DOCUMENT RESUME

ED 251 494 TM 840 775

AUTHOR Veldman, Donald J.; Sanford, Julie P.
TITLE The Influence of Class Ability Level on Student Achievement and Classroom Behavior.
INSTITUTION Texas Univ., Austin. Research and Development Center for Teacher Education.
SPONS AGENCY National Inst. of Education (ED), Washington, DC.
REPORT NO R&DCTE-4095
PUB DATE May 82
CONTRACT OB-NIE-G-80-0116
NOTE 34p.
AVAILABLE FROM Communication Services, R & DCTE, Education Annex 3.203, The University of Texas at Austin, Austin, TX 78712.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Ability Grouping; Academic Ability; *Academic Achievement; *Aptitude Treatment Interaction; *Classroom Environment; Classroom Observation Techniques; Classroom Research; English Instruction; High Achievement; Individual Differences; Junior High Schools; Low Achievement; Mathematics Instruction; *Student Behavior; Teacher Behavior; Teacher Effectiveness
IDENTIFIERS California Achievement Tests; Texas Junior High School Study

ABSTRACT

Using a series of regression equations, classroom process and student achievement data from 136 junior high school mathematics and English classes were analyzed to answer the following questions: (1) Are the classroom behaviors and achievement levels of students systematically different across classes of higher and lower ability? (2) Within classes, are the behaviors of higher and lower ability students systematically different? and (3) Does student ability level interact with the ability level of the class to affect systematically students' classroom behavior and achievement? Results of class level analyses suggest that better learning environments are associated with classes of higher mean ability, and that both higher ability students and lower ability students achieve better in higher ability classes. Interactions obtained between class and student ability levels suggest that differences in class environment associated with class ability level have more impact on achievement and behavior of lower ability students than on high ability students. Lower ability students appear to be more reactive to or dependent on class norms than are higher ability students. (Author)

The Influence of Class Ability Level On Student Achievement and Classroom Behavior

Donald J. Veldman

Julie P. Sanford

R & D Center for Teacher Education
The University of Texas at Austin

(R&D Rep. No. 4095)

Research and Development Center for Teacher Education
The University of Texas at Austin

May 1982

This study was supported in part by the National Institute of Education, Contract OB-NIE-G-80-0116, P2, Classroom Organization and Effective Teaching Project. The opinions expressed herein do not necessarily reflect the position or policy of the NIE and no official endorsement by that office should be inferred. Requests for reprints should be addressed to: Communication Services, R&DCTE, Education Annex 3.203, The University of Texas at Austin, Austin, Texas 78712.

Abstract

Using a series of regression equations, classroom process and student achievement data from 136 junior high school mathematics and English classes were analyzed to answer the following questions:

1. Are the classroom behaviors and achievement levels of students systematically different across classes of higher and lower ability?

2. Within classes, are the behaviors of higher and lower ability students systematically different?

3. Does student ability level interact with the ability level of the class to affect systematically students' classroom behavior and achievement?

Results of class level analyses suggest that better learning environments are associated with classes of higher mean ability, and that both higher ability students and lower ability students achieve better in higher ability classes. Interactions obtained between class and student ability levels suggest that differences in class environment associated with class ability level have more impact on achievement and behavior of lower ability students than on high ability students. Lower ability students appear to be more reactive to or dependent on class norms than are higher ability students.

The Influence of Class Ability Level on Student Achievement and Classroom Behavior

In the 1970's significant progress was made in research on classroom processes and effective teaching, but relatively little was focused on how characteristics of students making up classes influence processes or outcomes (Good, Note 1). Results of research on ability grouping in schools, aptitude treatment interactions, and several recent class composition studies suggest that more research is needed on student composition of classes as a context variable affecting classroom instructional processes and outcomes. The present study examines the effect of one class composition variable, class ability level, on achievement and behavior in junior high school mathematics and English classes.

A large number of studies have attempted to show that homogeneous ability grouping in schools has effects on student achievement and other educational outcomes (Esposito, 1973; Heathers, 1969; Rosenbaum, 1980). In Rosenbaum's review of research on educational grouping, the author discussed the conflicting results of ability grouping research on learning outcomes and hypothesized that the confusion of results may be due to failure to control for the teaching methods that were used or to examine how instructional processes differed for different groups in the various studies. Apart from Lundgren's work (1972) on the influence of steering groups on teacher instruction, there is little research that describes how teachers alter their instruction for different groups, and Rosenbaum speculated that the "absence of any instructional guidelines

for teaching different ability groups seems to affect teaching practices" (1980, p. 370).

