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CONTENTS

Responsibility, Anxiety, and Sociability in Male Students Talented in Mathematics or English

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THERE is increasing pressure within our society to find, identify, and utilize its talents with maximum efficiency. Such an objective necessitates a greater understanding of the learner, the learning process, the learning situation, and how these areas overlap and are interrelated.

In recent years psychologists have attempted to explore personality characteristics as determinants of learning ability, and there has been a growing interest in personality factors and their relationship to intelligence and intellectual functioning.

The personality variables—responsibility, anxiety, and sociability—were selected because research suggests these variables to be operative in a student's reaction to learning experiences. In other words, pre-instructional individual personality differences might influence a student's acquisition of abilities and skills because of differences in stimulus and response characteristics and ways in which stimulus and response are related or structured. In short, motivational responses may be germane to performance in mathematics and English.

Significant differences between the two groups—mathematics and English—might

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suggest that different environmental stimuli may be brought effectively to bear and inappropriate stimuli withheld. It was in terms of this inference that the following hypothesis emerged.

The specific hypothesis was: "Male high school seniors talented in either mathematics or English do not differ in sense of responsibility; but those talented in English have a high level of anxiety and a high degree of sociability."

A pilot study indicated a wide range of talent in both English and mathematics for male students. Generally only a few girls were enrolled in calculus. Because this population inbalance did not allow for an adequate sample of girls, a male population was used to determine whether those talented in mathematics differed from those talented in English in levels of responsibility, anxiety, and sociability.

For the purposes of this study, "sense of responsibility" was defined as being persevering, determined, and reliable, as measured by the R scale of the *Gordon Personal Profile* (Gordon, 1963). "Sociability" was defined as the degree to which a person seeks or avoids social relationships, as measured by the S scale of the *Gordon Personal Profile* (Gordon, 1963). "Anxiety" was defined as a feeling of tension, as measured by the *IPAT Anxiety Scale* (Cattell and Scheier, 1963). "Talented in English" referred to those students who were enrolled in an English honors class. "Talented in mathematics" referred to those students who were enrolled in calculus.

Because this research was concerned with students who develop vertical abilities, only students enrolled in English honors or calculus were included; the study did not include any student enrolled in both. It should be noted, however, that in the sample used for this study, most students did not excel in both areas.

In order to obtain relatively uniform conditions:

1. All schools included in the sample offered an English honors course and a calculus class;

2. All schools were located in relatively high socioeconomic suburban areas within a 50-mile radius of New York City; and

3. All schools had a population of which at least 85 percent of the graduates went on to further education.

Method

Forty mathematics and forty English students were randomly drawn from five suburban high schools. Sixteen senior male students from each high school—eight students from an English honors class and eight students from a calculus class—were used in the study. During a two-week period, the tests were administered by the researcher to all students. The tests were administered before noon in order to keep conditions as uniform as possible.

The *Gordon Personal Profile*, a forced-choice paper and pencil test, was used to measure responsibility and sociability. "The inventory was carefully constructed and a variety of norms are furnished. Validity data are thoroughly and conscientiously presented" (Heilbrun, 1965). The *IPAT Anxiety Scale* is a 40-item paper and pencil test which gives an accurate appraisal of anxiety level. Validity and reliability are reported and specific group norms are supplied. "For a quick measure of anxiety level in literate adolescents and adults for screening purposes, it has no peer" (Cohen, 1965).

The relationship of the English-mathematics talent variable on each of the three dependent variables—anxiety, responsibility, and sociability—was tested using a two-way analysis of variance. This required a 2x5 factorial design which permitted a test of the statistical significance of the difference between the mean of the English subject group and the mean of the mathematics subject group. This design also permitted a test of the difference among the five schools and a test for the interaction between the five schools and subject groups.

This analysis, in essence, compared students talented in mathematics with students talented in English and compared the five schools with each other to test if the respec-

Variations	Degrees of freedom	Sum of squares	Mean square	F
Subject groups	1	13.6	13.6	.783
Schools	4	98.0	24.5	1.426
Interaction	4	1.4	0.35	.020
Errors	70	1204.0	17.2	
Totals	79	1317.0		

Table 1. Analysis of Variance Source Table for Responsibility

tive levels of the dependent variable were significantly different among schools.

A two-way analysis of variance was computed for each dependent variable. Each such analysis yielded three tests for the comparisons: main effect of subject groups; main effect of schools; and interaction between schools and subject groups. Each comparison was expressed and tested in the form of an F ratio.

Results and Discussion

Table 1 indicates that no difference in levels of responsibility was found between the mathematics and English groups.

Judging from the results of this study and other studies, the personality variable, responsibility, appears to be a significant component of academic achievement.

Based on norms for male high school students throughout the country, 32 of the 80 students sampled (40 percent) scored in the 90-100 percentile range. Only five students scored below the 50th percentile. This would appear to indicate that responsibility is a crucial personality factor underlying academic achievement but that it does not differ between the two subject matter groups compared in this study.

Variations	Degrees of freedom	Sum of squares	Mean square	F
Subject groups	1	183	183	1.07
Schools	4	137	34.25	.200
Interaction	4	100	25	.146
Errors	70	10982	171	
Totals	79	11402		

Table 2. Analysis of Variance Source Table for Anxiety (Raw Scores)

The findings of this study indicate that there is no difference in anxiety level between the means of the mathematics and English groups. (See Table 2.) However, the data merit closer examination.

