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ABSTRACT

Varied attempts by educators to individualize the instructional process in a classroom setting are quite frequently hindered or facilitated by the vertical pattern of organization--graded or nongraded--under which a given school functions. The nongraded school allows for the progression of a student through the contents of a given subject independent of any fixed time boundaries. By virtue of its concern with the time factor in learning, John B. Carroll's model of school learning appears to be a viable theoretical basis for making decisions regarding the facilitation of individualized instruction via school organizational patterning. In this study the Carroll model was (a) utilized as a framework for individualizing instruction in a nongraded setting and (b) investigated as a theoretical basis for educational decisions relative to individualized instructional strategies and school organizational patterning. Measures of degree of learning and perseverance were recorded under two levels of quality of instruction and three levels of ability to understand instruction. The employment of a mastery learning strategy encompassing feedback/correction procedures served to differentiate between the two treatments. The findings of the investigation supported Carroll's hypothesized interaction as well as additional hypotheses inherent within the model. (Author)

AN INVESTIGATION OF JOHN B. CARROLL'S MODEL OF SCHOOL LEARNING AS A BASIS FOR FACILITATING INDIVIDUALIZED INSTRUCTION BY WAY OF SCHOOL ORGANIZATIONAL PATTERNING

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Nature of the Problem

Varied attempts by educators to individualize the instructional process in a classroom setting are quite frequently hindered or facilitated by the vertical pattern of organization--graded or nongraded--under which a given school functions. Schools which are organized on a graded basis can generally be characterized as providing group-based instruction with specified and limited periods of time allowed for the mastery of a series of learning tasks. Regardless of the time allotted, however, it is likely to be too much for some pupils while not enough for others. In response to this obvious limitation of the graded school, the nongraded form of school organization has been suggested as a viable alternative. In essence, the nongraded school allows for the progression of a student through the contents of a given subject independent of any fixed time boundaries. Subject-matter mastery is the constant while the time allowed for its mastery is the variable.

The rationale conventionally appealed to as the justification for nongradedness is the position that individual learners differ with respect to their potentialities for achievement and interest in various subject areas and, therefore, must be permitted to operate under a form of school organization which is amenable--and indeed conducive--to each student progressing at a rate dictated by his own capabilities. It certainly does seem that the implementation of a pedagogical approach which attempts to individualize instruction would be facilitated by the provision of flexible time allotments. As a result of this orientation, past research concerning the vertical patterning of schools has attempted to demonstrate the superiority of nongradedness over gradedness as the more viable organizational approach to accommodating the individual differences among students. Numerous studies which evaluated nongraded programs, however, have reported results that are contradictory and inconclusive (Bowman, 1971; Hunt, 1970; Jackson, 1965; Killough, 1971; Otto, 1971; Ramayya, 1971; Remacle, 1970; Steere, 1968; and Zerby, 1960).

A basic contention of the study presently being reported is that what is needed in the area of research concerning the relationship between individualized instruction and school organizational patterning is not just simply a comparison of nongradedness with gradedness on various dependent variables. Although this methodological approach undoubtedly has some merit by virtue of its comparative nature, it seems that a research strategy which looks directly at the theory undergirding individualized instruction and appropriate school organizational patterning is in dire need. By virtue of its concern with the time factor in learning, John B. Carroll's model of school learning appears to be a viable theoretical basis for making decisions regarding the facilitation of individualized instruction via school organizational patterning.

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Purpose of the Study

The objectives of this investigation were as follows: (a) to utilize Carroll's model as a framework for implementing an individualized instructional program in a nongraded setting; (b) to identify the Carroll model as a possible theoretical basis for educational decisions relative to individualized instructional strategies and school organizational patterning; and (c) to test several hypotheses derived from the model which have direct implications concerning individualized instruction and school organization.

Theoretical Framework

John B. Carroll's (1963) model of school learning is a paradigm which describes the degree of learning that takes place in a school setting as a function of the time spent on a learning task divided by the time needed for its mastery. The basic formulation of the model can be expressed as follows:

$$\text{Degree of Learning} = f\,\frac{\text{(Time Spent)}}{\text{(Time Needed)}}$$

The following five variables comprise the model: (a) opportunity--the amount of time allowed or made available for learning; (b) perseverance--the amount of time the learner is willing to spend actively engaged in a learning task; (c) aptitude--the amount of time the student will need to learn the task under optimal instructional conditions; (d) ability to understand instruction--the ability of the learner to understand the nature of the task he is to learn and the procedures he is to follow in the learning of the task, a combination of general and verbal intelligence; and (e) quality of instruction--the degree to which the presentation, explanation, and ordering of elements of the task to be learned approach the optimum for a given learner. Opportunity and perseverance function as determinants of time spent while aptitude, ability to understand instruction, and quality of instruction serve as determinants of time needed.