Although not directly addressing the question of class composition, research on aptitude-treatment interactions (ATI) has shown that within classes, different instructional methods are more or less effective with groups of students of different ability. From such findings, a logical inference is that outcomes would also differ across classes of very different student composition. For example, Peterson, Janicki, and Swing (1981) reported that in four classes of randomly assigned fourth and fifth grade students who were taught a special two-week geometry unit, higher and lower ability students achieved better when taught with a small group approach, but medium ability students did slightly better in a large group approach than in a small group approach. These findings supported previous aptitude-treatment interaction study results. The authors observed group processes in an effort to explain the expected ATI, and they concluded that high and low ability students both participated in and benefited from peer tutoring in small group settings, but middle ability students did not.

These ATI results underscore the importance of considering the "mix" of students within a class as well as the general or mean ability level of the class. For example, the research findings described for small group instruction suggest that if a teacher had a homogeneous middle ability class, small group instruction might not be indicated. The finding of Peterson et al. (1981) concerning the role of peer tutoring in the small group approach, however, also suggests that in a homogeneous lower ability class one could not expect the beneficial effects of small group instruction (as used in that study) to occur.

The absence of higher ability students in the class and in the small groups would make a difference.

Such effects of class composition with respect to "mix" of student aptitude have been studied in third and fourth grade classes by Beckerman and Good (1981). They examined the effects of classroom ratio of high aptitude students to low aptitude students on mathematics achievement of students. Defining "more favorable" composition as classrooms with greater than 1/3 students of high aptitude and less than 1/3 students of low aptitude, and "less favorable" composition as classes with less than 1/3 students of high aptitude and more than 1/3 students of low aptitude, the authors compared residual achievement scores of both high and low aptitude students in favorable and less favorable composition situations in 81 classes. Analysis of variance indicated that in general both high and low aptitude students in more favorable composition situations had greater achievement gains than comparable students in less favorable composition situations. Effects were stronger for the low aptitude students: no significant differences were found between favorable and less favorable composition classes for third grade high aptitude students.

Two other recent studies have examined aspects of class composition and its effects on classroom processes and outcomes. Evertson (in press) compared average and low ability classes taught by the same teachers, and found that lower ability classes tended to have more off-task, inappropriate and disruptive student behavior, and when teaching their lower ability classes teachers were rated by observers as less consistent in handling behavior, less clear in instruction, and

less effective in adjusting instruction to fit student interests and backgrounds than when they taught their average ability classes.

Sanford (Note 2) examined the effects of another class composition variable, the range or spread of student ability within classes. Using 27 junior high school English classes, a series of regression models was used to assess class environment, management constraints, and teaching effects associated with classes with wide ranges of student academic ability. Results showed that extreme class heterogeneity placed greater demands on teachers for managing student behavior, meeting student concerns, and adjusting instruction. No effects were found on student achievement gains or on student ratings of the teacher. Neither the Evertson (in press) nor the Sanford (Note 2) study examined differential effects of class composition on students of differing ability levels within classes.

Purpose

In the present study data from 136 junior high school classes were analyzed to answer the following questions about class composition:

1. Are the classroom behaviors and achievement levels of students systematically different across classes of higher and lower ability?
2. Within classes, are the behaviors of higher and lower ability students systematically different?
3. Does student ability level interact with the ability level of the class to affect systematically students' classroom behavior and achievement? For example, do lower ability students behave differently or achieve at different levels according to whether they are in higher or lower ability

classes? Is the impact of class membership similar for low and high ability students?

The measure of class composition used in this study was class mean entering achievement level. This measure allowed the use of all of the classes available in the sample and permitted tests for interactions between class mean ability levels and student ability levels for a large number of variables. A series of regression equations were used to answer the three questions, first with regard to student achievement and then for measures of students' and teachers' classroom behavior, as well as ratings of students by classroom observers.

Methods

Sample

Using data sets obtained in the Texas Junior High School Study (TJHSS) (Evertson, Anderson, & Brophy, Note 3), data were available from 58 mathematics and 78 English classes in Grades 7 and 8 from nine junior highs representing a wide range of socioeconomic status in a city in the southwest. Within these classes measures of individual students were available for approximately 500 target students in mathematics and 650 target students in English classes, depending on the amount of missing data for particular variables. In the TJHSS individual student data were collected on a subsample of 10 to 12 target students per class. Target students were selected randomly within sex from teachers' rolls.

