A LOCAL SCHOOL USES THE SCIENTIFIC METHOD TO SOLVE ITS GROUPING PROBLEMS

John T. Lovell and Harrison C. Godfrey
Auburn University

The setting was a principal's office. The characters included a principal, several teachers, and a college professor. The subject was a cooperative research study which was being designed by the faculty of Bay High School, Panama City, Florida. Its object: to improve their effectiveness in providing for the individual needs of their students.

Briefly, these teachers sensed they were not achieving their teaching purposes as effectively as they might. The group identified the range of individual ability in classes as being a big block to achieving purposes. The teachers hypothesized that if they could reduce the range of individual ability in their classes in English, biology, and algebra; they could do a more effective job of helping students master the subject matter, of improving their attitudes toward school, of aiding students in becoming more acceptable to themselves and to their classmates.

The Purpose of this Study

Through the use of statistical analyses this study was designed to determine the effects of ability grouping upon high school students in the following respects: (a) academic progress in subject matter areas of English, biology and algebra II, (b) attitude toward school in general and toward certain subjects in particular, (c) student's acceptance of self and others, and (d) acceptance of students by their classmates.

In general, this study was designed to evaluate student performance in and reaction to a reduced range of ability grouping situation; more specifically, it dealt with the relationship between the grouping situation and any associated differences in scores on the several measuring instruments used.

The experimental variable of the present study was the situational influence brought about by the particular circumstances created by grouping. The dependent variable was effects of the situation inferred from differences in scores or responses on the several instruments used.

To keep the study within as rigid experimental controls as possible, the grouping situation was highly specific. The time between initial test and retest was the same for both groups. The teacher variable was controlled by having the same teachers work with approximately the same number of sections included in both groups. Therefore, if significant differences were found, it could be shown that they were due to the grouping situation and little else.

The main feature of this design is that it controls scholastic aptitude, prior achievement, and teacher influence leaving the grouping situation as the influencing variable to be observed.

It was hypothesized that students grouped homogeneously according to ability as evaluated by scholastic aptitude test scores, achievement test scores and grades in the specific subject area, when compared with students of approximately equal ability, grouped more heterogeneously would: (a) make greater academic progress in the subjects investigated, (b) reveal no significant effects in acceptance by their classmates, (c) reveal no significant difference in acceptance of self and others, and (d) show a more positive attitude toward school in general and the subject areas investigated in particular.

Description of the Population

The subjects of this study were students in the tenth grade who attended Bay High School, Panama City, Florida, during the school year 1958-1959. The two major groups employed in the investigation are those which can be referred to as the experimental group and the control group. These groups were matched for general scholastic aptitude and general prior achievement as follows:

The School Ability Test was used as a measure of scholastic aptitude. Prior general achievement was measured by use of the American Council on Education Psychological Examination. These scores were combined with grade point averages to arrive at an ability index for each student.

The entire tenth grade was then ranked from highest to lowest ability index scores. Students were then assigned numbers. The student having the highest ability index score received number one, and so on down to the lowest score. Odd numbered students were then placed in the experimental group to be organized into sections designed to reduce the range of ability as much as possible in English, biology, and algebra. Even numbered students were placed in the control group where sections of these same subjects were organized so as to include the full range of ability in every section.

In the experimental or narrowed ability range group, nine sections of twenty-eight to thirty students each were organized. Students' scores on the ability index were again used as a criterion for sectioning. The top ranking thirty students in the group were assigned to the first section and succeeding blocks of twenty-eight to thirty students as ranked made up the other sections.

The investigators felt that experimental type grouping would not in all instances provide sufficient controls with regard to previous achievement

and scholastic aptitude. These variables were, therefore, controlled statistically principally through analysis of co variance in all cases where the groups changed as a result of drop-outs or missing re-test scores. This treatment was necessary, however, only in testing the significance of differences in the English classes.

The experimental (decreased ability range) and control (increased ability range) groups were utilized for purposes of comparison of (a) academic progress as measured by standardized tests given at the beginning and end of the school year in each subject area, (b) student acceptance by classmates as measured by sociogram administered at beginning and end of the term, (c) student acceptance of self and others as measured by the High School Index of Adjustment and Values also given at beginning and end of the school term, and (d) student attitude toward school in general and particular subjects as measured by questionnaire developed by the writer with response at the end of the school year by the entire sample.

Group Characteristics

The population of this study consisted on an experimental group and a control group of students in English, biology, and algebra II classes at Bay High School, Panama City, Florida. The criteria for matching the two groups were: (a) scholastic aptitude, (b) prior general achievement, and (c) previous grades in subject.