Two of the determinants of time needed for learning--ability to understand instruction and quality of instruction--are hypothesized to interact in such a way that students low in ability to understand instruction will suffer more with respect to degree of learning when subjected to low quality of instruction than will students high in ability to understand instruction.

Review of Related Literature

Carroll's model of school learning has served as a catalyst and framework for the development of feedback/correction strategies for mastery learning. Conclusive findings have been reported which tend to justify such strategies as a high quality of instruction capable of increasing substantially the degree of learning on the part of students (Airasian, 1967; Arlin, 1973; Baley, 1972; Block, 1970, 1972, 1974;

Block & Burns, 1976; Carroll & Spearritt, 1967; Collins, 1969, 1970; Gentile, 1970; Gregware, 1974; Keller, 1968; Kersh, 1970; Kim et al., 1969, 1970; Mayo, Hunt, & Tremmel, 1968; Merrill, Barton, & Wood, 1970; Moore, Mahan, & Ritts, 1968; Sherman, 1967; Silberman & Coulson, 1964).

As alluded to earlier, one of the most interesting aspects contained in the Carroll model concerns the hypothesized interactive effects of ability to understand instruction and quality of instruction upon degree of learning. The nature of this hypothesized interaction is such that students low in ability to understand instruction will suffer more relative to degree of learning when subjected to a low quality of instruction than will students high in ability to understand instruction. Unfortunately, the literature is currently limited to only three studies which were designed intentionally to investigate Carroll's hypothesized interaction (Carroll & Spearritt, 1967; Gaines, 1971; Gregware, 1974) and two studies which lend themselves to interpretation in terms of the hypothesized interaction (Kim et al., 1969; Silberman & Coulson, 1964).

The research findings contained in the studies cited immediately above did not represent conclusive evidence which could be used to support or reject completely Carroll's hypothesized interaction between ability to understand instruction and quality of instruction. More specifically, the various investigations indicated the following: (a) the absence of a significant ordinal interaction of the type hypothesized by Carroll relative to degree of learning (Carroll & Spearritt, 1967; Gaines, 1971; Gregware, 1974); (b) the presence of a significant disordinal interaction relative to perseverance, suggestive of possible modifications needed in the model (Carroll & Spearritt, 1967); and (c) data consistent with the pattern of ordinal interaction hypothesized by Carroll relative to degree of learning but lacking statistical tests of significance (Kim et al, 1969; Silberman & Coulson, 1964).

Research Hypotheses

The educational setting in which this study was implemented can be described in the following manner: A mastery learning group and a control group operated within a nongraded form of school organization which provided students with unlimited time opportunity for the attainment of a maximum degree of learning over a series of learning tasks. Hence, the school organizational pattern permitted the expenditure of whatever amount of time was needed by the students in their quest for total mastery learning.

Accordingly, this investigation endeavored to answer the following major question: Given a nongraded school organizational structure that provides students with unlimited time allotments for the mastery of a series of learning tasks, what are the main effects of quality of instruction and the interactive effects of ability to understand instruction and quality of instruction relative to the degree of learning attained and the amount of perseverance manifested by students?

The specific research hypotheses addressed in this study are listed below:

Research hypothesis 1. There will be a significant difference between the mastery learning group and the control group relative to degree of learning. More specifically, the mastery learning group will attain a significantly greater degree of learning than will the control group.

Research hypothesis 2. There will be a significant ordinal interaction between ability to understand instruction and quality of instruction relative to degree of learning. More specifically, as students decrease in ability to understand instruction, their degree of learning will decrease in both the mastery learning group and the control group; however, the extent of decrease will be significantly greater in the control group than in the mastery learning group.

Research hypothesis 3. There will be a significant difference between the mastery learning group and the control group relative to the correlation between degree of learning and ability to understand instruction. More specifically, the correlation between degree of learning and ability to understand instruction will not deviate significantly from zero in the mastery learning group but will be significantly positive in the control group.

Research hypothesis 4. There will be a significant difference between the mastery learning group and the control group relative to perseverance. More specifically, the mastery learning group will manifest a significantly greater amount of perseverance than will the control group.

Research hypothesis 5. There will be a significant ordinal interaction between ability to understand instruction and quality of instruction relative to perseverance. More specifically, as students decrease in ability to understand instruction, the amount of perseverance manifested will increase in the mastery learning group but will decrease in the control group.

Research hypothesis 6. There will be a significant difference between the mastery learning group and the control group relative to the correlation between perseverance and ability to understand instruction. More specifically, the correlation between perseverance and ability to understand instruction will be significantly negative in the mastery learning group but significantly positive in the control group.

Research hypothesis 7. There will be a significant difference between the mastery learning group and the control group relative to classes spent. More specifically, the mastery learning group will spend a significantly greater number of classes than will the control group.