Student ability level was defined by scores on the California Achievement Test, which was administered to all students in all classes at the begining of the school year. Table 1 shows class means and standard deviations. Student achievement level was defined by scores on specially constructed tests referenced to course content which were

administered to all students at the end of the school year. Process measures of classroom behaviors involving target students were averaged over 20 hours of observation which took place regularly between November and April. In addition ratings of target students by the observers were obtained at the end of the school year.

Procedure

In order to answer the stated questions about class composition, analyses were conducted separately for mathematics and English classes, using the achievement measure, 25 high inference ratings of target students by observers, and 25 low inference classroom process measures of teacher and target student behaviors. To answer the first question (Are the classroom behaviors and achievement levels of students systematically different across classes of higher and lower ability?) class means were employed as the unit of analysis, and the predictive efficiencies of two regression models were compared. These models are shown below in abbreviated notation.

$$B_c = G + A_c$$

$$B_c = G$$

Where B_c = the criterion class mean achievement or behavior measure

G = grade level (7, 8)

A_c = class mean ability

The inclusion of grade level in the second equation served to hold it constant statistically when the significance of class mean ability level as a predictor of the criterion variable was assessed by comparing the second equation with the first.

To answer Question 2 (Within classes are the behaviors and achievement of higher and lower ability students systematically different?) and Question 3 (Does student ability level interact with the ability level of the class to affect students' classroom behavior and achievement?), scores from individual students were employed as the unit of analysis. Three regression equations were used for this purpose, shown below in abbreviated notation:

$$B_s = G + A_c + A_s + A_c * A_s$$

$$B_s = G + A_c + A_s$$

$$B_s = G + A_c$$

Where B_s = the criterion student behavior or achievement measure

A_s = student ability

G and A_c as defined earlier

The interaction of class and student ability levels was assessed by comparing the predictive efficiencies of the first and second equations. When the R^2 difference indicated a significant interaction, the nature and strength of that interaction was determined by computing four expected criterion values in order to illustrate the patterns. These scores were for higher and lower ability students in higher and lower ability classes where "higher" and "lower" were defined as one standard deviation from the grand means of students and classes.

The effect of individual student ability on behavior was estimated by comparing the second and third equations above. Because the class mean ability estimate remained present in the third equation, individual student ability was, in effect, assessed within classes.

Results

Student Achievement

When end-of-year achievement was the criterion, results of the analyses with regard to Questions 1 and 2 were predictable. At the class mean level of analysis, significant, high correlations were found between class mean ability level and class mean achievement (r = .93 and .95). The pupil level effects were also predictable and highly significant ($p < .001$): within classes, higher ability students achieved at higher levels than did lower ability students. The answer to Question 3 (Does student ability level interact with the ability level of the class to systematically affect students' classroom achievement?) was of much more interest. Significant interaction effects were found indicating that both high and low ability pupils do better in high ability classes and that the impact of the class level is more pronounced with low ability students. The interaction for math classes is illustrated in Figure 1, which shows expected achievement computed as a function of mean class ability levels. Comparison of the slopes of the two lines indicates that membership in a higher ability class has somewhat more impact on the achievement of low ability students than it does on the achievement of higher ability students. This pattern was even more striking in English classes (Figure 2). There, class mean ability level appears to have only a small positive effect on achievement of higher ability students, but the positive impact of higher class mean ability levels on achievement of lower ability students in English is pronounced.

Classroom Behaviors

Students' and teachers' classroom behavior data were analyzed to show how class ability level affects learning environments and, specifically, to explain why class ability level has more impact on achievement scores of lower ability students than on achievement of higher ability students. Classroom behavior data that were available from the Texas Junior High School Study included frequency counts of teacher and student behaviors (e.g., procedural contacts) and proportions formed from these (e.g., proportion of student responses that were callouts). In addition, observer ratings of target students' behavior characteristics were obtained. A total of 50 classroom behavior variables were used in the present analysis. Tables 2 and 3 show descriptors and class, pupil-within-class, and interaction effects for these variables. All had significant ($p < .05$) between-observer reliability. In addition Table 4 describes interaction effects for selected variables in one subject area. These illustrate many of the findings discussed below.