Since the two groups were matched according to scores obtained on the School Ability Test and the American Council of Education Psychological Examination, it was not to be expected that statistically significant differences existed between the total groups. Table 1 shows the results of the comparison of these two groups in scholastic aptitude and general achievement. As indicated in Table 1 the F values computed by the analysis of variance are not statistically significant. With 1 and 553 degrees of freedom, an F value of 3.86 is needed for significance at the .05 level of confidence.

Table 1

Comparison of Psychological and Achievement Test Scores Obtained by High School Students in Increased and Reduced Ability Range Groups

Tests	Experimental Reduced Ability Range Group		Control Increased Ability Range Group		F
	N	M	N	M	
ACE Psychological Examination	261	49.32	294	50.04	.79
School Ability Test	261	48.67	294	49.72	.51

This comparison of scholastic aptitude and prior achievement shows no significant differences between the total experimental group and the total control group. Thus, the assumption of adequate comparability on these bases seems to be satisfied insofar as the total group is concerned.

Comparison of Academic Progress of Decreased and Increased Range of Ability Groups

To gain information with regard to the existence of differences in academic progress between the decreased and increased range of ability groups as well as low and high ability classifications within the two main groups in the subject areas of English, biology and algebra II, the analysis of variance, analysis of co variance, and the t statistics were employed. Gain reflected between initial and post tests on the several standardized tests was the criterion of academic progress.

Table 2 shows the results of the analysis of co variance with the total English classes and with upper and lower ability classifications within the experimental and control groups. The California Language Test scores were the bases for assessing achievement in English.

Table 2

Comparison of Gain Scores by High School Students in Reduced and Increased Ability Range Groups

California Language Test	Experimental Reduced Ability Range Group		Control Increased Ability Range Group		F
	N	M	N	M	
Total	246	1.29	241	1.04	3.92*
Upper Ability	82	1.63	82	1.18	7.90**
Lower Ability	74	1.02	70	.90	.74

*Significant at .05 level
**Significant at .01 level

As indicated in Table 2, the mean grade placement gain scores on the California Language Test is considerably different for the two groups. The gain in grade placement for the total experimental group is 1.29 years while the total control group gained 1.04 years. The F value for total is 3.92 and is significant at the .05 level.

As also shown in Table 3, the difference is achievement in the upper ability classification is more pronounced. Mean gains of 1.63 and 1.18 grades respectively for the experimental group and control group are shown. The resulting F value of 7.90 is significant at the .01 level.

Table 3

Comparison of Gain Scores Obtained by High School Students In Increased and Reduced Ability Range Groups

Cooperative Literary Appreciation Test	Experimental Reduced Ability Range Group		Control Increased Ability Range Group		F
	N	M	N	M	
Total Group	237	.41	265	.47	.06
Upper Ability Group	72	.52	76	.61	.09
Lower Ability Group	67	.43	69	.45	.0

The comparatively small difference in the mean gain of the lower ability classification was not statistically significant. This difference of .12 grade placement years and the F value of 174 did not approach the required value of 3.86 for significance.

Analysis of the Cooperative Literary Appreciation Test results shown in Table 3 revealed no statistically significant differences between the experimental (reduced range of ability) and control groups either in the total group or in upper and lower ability classifications. The values of F obtained range from 0 to .09 and do not even approximate the required values of 3.86 for the total and 3.91 for the upper and lower classification.

The t statistic for correlated means was employed to determine the significance of differences in mean gain between the experimental and control groups as measured by the Blyth-Nelson Biology Test administered at the beginning and end of the school term.

The experimental and control groups were divided into upper and lower ability classifications and analyzed separately. The results of these computations are shown in Table 4. The t values of 1.04 and .37 are not statistically significant. A value of 1.96 is needed to meet the .05 criterion.

Table 4

Comparison of Achievement in Biology Of
Increased Ability and Reduced Ability High School Groups

Blyth-Nelson Biology Test	Experimental Reduced Ability Range Group		Control Increased Ability Range Group		t
	N	M	N	M	
Upper Ability Group	65	3.48	84	4.36	1.04
Lower Ability Group	66	2.35	84	2.93	.37

The comparison of the two groups in algebra II by the t test is shown in Table 5. The values of t reported are .87 for the upper ability classification and .52 for the lower ability group. These values do not approach the value of 2.01 required for significance at the .05 level of probability.

Table 5

Comparison of Achievement in Algebra II
By Increased and Reduced Ability High School Groups

Algebra Test	Experimental Reduced Ability Range Group		Control Increased Ability Range Group		t
	N	M	N	M	
Upper Ability Group	28	14.0	24	9.25	.87
Lower Ability Group	28	13.25	24	11.92	.52

The hypothesis that students would make greater academic progress when grouped according to ability than would students in more heterogeneously grouped classes is sustained by the findings of this study only in the investigation of English classes. The findings do not support the hypothesis in the case of the biology and algebra II classes. The hypothesis is, therefore, not sustained in the case of the latter.