Research hypothesis 8. There will be a significant ordinal interaction between ability to understand instruction and quality of instruction relative to classes spent. More specifically, as students decrease in ability to understand instruction, the number of classes spent will increase in the mastery learning group but will decrease in the control group.

Research hypothesis 9. There will be a significant difference between the mastery learning group and the control group relative to the correlation between classes spent and ability to understand instruction. More specifically, the correlation between classes spent and ability to understand instruction will be significantly negative in the mastery learning group but significantly positive in the control group.

Research hypothesis 10. There will be a significant difference between the mastery learning group and the control group relative to the correlation between degree of learning and perseverance. More specifically, the correlation between degree of learning and perseverance will be significantly negative in the mastery learning group but significantly positive in the control group.

Research hypothesis 11. There will be a significant difference between the mastery learning group and the control group relative to the correlation between degree of learning and classes spent. More specifically, the correlation between degree of learning and classes spent will be significantly negative in the mastery learning group but significantly positive in the control group.

Method

Subjects

The sample used in this investigation was identical to a population of 169 male students who were enrolled in the second of six learning sequences (units) which comprised an Algebra I course at the secondary school level. More specifically, these students addressed the first part of a learning sequence entitled "Polynomials and Equations" which concerned the addition, subtraction, multiplication, and division of directed numbers. This sample was divided into three levels of ability based upon intelligence quotient scores. The students within each ability level were randomly assigned to two levels of treatment designated as (a) the mastery learning group and (b) the control group. Initially, there were 85 and 84 students in the mastery learning group and the control group, respectively. As a result of experimental mortality, the size of the mastery learning group and the control group was reduced to 64 and 77 students, respectively; hence, the final sample size equaled 141 students.

Treatments

Mastery learning strategy refers to an instructional approach which accommodates the individual differences among students in such a way that the vast majority of the students attain mastery of the learning task or tasks under consideration. In this study the employment of a mastery learning strategy encompassing feedback/correction procedures served to differentiate between the two treatments. Accordingly, the two elements of the mastery learning treatment which were responsible

for its being representative of a high quality of instruction included the following: (a) the use of formative tests and (b) the prescription of learning correctives of a review-remedial nature.

Students in the mastery learning group were subjected to formative tests at two intermittent stages prior to the completion of the designated material. More specifically, Formative Test I was administered immediately subsequent to the completion of the assignments associated with the addition and subtraction of directed numbers while Formative Test II was administered immediately after the completion of the assignments associated with the multiplication and division of directed numbers. The rationale behind the use of this type of formative evaluation was that the formative tests would provide both the student and the teacher with on-going feedback relative to the learning deficiencies experienced by the student as well as the alterations most needed in the instructional materials and/or strategies. For the purpose of ensuring the effectiveness of each formative test, a criterion level of 80 percent mastery was established. A score of 80 or higher on a 100-point scale entitled the student to proceed to the next group of objectives (in the case of Formative Test I) or to the summative test (in the case of Formative Test II). A score which indicated less than 80 percent mastery, however, required that the student retake the formative test (that is, a different form of it) until 80 percent mastery was demonstrated. In either situation, though, any test items missed served to determine those learning correctives to which the student was recycled.

Based upon the feedback provided by the formative tests, exercises of a review-remedial nature were prescribed for the purpose of correcting any learning deficiencies experienced by the student. Upon the initial unsuccessful attempt at attaining the criterion score on either formative test, the student was recycled back to additional assignments of the same type as those he had completed previously. However, upon any unsuccessful attempts thereafter at attaining the criterion score on either formative test, the student was provided with a brief tutoring session in which a teacher or paraprofessional attempted to provide the needed personalized assistance.

The characteristic which was most instrumental in the control treatment being reflective of a low quality of instruction, as already alluded to, was the absence of formative tests and the corresponding learning correctives. The students in this group were required to complete the Summative Test without the assistance of the feedback/correction procedures described above.

The control treatment represented the standard operating procedure which had already been planned for implementation even before the commencement of the study. The major components of the mastery learning treatment, however, represented an alteration of the school's standard operating procedure for the purpose of constructing an instructional strategy more conducive to the attainment of mastery learning by a greater percentage of students.

Dependent Variables

Degree of learning, perseverance, and classes spent were the three dependent variables investigated in this study. Degree of learning refers to the percentage of learning material mastered by each student and reported in the form of an achievement raw score on a summative test covering algebraic topics.

Perseverance refers to the total number of minutes and seconds spent by each student on a difficult learning task administered subsequent to the summative test. This highly controlled measure is consistent with Carroll's definition of perseverance as the amount of time a student is willing to spend actively engaged in a learning task.

Classes spent refers to the total number of instructional periods in an algebra course attended by each student while completing the unit of instruction used in this study. It is acknowledged that this measure represents only an approximation of the highly controlled variable of perseverance identified in the Carroll model.

Data Collection Procedures

Degree of learning was assessed by way of achievement scores attained on a summative test based upon the specific learning tasks to which the students were exposed.