Observer ratings of students. Of the 25 observer rating variables shown in Table 2, 14 showed significant relationships ($p < .05$) with class and pupil-within-class ability levels in both mathematics and English Classes. These results showed expected patterns associated with classes of higher mean ability and, within classes, with students of higher mean ability: Both higher ability classes and higher ability students within classes were associated with observer's perceptions of better work habits and motivation, more obedient, dependable behavior, greater persistence, self-confidence, and academic leadership, and more participation in class. They were also associated with lower observer ratings of student behavior problems, physical or verbal agression,

profane language, and academic dependence on the teacher. No consistent patterns of class level or pupil level effects were found for other ratings of student characteristics or behavior: extroversion, frequent interaction with teacher, calmness, unhappiness, physical maturity, atheletic ability, good peer relationships and cooperation, and frequent talking to neighbors. These characteristics did not consistently distinguish between high and low ability classes or between high and low ability students within classes. Several variables showed one or more significant relationships in one subject area but not in the other, but these subject differences formed no interpretable patterns.

Only three observer rating variables produced significant interactions between class and pupil ability levels in both subjects. One additional variable in English classes and five additional variables in mathematics classes showed interactions. Of the total of 12 such interactions, nine suggested that class ability level has more impact on the behavior of low ability students than high ability students in the class. For example, Table 4 shows results for the variable, Frequent Interaction with the Teacher. Low ability students were less likely to be rated high on this scale when they were members of high ability English classes than when they were members of lower ability English classes. No effects were found for high ability students. The same results were found for this variable in mathematics classes.

In English classes only, low ability students were rated as talking to their neighbors more in low ability classes than in high. This effect was not found for high ability students. In mathematics classes only, membership in higher ability classes appeared to have positive effects on ratings of low ability students' extroversion, confidence,

work habits, achievement (does the work and gets good grades), dependability, and avoidance of profane language. These class membership effects were either much weaker or nonexistent for higher ability students.

Classroom process variables. Low inference measures of classroom processes provided additional information about differences in classroom environments in high and low ability classes and about the impact of these differences on high and low ability students. The 25 measures shown in Table 3 yielded significant results consistent across subject matter for seven class level effects, eight pupil-within-class effects, and five interactions. At the class level, higher ability classes were characterized by fewer procedural contacts, less behavioral criticism, less mild and serious misbehaviors, fewer private student-created contacts, fewer behavior related contacts, and fewer callouts. These differences suggest better learning environments in higher ability classes. No consistent class level effects were found for academic praise, academic criticism, social contacts, student comments and questions, and most of the proportion variables (Variables 14 through 25).

Within classes, more able students were given more response opportunities and gave more correct answers, fewer incorrect answers, and fewer nonresponses. They experienced fewer aversive teacher contacts, and showed less mild and less serious misbehavior.

With regard to interactions between student and class ability levels, four of the five interactions that were significant in both mathematics and English classes showed similar patterns in the two subjects. When lower ability students were members of lower ability

classes, they had more aversive contacts, and more private teacher contacts, both teacher created and student-created, than did lower ability pupils in higher ability classes. In addition, in both English and mathematics classes, lower ability pupils in low classes and higher ability pupils in higher classes tended to receive more academic criticism from their teachers than either lower ability students did in higher ability classes or higher ability students did in lower ability classes.

In English class, but not in mathematics classes, lower ability students showed less misbehavior, mild or serious, when they were members of higher ability classes. Effects were weaker or nonexistent for high ability students. These results are included in Table 4.

Discussion

Results of class level analyses suggest that better learning environments are associated with classes of higher mean ability, and that both higher ability students and lower ability students achieve better in higher ability classes. Results for achievement are similar to those recently reported by Beckerman and Good (1981) in third and fourth grade classes. Interactions obtained between class and student ability levels suggest that differences in class environment associated with class ability level have more impact on achievement and behavior of lower ability students than on high ability students. Beckerman and Good hypothesized that achievement effects might be due to the fact that because teachers have fewer management problems in high ability classes, they have more time to provide individual help to students, particularly to lower ability students who might need individual tutoring. This interpretation is not supported by process findings in the present

study, which indicated that in higher ability classes lower ability students had fewer private contacts with the teacher, not more. This was true in both mathematics and English classes. An alternate, related hypothesis would be that better learning environments associated with higher ability classes allow teachers more time for active instruction in large or small groups.

Another interpretation of how class ability contexts affect student achievement is suggested by interaction effects for student behavior variables. With regard to work habits, dependability, and academic independence, lower ability students appear to be more likely to act in a manner consistent with the class as a whole, whereas higher ability students are less likely to do so. Higher ability students seem less reactive to or dependent on class norms than lower ability students do. A beneficial peer modeling situation is suggested, in which low ability students model good work behavior of a higher ability majority in higher ability classes.

