.	13, 17, 23, 30, 42.

APPENDIX VII

MEAN FOR EACH STATEMENT ON THE ATTITUDE INVENTORY

Statement Number	Group	Individualized
1	3.44	3.24
2	3.82	3.85
3	3.36	3.70
4	3.38	3.30
5	3.41	3.52
6	2.82	2.74
7	3.38	3.62
8	2.64	2.98
9	3.00	3.22
10	2.92	2.91
11	3.18	3.12
12	2.90	3.16
13	2.96	3.42
14	3.22	3.61
15	3.18	3.42
16	3.01	3.16
17	3.38	3.20
18	3.42	3.89
19	3.20	3.42
20	3.62	3.69
21	3.28	3.63

APPENDIX VII (CONTINUED)

Statement Number	Group	Individualized
22	3.29	3.93
23	2.98	3.30
24	3.02	3.43
25	3.47	3.80
26	3.36	3.63
27	3.14	3.45
28	2.93	3.41
29	3.42	3.71
30	2.64	3.05
31	2.94	3.06
32	3.12	3.62
33	2.01	3.66
34	3.28	3.66
35	3.22	3.52
36	3.04	2.98
37	3.52	4.06
38	3.53	3.11
39	3.12	3.36
40	3.40	3.42
41	3.19	4.06
42	3.10	2.90
43	3.22	3.27
44	3.29	3.27

APPENDIX VII (CONTINUED)

Statement Number	Group	Individualized
45	3.10	3.25
46	2.86	3.06
47	3.42	3.81