An instrument labeled Assessment of Perseverance was used to measure the amount of time a student was willing to spend actively engaged with a difficult learning task. During the class session immediately subsequent to his completion of the summative test, each student was given this instrument which consisted of (a) instructional material on a new algebraic topic and (b) a single mathematical problem pertaining to the same topic. In a highly controlled setting, each student was requested to read the instructional material and then to solve the problem. Measures of perseverance were obtained by recording the total number of minutes and seconds spent by each student on the difficult learning task.

Concerning the tabulation of the number of classes spent, an accurate account was maintained of the total number of instructional periods in algebra attended by each student while completing the designated unit of instruction. This record was amassed by way of a simple attendance check. Excluded from this tabulation were the two class sessions devoted by each student to the completion of the summative test and the Assessment of Perseverance instrument. Included in this tabulation, though, were the number of partial and/or complete class sessions spent by each member of the mastery learning group in completing the two formative tests.

Research Design and Data Analysis Techniques

The experimental design used in this study can be characterized as a logical extension and concurrent replication of the Posttest-Only Control Group Design. The crossing of three ability levels with two

treatment levels resulted in a 3 X 2 fixed-effects factorial design. The statistical techniques employed included two-way fixed-effects analysis of variance (unweighted means) and Pearson product-moment correlation.

Results

The following is a listing of the results of this study. In order to facilitate the synthesis of these findings, the various null hypotheses are grouped according to pertinent dependent variables.

Degree of Learning

Null hypothesis 1. The null hypothesis of no significant difference between the mastery learning group and the control group relative to degree of learning was rejected at the .001 level of significance in favor of the mastery learning group. Tables 1 and 2 present the appropriate summary data for the unweighted means analysis of variance of achievement scores for both treatment groups crossed with the three ability levels.

Null hypothesis 2. The null hypothesis of no significant interaction between ability to understand instruction and quality of instruction relative to degree of learning was rejected at the .05 level of significance in favor of the ordinal interaction hypothesized by Carroll. (See Table 2.) Figure 1 illustrates the graph of the significant ordinal interaction found between ability to understand instruction and quality of instruction relative to achievement scores.

Null hypothesis 3. The null hypothesis of no significant difference between (a) the mastery learning group's correlation coefficient for degree of learning and ability to understand instruction and (b) zero was rejected at the .025 level of significance in favor of a positive coefficient. The null hypothesis of no significant difference between (a) the control group's correlation coefficient for degree of learning and ability to understand instruction and (b) zero was rejected at the .01 level of significance in favor of a positive coefficient. Table 3 presents the coefficients of correlation between achievement scores and intelligence quotient scores as well as the standard deviations for both treatment groups.

Perseverance

Null hypothesis 4. The null hypothesis of no significant difference between the mastery learning group and the control group relative to perseverance was not rejected. Tables 4 and 5 present the appropriate summary data for the unweighted means analysis of variance of the number of minutes spent in persevering by both treatment groups crossed with the three ability levels.

Null hypothesis 5. The null hypothesis of no significant interaction between ability to understand instruction and quality of instruction relative to perseverance was not rejected. (See Table 5.) Figure 2 illustrates the graph of the nonsignificant disordinal interaction discovered between ability to understand instruction and quality of instruction relative to the number of minutes spent in persevering.

Null hypothesis 6. The null hypothesis of no significant difference between (a) the mastery learning group's correlation coefficient for perseverance and ability to understand instruction and (b) zero was not rejected. The null hypothesis of no significant difference between (a) the control group's correlation coefficient for perseverance and ability to understand instruction and (b) zero was not rejected. Table 6 presents the coefficients of correlation between the number of minutes spent in persevering and intelligence quotient scores as well as the standard deviations for both treatment groups.

Classes Spent

Null hypothesis 7. The null hypothesis of no significant difference between the mastery learning group and the control group relative to classes spent was rejected at the .001 level of significance in favor of the mastery learning group. Tables 7 and 8 present the appropriate summary data for the unweighted means analysis of variance of the number of classes spent by both treatment groups crossed with the three ability levels.

Null hypothesis 8. The null hypothesis of no significant interaction between ability to understand instruction and quality of instruction relative to classes spent was not rejected. (See Table 8.) Figure 3 illustrates the graph of the nonsignificant ordinal interaction discovered between ability to understand instruction and quality of instruction relative to the number of classes spent.

Null hypothesis 9. The null hypothesis of no significant difference between (a) the mastery learning group's correlation coefficient for classes spent and ability to understand instruction and (b) zero was not rejected. The null hypothesis of no significant difference between (a) the control group's correlation coefficient for classes spent and ability to understand instruction and (b) zero was not rejected. Table 9 presents the coefficients of correlation between the number of classes spent and intelligence quotient scores as well as the standard deviations for both treatment groups.