In evaluating the impact of class composition on classroom processes and outcomes, the importance of teacher effects should not be overlooked. Class level effects in the present study, though significant, were of modest magnitude. A history of recent research on teaching suggests that when classroom behaviors or residual achievement gains scores are criteria in question, teachers' instructional and classroom management skills are more powerful predictors than are class composition or other context variables. A change in class composition or other context is unlikely to convert a very effective teacher into a totally ineffective one, and all low ability classes are, of course, not characterized by disruption and poor learning environments. In two

analyses demonstrating strong class ability level effects (Evertson, in press; Metz, Note 4), teacher effects were controlled by comparing classes of different ability tracks within teachers. Nevertheless, these studies and the present anaylsis demonstrate that class ability level is a context variable that should be taken into account in classroom research. As Beckerman and Good (1981) and others have warned, when analyses are being used to identify effective teachers or effective teaching strategies, classroom context must be taken into account in order to avoid confounding teacher effects with context effects.

Further research on composition of classes is needed, including attention to the issue of how best to measure and describe composition. In this study, mean class entering achievement scores were used as a rough measure of class ability context. This measure, however, leaves questions about the actual mix of students within classes. A class with a moderately high mean ability score may be a heterogeneous class with even distribution, a homogeneous class of moderate ability students, or a hetereogeneous class consisting of a group of very high ability students and a group of low ability students. The Beckerman and Good (1981) study utilized a range of ratios of high-ability to low-ability students to select subsamples of classes, but the authors cautioned that they made no attempt to define the ideal ratio that maximizes achievement for all students. More research is needed to identify critical mixes of students within classes.

Future studies of student ability levels as a class composition variable should include a variety of data about instructional processes in classes. The present analysis was limited to process variables

(frequency counts and formed proportions) and ratings of student characteristics. More information is needed about how instructional activities vary with different ability levels of classes and how student ability levels affect pacing of instruction and content coverage.

No study of teaching effectiveness will be able to take into account every possible variable of classroom context and student characteristics. However, concentration on those already shown to be related to teaching effects (for example, some measure of ability level of students in classes) seems crucial. More work is called for in identifying the best ways to measure such variables. Other potentially important class composition variables need to be explored as well. Goals for continued study of class composition and its effects should be to produce research based guidelines for making grouping decisions in schools and, ultimately, instructional guidelines for effective teaching in classes of different composition.

Reference Notes

1. Good, T. L. Classroom research: What we know and what we need to know. Austin: Research and Development Center for Teacher Education, The University of Texas at Austin, 1982.

2. Sanford, J. Comparison of heterogeneous and homogeneous junior high classes (R&D Rep. No. 6108). Austin: Research and Development Center for Teacher Education, The University of Texas at Austin, 1980.

3. Evertson, C., Anderson, L., & Brophy, J. Texas Junior High School Study: Final report of process-outcome relationships (R&D Rep. No. 4016). Austin: Research and Development Center for Teacher Education, The University of Texas at Austin, 1978. (ERIC Document Reproduction Service No. ED 173 744)

4. Metz, M. H. Teachers' adjustment to students behavior: Some implications for the process of desegregation. Paper presented at the annual meeting of the American Ecuational Research Association, Toronto, 1978.

References

Beckerman, T. M., & Good, T. L. The classroom ratio of high- and low-aptitude students and its effects on achievement. American Educational Research Journal, 1981, 18(No. 3), 317-327.

Evertson, C. E. Differences in instructional activities in average- and low-achieving junior high English and mathematics classes. Elementary School Journal, in press.

Esposito, D. Homogeneous and heterogeneous ability grouping: Principal findings and implications for evaluating and designing more effective educational environments. Review of Educational Research, 1973, 43, 163-179.

Heathers, G. Grouping. In R. L. Ebel (Ed.), Encyclopedia of educational research (4th ed.). New York: The Macmillan Company, 1969.

Lundgren, U. Frame factors and the teaching process. Stockholm: Almqvist & Wiksell, 1972

Peterson, P. L., Janeke, T. C., & Swing, S. R. Ability x treatment interaction effects on children's learning in large group and small group approaches. American Educational Research Journal, 1981, 18(No. 4), 453-473.

Rosenbaum, J. E. Social implications of educational grouping. In D. C. Berliner (Ed.), Review of Research in Education, American Educational Research Association: 1980.