Comparison of Acceptance of Students by Classmates in the Experimental and Control Groups

To determine the effects of ability grouping upon the acceptance of students by their classmates, the Mann-Whitney U Statistic was employed. The applicability of this statistic is indicated since the instrument used to evaluate acceptance achieved only ordinal measurement. Responses to a sociogram developed by the writers were used for this purpose.

The two groups were ordered according to change scores reflected between initial and final administrations of the sociogram. The range of change in acceptance as measured ranged from -22 to +20 choices in the entire sample. The U value of the ordered differences was 35,921.5 and the accompanying Z value corrected for ties was .4311. This value of Z meets the .33 level of probability, but not the criterion .05 level and is thus considered not statistically significant. The hypothesis that both groups were drawn from the same population is therefore tenable and the hypothesis of no significant effects on the acceptance of students by their classmates is sustained by the findings.

Comparison of Acceptance of Self and Others in the Experimental and Control Groups

To effect a test of the significance of any differences existing between the two groups with regard to acceptance of self and others the chi square statistic was utilized in an examination of Index of Adjustment and Values changes.

Changes in the four scoring categories of the Index of Adjustment and Values by students between the initial and final administrations of the instrument were accepted as the criteria of change in acceptance of self and others. The scoring categories -+, +-, ++, and -- were utilized for this purpose. Change by a student from a lower category to a higher one was considered positive change. Change to a lower rating from a higher one was considered evidence of negative change. No change in category rating was accepted as evidence of no change in acceptance of self and others.

The values of chi square obtained under the hypothesis of equal probability are shown in Tables 6, 7, and 8. The values thus computed range from .20 to 1.40. None of these values even approximates that required for significance at the .05 level of confidence for two degrees of freedom.

Table 6

Comparison of Index of Adjustment and Values Category Changes in Increased and Reduced Ability High School English Classes

	Experimental Reduced Ability Range Group	Control Increased Ability Range Group	Chi-Square
	N	N	
Total Group	201	225	.20
Upper Ability Group	74	59	.56
Lower Ability Group	64	60	.08

Table 7

Comparison of Index of Adjustment and Values Category Changes in Increased and Reduced Ability High School Biology Classes

	Experimental Reduced Ability Range Group	Control Increased Ability Range Group	Chi-Square
	N	N	
Total Group	192	217	1.40
Upper Ability Group	58	71	.88
Lower Ability Group	61	51	.80

Comparison of Index of Adjustment and Values Category Changes in Increased and Reduced Ability High School Algebra II Classes

	Experimental Reduced Ability Range Group	Control Increased Ability Range Group	Chi-Square
	N	N	
Total Group	79	69	.28

It is thus established that no statistically significant difference exists between the reduced and increased ability range groups with regard to category changes measured by the Index of Adjustment and Values. The hypothesis of no difference in acceptance of self and others may be considered as sustained by these findings.

Comparison of Student Attitudes Toward Their School Situation

The chi square statistic was also employed to test the significance of difference between the classes of students included in the reduced and increased ability range groups. Chi square values were calculated on each item of the nine item questionnaire.

Significant differences were found between the two ability range groups in both the English and biology classes. In the English classes a significant difference favoring the reduced ability range group was found on the item of teacher interest in teaching English. The reduced ability range group revealed a more positive attitude here. In the biology classes differences significant at the .01 level of confidence favoring the reduced ability range group were evident in items of student learning, student interest in subject, teacher interest in subject, teacher interest in student, and learning needs in biology being met. Significant differences meeting the .05 criterion included the items, student friendliness and student honesty.

Summary and Conclusions

The conclusions of this study are really a progress report, since the study was designed to cover a five-year period. However, it is felt that certain findings even at this early date have strong implications for hypothesizing about grouping procedures.

The hypothesis that students would make greater academic progress when grouped according to reduced range of ability was sustained by the findings of this study only in the case of the English classes. There were no statistically significant differences in the algebra and biology groups.

Indications are that grouping children in reduced range of ability groups as it was done at Bay High School has no statistically significant effect on the acceptance of students by their classmates as measured by the sociogram used, or the students' acceptance of self and others as measured by the Index of Adjustment and Values.

The experimental group developed a more positive attitude toward their school situation. This was especially true in the biology classes. There were no statistically significant differences in the algebra classes and only one in the English Classes, but all the differences were in favor of the experimental group.

One interesting observation of the results is that the F value for the upper one-third in the experimental group was substantially higher in all cases than the lowest one-third. The higher ability students profited more from the reduced range of ability grouping. In no case did the lower one-third in the experimental group profit more.

One significant factor in the Bay High School situation was that the teachers had a strong bias in favor of the reduced range of ability grouping at the beginning of the year and still had this strong bias at the end of the year. There is no way to assay the effect this might have had on the results of the study.