Degree of Learning and Perseverance

Null hypothesis 10. The null hypothesis of no significant difference between (a) the mastery learning group's correlation coefficient for degree of learning and perseverance and (b) zero was not rejected. The null hypothesis of no significant difference between (a) the control group's correlation coefficient for degree of learning and perseverance and (b) zero was not rejected. Table 10 presents the coefficinets of correlation between achievement scores and the number of minutes spent in persevering as well as the standard deviations for both treatment groups.

Degree of Learning and Classes Spent

Null hypothesis 11. The null hypothesis of no significant difference between (a) the mastery learning group's correlation coefficient for degree of learning and classes spent and (b) zero was not rejected. The null hypothesis of no significant difference between (a) the control group's correlation coefficient for degree of learning and classes spent and (b) zero was not rejected. Table 11 presents the coefficients of correlation between achievement scores and the number of classes spent as well as the standard deviations for both treatment groups.

Discussion

Further empirical verification was provided regarding Carroll's assumption that an increase in quality of instruction while the other components of the model remain constant results in a closer approximation of mastery learning. Furthermore, the first instance of empirical support was provided regarding Carroll's hypothesized interaction between ability to understand instruction and quality of instruction relative to degree of learning. Hence, educational administrators, curriculum developers, and instructional strategists alike have available a theoretical paradigm accompanied by supporting evidence which can serve as a basis for arriving at decisions in their respective areas.

Previous research has failed to address itself to the theoretical basis underlying administrative decisions regarding the organizational patterning of schools. This study, however, served to fill this void and, in so doing, established empirical verification of a number of basic assumptions inherent in the Carroll model. Due to its heavy reliance upon the time factor in learning, the Carroll model represents an excellent basis for the theoretical justification of a form of school organization such as nongradedness which has as its primary objective the provision of flexible time allotments during which a student can actively engage in a learning task until his time spent is commensurate with his time needed.

The organizational structuring of schools in terms of a nongraded pattern as well as the construction of an instructional strategy based upon feedback/correction procedures are related very directly to decisions of a curricular nature. Of particular importance are those decisions that foster (a) the segmenting of courses into various learning sequences and (b) the emphasizing of time as a variable and subject-matter mastery as a constant.

The employment of feedback/correction procedures in this study for the purpose of constructing a high quality of instruction served to demonstrate the efficacy of this particular instructional strategy. Though not contingent upon a nongraded or continuous-progress setting for implementation, the effectiveness of a pedagogical approach characterized by feedback/correction procedures is enhanced by a school organizational pattern which provides unlimited time opportunity for learning.

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TABLE 1

Cell Summary for Unweighted Means Analysis of Variance of Achievement Scores for Mastery Learning and Control Groups Crossed With Three Ability Levels

Factor A: Ability	Factor B: Treatments					
	MLG		CG		Rows	
	n	Mean	n	Mean	n	Mean
High	27	20.37	33	15.64	60	17.77
Average	26	17.73	33	11.91	59	14.47
Low	11	18.00	11	8.73	22	13.36
Columns	64	18.89	77	13.05		

TABLE 2

Unweighted Means Analysis of Variance of Achievement Scores for Mastery Learning and Control Groups Crossed With Three Ability Levels

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Squares	F
Ability Levels	2	425.04	212.52	12.42**
Treatments	1	1236.67	1236.67	72.27**
Ability Levels X Treatments	2	105.98	52.99	3.10*
Error	135	2309.96	17.11	
Total	140	4077.64		

*Significant at the .05 level.
**Significant at the .001 level.

TABLE 3

Coefficients of Correlation Between Achievement Scores and Intelligence Quotient Scores for Mastery Learning and Control Groups

r		Achievement S. D.'s		Intelligence Quotient S. D.'s		N	
MLG	CG	MLG	CG	MLG	CG	MLG	CG
.29*	.48**	3.93	5.01	11.35	11.85	64	77

*Significant at the .025 level.
**Significant at the .01 level.

TABLE 4

Cell Summary for Unweighted Means Analysis of Variance of Number of Minutes Spent in Persevering by Mastery Learning and Control Groups Crossed With Three Ability Levels

Factor A: Ability	Factor B: Treatments					
	MLG		CG		Rows	
	n	Mean	n	Mean	n	Mean
High	27	8.26	33	9.53	60	8.96
Average	26	10.29	33	8.70	59	9.40
Low	11	10.15	11	8.14	22	9.14
Columns	64	9.41	77	8.97		

TABLE 5

Unweighted Means Analysis of Variance of Number of Minutes Spent in Persevering by Mastery Learning and Control Groups Crossed With Three Ability Levels

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Squares	F
Ability Levels	2	6.81	3.41	.20
Treatments	1	17.05	17.05	1.00
Ability Levels X Treatments	2	59.81	29.90	1.76
Error	135	2293.36	16.99	
Total	140	2377.03		