Table 1

Class Mean Entering
California Achievement Test Scores
(Grade Level Equivalents)

	Means	Standard Deviation
Mathematics Classes	6.47	1.42
English Classes	6.74	1.76

Table 2

Class and Student Ability Level
Effects for Observer Ratings of Students

Variable	English Classes			Mathematics Classes		
	Class Level Effect	Pupil Within Class Effect	Interaction Effect	Class Level Effect	Pupil Within Class Effect	Interaction Effect
1 Extroversion	ns	<.05(+)	ns	ns	ns	.05
2 Obedience	<.01(+)	<.01(+)	ns	<.01(+)	<.01(+)	ns
3 Confidence	<.01(+)	<.01(+)	ns	<.01(+)	<.01(+)	<.01
4 Bad work habits	<.01(-)	<.01(-)	ns	<.01(-)	<.01(-)	<.05
5 Frequent interaction with teacher	ns	ns	<.01	ns	ns	<.05
6 Sloppy appearance	<.01(-)	<.01(-)	ns	<.01(-)	<.01(-)	ns
7 Academic dependence on teacher	<.01(-)	<.01(-)	ns	<.01(-)	<.01(-)	ns
8 Emotional maturity	ns	<.01(+)	ns	ns	<.01(+)	ns
9 Achievement motivation	<.01(+)	<.01(+)	ns	<.01(+)	<.01(+)	ns
10 Calmness	ns	ns	ns	<.05(+)	<.05(+)	ns
11 Unhappiness	ns	ns	ns	ns	ns	ns
12 Academic achievement (good student)	<.01(+)	<.01(+)	<.01	<.01(+)	<.01(+)	<.01

Table 2, Continued

Variable	English Classes: Class Level Effect	English Classes: Pupil Within Class Effect	English Classes: Interaction Effect	Mathematics Classes: Class Level Effect	Mathematics Classes: Pupil Within Class Effect	Mathematics Classes: Interaction Effect
13 Physical maturity	<.01(-)	ns	ns	ns	ns	ns
14 Lacking persistence	<.01(-)	<.01(-)	ns	<.01(-)	<.01(-)	ns
15 Class participation	<.05(+)	<.01(+)	ns	<.05(+)	<.01(+)	ns
16 Good peer relationships	ns	<.01(+)	ns	ns	ns	ns
17 Good relationship with teacher	ns	<.01(+)	ns	<.01(+)	<.01(+)	ns
18 Physical or verbal agression	.05(-)	<.05(-)	ns	<.05(-)	<.01(-)	ns
19 Lacking dependability	<.01(-)	<.01(-)	ns	<.01(-)	<.01(-)	.01
20 Talking to neighbor	ns	ns	<.05	<.01(-)	ns	ns
21 Lacking cooperation	ns	ns	ns	<.01(-)	ns	ns
22 Behavior problems	<.01(-)	<.01(-)	ns	<.01(-)	<.01(-)	ns
23 Athletic ability	<.01(-)	ns	ns	ns	ns	ns
24 Profane language	<.05(-)	<.01(-)	ns	<.01(-)	<.05(-)	<.01
25 Academic leadership	<.01(+)	<.01(+)	<.01	<.01(+)	<.01(+)	<.01

Table 3

Class and Student Ability Level
Effects for Classroom Process Variables

Variable	English Classes			Mathematics Classes		
	Class Level Effect	Pupil Within Class Effect	Interaction Effect	Class Level Effect	Pupil Within Class Effect	Interaction Effect
1 Public response opportunities	ns	<.01(+)	<.01	<.01(+)	<.05(+)	<.01
2 Pupil receives academic praise	ns	<.01(+)	ns	ns	ns	<.05
3 Pupil receives academic criticism	ns	ns	.01	ns	ns	<.01
4 Student/teacher procedural contacts	<.01(-)	ns	<.05	<.05(-)	ns	ns
5 Student/teacher social contacts	ns	ns	ns	ns	ns	ns
6 Student receives behavioral criticism	<.05(-)	ns	ns	<.01(-)	<.05(-)	ns
7 Mild misbehaviors	<.01(-)	.01(-)	<.01	<.01(-)	.01(-)	ns
8 Serious misbehaviors	<.01(-)	ns	.01	.05(-)	<.05(-)	ns
9 Reinforcing contacts	.05(+)	<.05(+)	ns	ns	ns	ns
10 Aversive contacts	<.01(-)	<.05(-)	<.01	ns	<.05(-)	<.05
11 Private student-created contacts	<.01(-)	ns	<.05	<.01(-)	ns	.05