TABLE 6

Coefficients of Correlation Between Number of Minutes Spent in Persevering and Intelligence Quotient Scores for Mastery Learning and Control Groups

r		Perseverance S. D.'s		Intelligence Quotient S. D.'s		N	
MLG	CG	MLG	CG	MLG	CG	MLG	CG
-.19	.15	4.06	4.19	11.35	11.85	64	77

TABLE 7

Cell Summary for Unweighted Means Analysis of Variance of Number of Classes Spent by Mastery Learning and Control Groups Crossed With Three Ability Levels

Factor A: Ability	Factor B: Treatments					
	MLG		CG		Rows	
	n	Mean	n	Mean	n	Mean
High	27	16.33	33	9.18	60	12.40
Average	26	16.92	33	9.03	59	12.51
Low	11	15.64	11	8.82	22	12.23
Columns	64	16.45	77	9.06		

TABLE 8

Unweighted Means Analysis of Variance of Number of Classes Spent by Mastery Learning and Control Groups Crossed With Three Ability Levels

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Squares	F
Ability Levels	2	11.21	5.60	.19
Treatments	1	1503.41	1503.41	51.38*
Ability Levels X Treatments	2	5.71	2.86	.10
Error	135	3949.91	29.26	
Total	140	5470.23		

*Significant at the .001 level.

TABLE 9

Coefficients of Correlation Between Number of Classes Spent and Intelligence Quotient Scores for Mastery Learning and Control Groups

r		Classes Spent S. D.'s		Intelligence Quotient S. D.'s		N	
MLG	CG	MLG	CG	MLG	CG	MLG	CG
-.004	.04	5.49	5.21	11.35	11.85	64	77

TABLE 10

Coefficients of Correlation Between Achievement Scores and Number of Minutes Spent in Persevering for Mastery Learning and Control Groups

r		Achievement S. D.'s		Perseverance S. D.'s		N	
MLG	CG	MLG	CG	MLG	CG	MLG	CG
.13	-.08	3.93	5.01	4.06	4.19	64	77

TABLE 11

Coefficients of Correlation Between Achievement Scores and Number of Classes Spent for Mastery Learning and Control Groups

r		Achievement S. D.'s		Classes Spent S. D.'s		N	
MLG	CG	MLG	CG	MLG	CG	MLG	CG
-.16	-.22	3.93	5.01	5.49	5.21	64	77