Table 3, Continued

Variable	English Classes: Class Level Effect	English Classes: Pupil Within Class Effect	English Classes: Interaction Effect	Mathematics Classes: Class Level Effect	Mathematics Classes: Pupil Within Class Effect	Mathematics Classes: Interaction Effect
12 Private teacher-created contacts	<.01(-)	<.01(-)	<.01	ns	ns	<.01
13 Student comments and questions	ns	ns	ns	ns	ns	ns
*14 Callouts/responses	<.05(-)	ns	ns	<.05(-)	.01(-)	ns
15 Correct answers/responses	ns	<.01(+)	ns	ns	<.01(+)	<.05
16 Incorrect answers/responses	ns	<.01(-)	ns	ns	.01(-)	ns
17 Don't know/responses	ns	<.01(-)	ns	ns	ns	ns
18 No response/response	<.05(-)	<.01(-)	ns	ns	<.05(-)	ns
19 Praise/response opportunit[illegible]	ns	ns	ns	ns	ns	ns
20 Criticism/response opportunities	ns	<.05(-)	<.05	ns	ns	ns
21 Response opportunties/dyadic contacts	ns	<.01(+)	ns	<.01(+)	<.05(+)	ns

Table 3, Continued

Variable	English Classes: Class Level Effect	English Classes: Pupil Within Class Effect	English Classes: Interaction Effect	Mathematics Classes: Class Level Effect	Mathematics Classes: Pupil Within Class Effect	Mathematics Classes: Interaction Effect
22 Student-created private/ dyadic contacts	ns	ns	ns	<.01(-)	ns	.01
23 Teacher-created private/ dyadic contacts	<.01(-)	<.01(-)	ns	ns	ns	<.01
24 Behavior related/dyadic contacts	<.01(-)	<.01(-)	ns	<.05(-)	<.01(-)	ns
25 Social dyadic contacts/ dyadic contacts	ns	ns	ns	ns	ns	ns

*Variables 14 through 25 are proportions formed from rate variables. For example, Callouts/responses should be read "the proportion of student responses that were callouts", and Praise/response opportunities is "the proportion of student response opportunities that were followed by teacher praise".

Table 4

Class and Student Ability Level Effects for Selected Classroom Behavior Variables in English Classes

Variable	Class Level Effect	Pupil Within Class Effect	Interaction Effect	Nature of Interaction
Frequent interaction with teacher	ns	ns	.003	For low ability students, lower ratings in higher ability classes. No effect for higher ability students.
Talking to neighbor	ns	ns	.02	For low ability students, lower ratings in higher ability classes. No effect for higher ability students.
Receives academic criticism	ns	ns	.01	Less for lower ability students in higher ability classes. More for higher ability students in higher ability classes.
Mild misbehaviors	.0001(-)	.01(-)	.0007	For low ability students, less in higher ability classes. Effect for higher ability students similar but much weaker.

Table 4, Continued

Variable	Class Level Effect	Pupil Within Class Effect	Interaction Effect	Nature of Interaction
Serious misbehaviors	.007(-)	ns	.01	For low ability students, less in higher ability classes. No effect for higher ability students.
Aversive contacts	.0001(-)	.02(-)	.0004	For lower ability students less in higher ability classes. Little effect for higher ability students.
Private student-created contacts	.004(-)	ns	.03	For lower ability students less in higher ability classes. Effects similar but weaker for higher
Private teacher-created contacts	.003(-)	.005(-)	.006	For lower ability students less in higher ability classes. Effects similar but weaker for higher ability students.