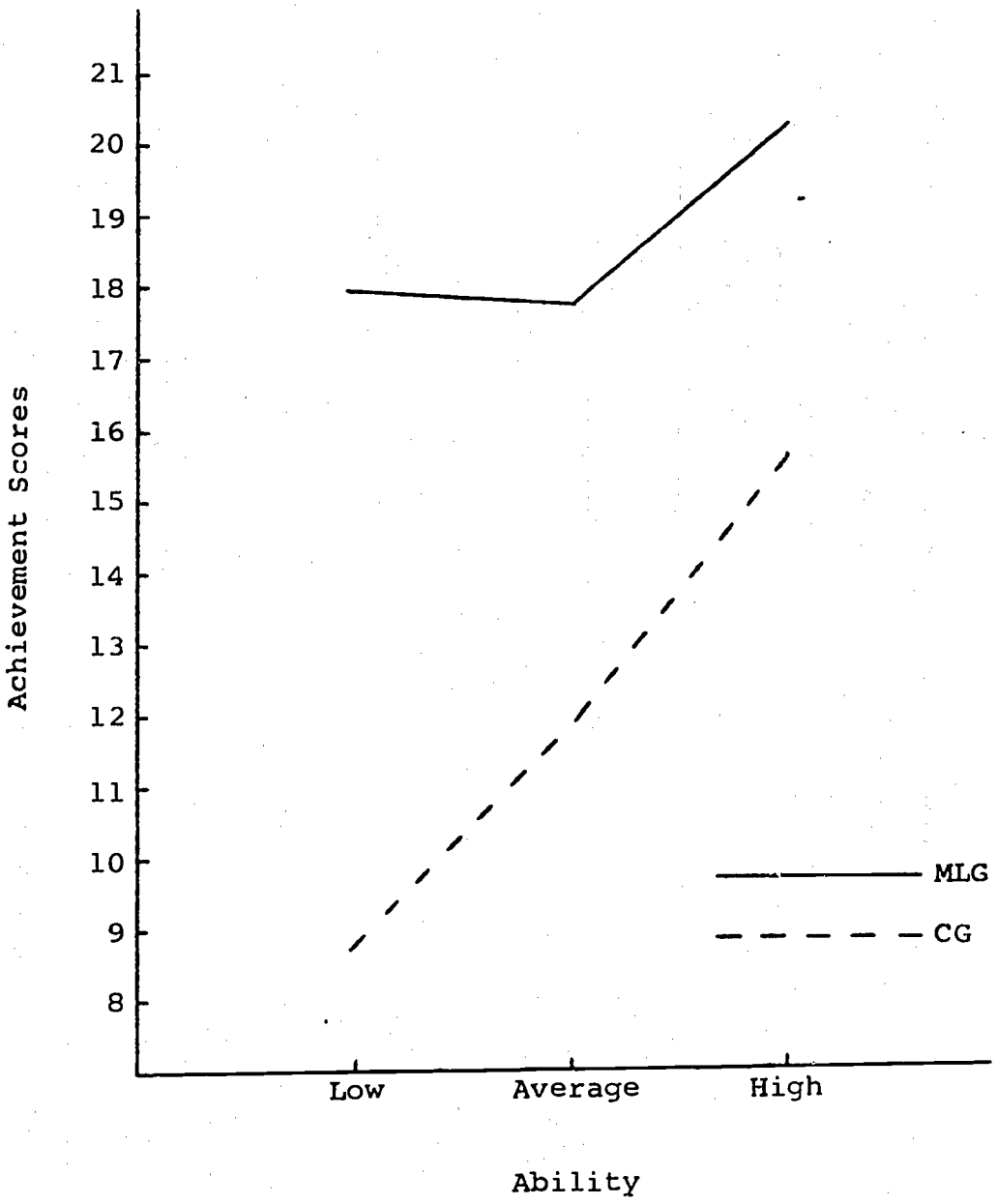

Fig. 1. Illustration of the significant ordinal interaction found between ability to understand instruction and quality of instruction relative to achievement scores.