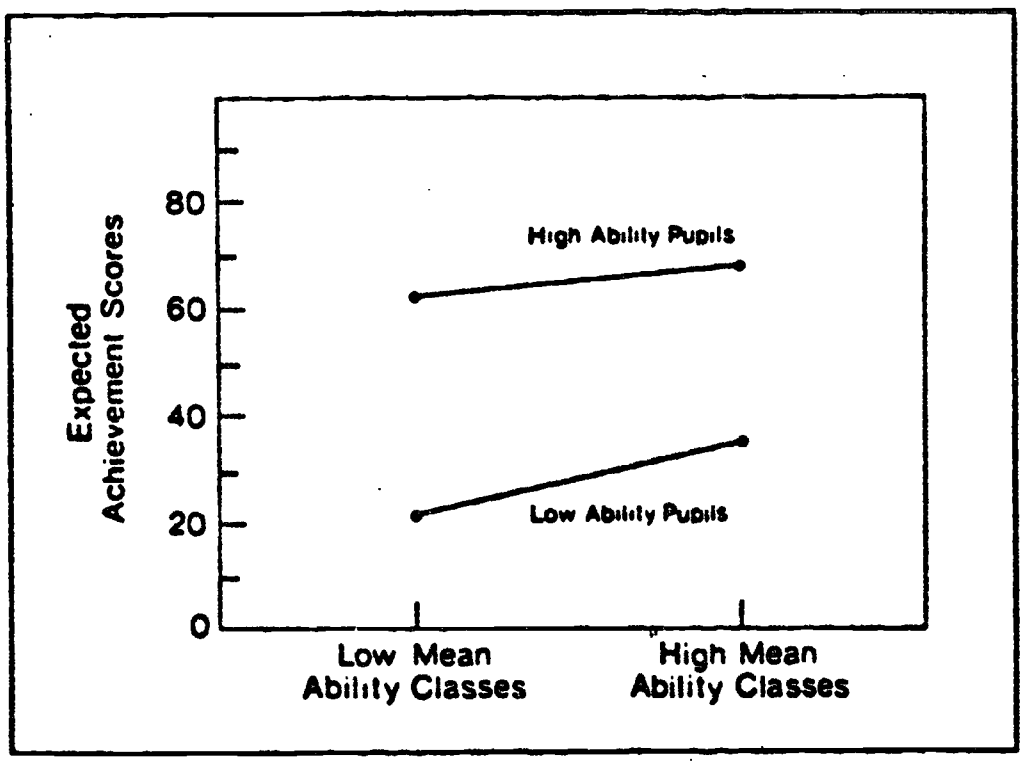

Figure 1. Expected achievement as a function of mean class ability levels in mathematics classes.

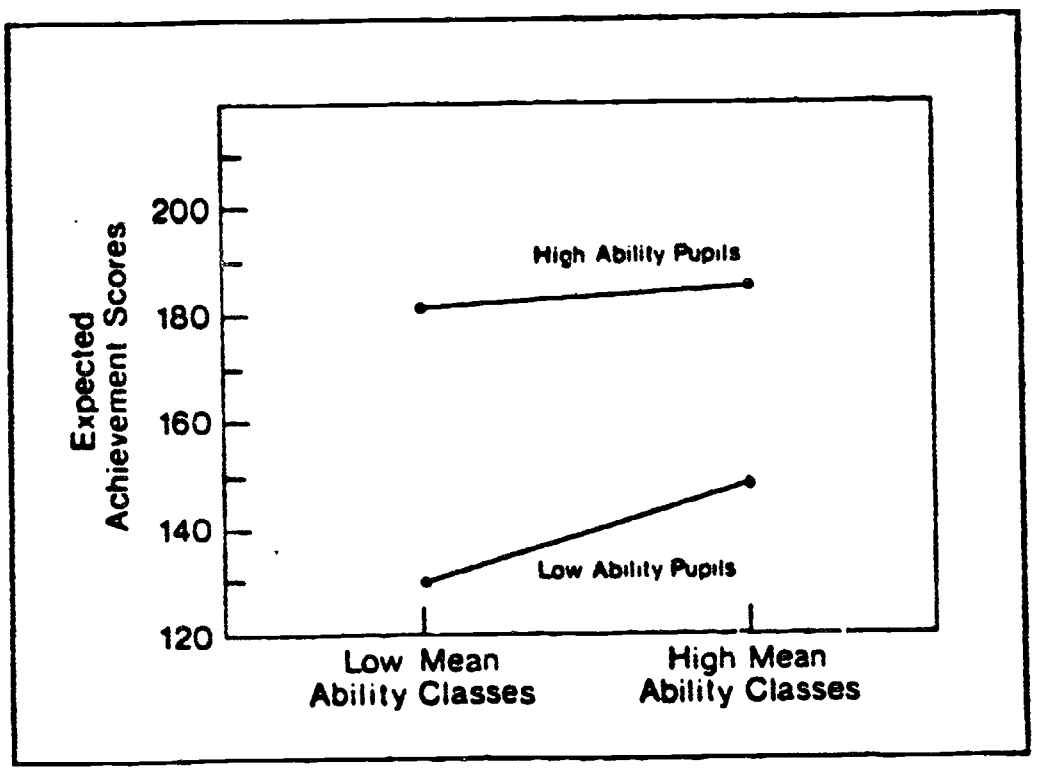

Figure 2. Expected achievement as a function of mean class ability levels in English classes.