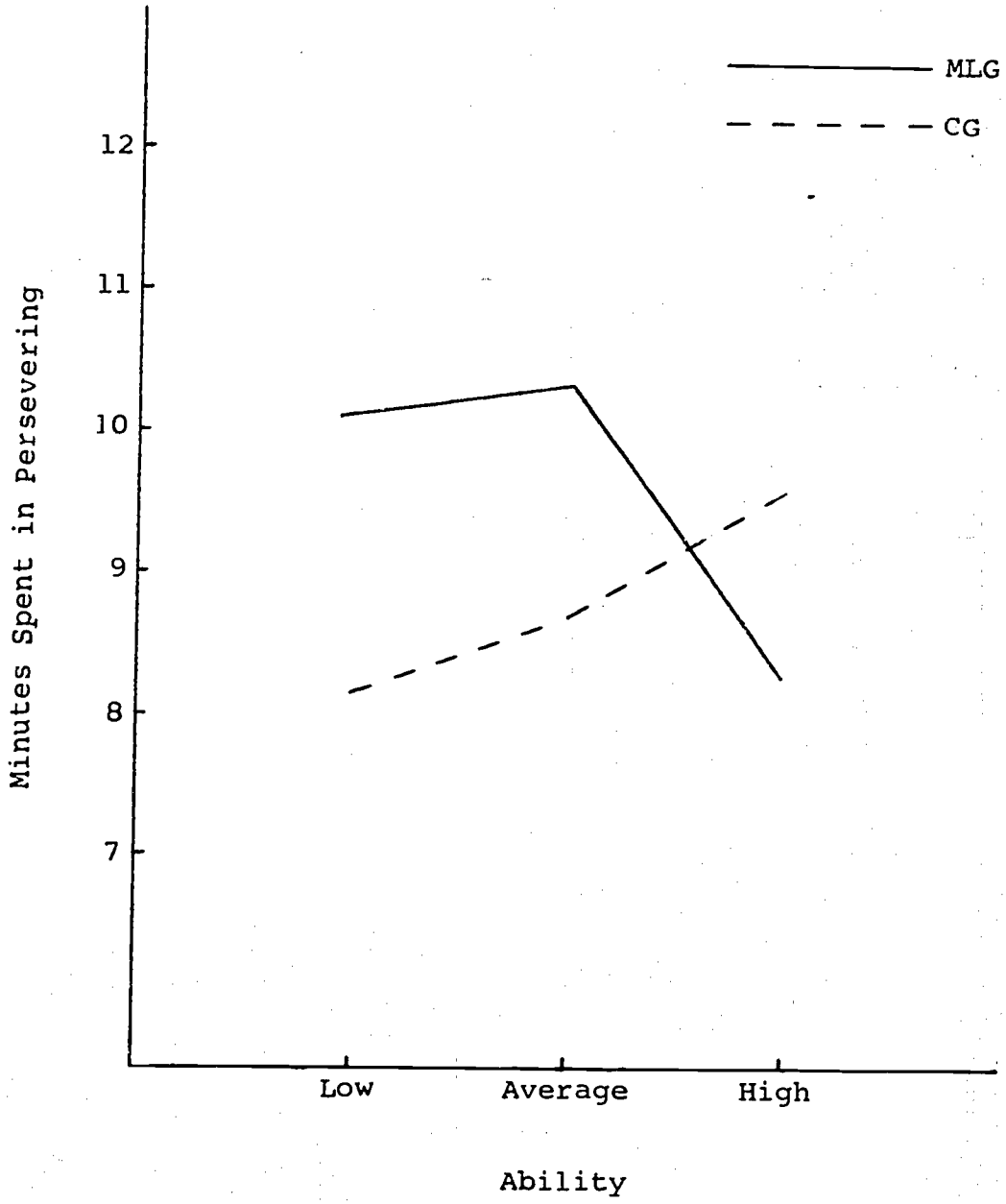

Fig. 2. Illustration of the nonsignificant disordinal interaction found between ability to understand instruction and quality of instruction relative to the number of minutes spent in persevering.

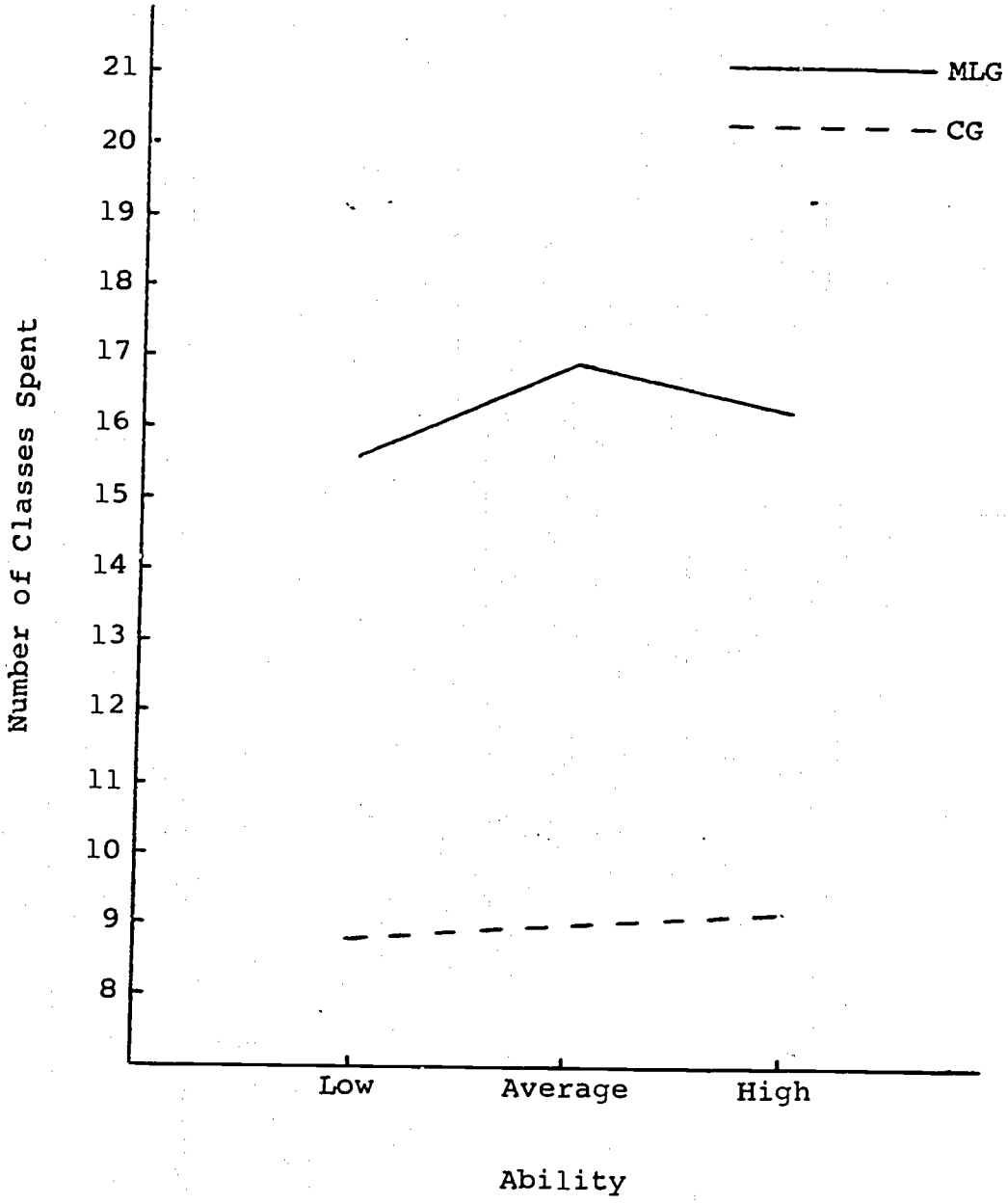

Fig. 3. Illustration of the nonsignificant ordinal interaction found between ability to understand instruction and quality of instruction relative to the number of classes spent.