The scores themselves need further explanation. According to Cattell and Scheier:

> . . . A score of 1-3 is that of an unusually secure, phlegmatic, tough, placid, or relaxed person; a sten score of 4, 5, 6, or 7 indicates an average degree of anxiety. A score of 8 indicates a person whose anxiety level could be getting serious, while a sten score of 9 or 10 reveals a person definitely needing help, either for amelioration of a severely threatening situation or a more embedded characterological disposition (1963, p. 10).

The raw and sten scores for all students involved in the study indicate that mathematics students tended toward extremes. At least one mathematics student in each school had a sten score in the 1-3 range, whereas no English students scored in this range. Of the 40 students sampled in mathematics, eight had a sten score in the 9-10 range, whereas only two of the 40 students sampled in English had a sten score in this range. Figure 1 graphically illustrates this.

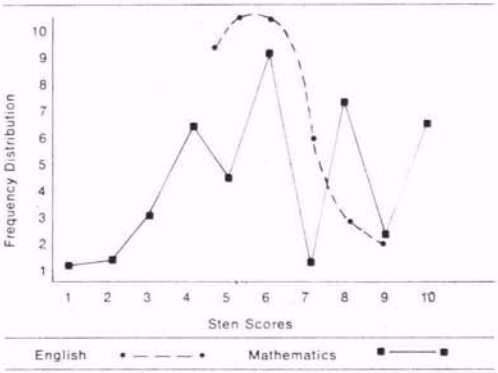

Figure 1. Distribution of Scores for English and Mathematics Groups

Because the analysis of variance is not sensitive to the shape of the distributions of the estimated means, a post hoc analysis of a comparison of the logarithms of the variances between the mathematics and English groups was computed and the F ratio, $F = 2.017$, was found to be significant beyond the .05 level (Scheffé, 1959, p. 83). In other words, even though the means of the two groups were not different, the distribu-

Variations	Degrees of freedom	Sum of squares	Mean square	F
Subject groups	1	3354	3354	101.02*
Schools	4	198	49.5	1.53
Interaction	4	50	12.5	0.388
Errors	70	2256	32.2	
Totals	79	5858		

* Significant $p < .05$.

Table 3. Analysis of Variance Source Table for Sociability

tion of scores was in fact different for the two groups.

Regarding sociability, the findings support previous research in the field. English students scored markedly higher in sociability than mathematics students. (See Table 3.)

When the scores were converted to percentile rank equivalents based on norms for male high school students throughout the country (Cattell and Scheier, 1963, p. 5), 29 of the 40 students sampled in English scored in the 80-100 percentile range. Only one student of the 40 sampled in mathematics scored in this range.

Other factors such as teaching style or methods of material presentation might also account for the differences in sociability between the two student groups. There is a growing body of research which relates teacher behavior to classroom climate and academic achievement.

The content material for English and mathematics classes might be such that certain kinds of teacher behavior are more prevalent in specific subject areas. Snider (1965), for example, studying classroom interaction in high school physics classes, found that teachers rarely used pupils' ideas.

Summary

Given the restricted definitions of anxiety, responsibility, sociability, and talent; the constricted range of students' ability; the limitation of the instruments; and the size and composition of the sample, it may be concluded that:

1. Students talented in mathematics or English do not differ in levels of responsibility.

2. Students talented in mathematics or English do not differ in mean levels of anxiety. However, mathematics students tend toward extremes—unusually secure to severely anxious. English students, on the other hand, tend to fall within the average range.

3. Students talented in English are considerably more sociable than students talented in mathematics.

No difference was found among schools and no interaction was evident between schools and student groups.

Implications

It would appear from this research that academically talented students have a generally high level of responsibility. This might be a dimension for further exploration in the problems of identification of academic potential of poor achievers. In high schools there has been a growing tendency to establish College Discovery programs, and colleges have been admitting a small number of students who fall below standards. Though many students are interested, there are a limited number of openings that can be made available. It might be well to use responsibility scores as one additional criterion in the selection process, since this trait seems to be a component of academic achievement.

The present research further suggests that mathematics and English classes have, for the most part, a different student body. English students were found to have a significantly higher level of sociability. This might indicate the desirability of a different approach for such students when studying math as well as the modification of the techniques for teaching language arts for students low on the sociability scale.

The data on anxiety with the broader range of anxiety scores for students talented in mathematics have several educational implications. First, these data too might indicate the desirability of varying teaching approaches for different types of students in terms of level of anxiety. Certainly, schools should be concerned with more extensive identification of anxiety levels of students and with school related factors contributing to extreme scores on anxiety. Further, given

the extremely serious potential damage of extreme anxiety, the presence in schools of students at high anxiety levels would appear to pose a critical problem for educators.

Of the mathematics students sampled, 20 percent of the students had an anxiety level which revealed "a person definitely needing help, either for amelioration of a severely threatening situation or a more embedded characterological disposition" (Cattell and Scheier, 1963, p. 10). This should be of deep concern and may be the most important finding of the study.

The present investigation raises some serious questions and doubts about placement procedures in high school mathematics classes. Math students in this investigation had low levels of sociability, and one-third of the students in each school had an anxiety level which was approaching a serious level or was already at a serious level.

It might be advisable for schools to administer to students the *IPAT Anxiety Scale* or a similar instrument to serve as a guideline for teachers and counselors in terms of placement. Such knowledge could also clue the teacher toward handling anxiety producing situations more thoughtfully and sensitively so that reactions would be appropriate rather than devastating.

In the present study, level of sociability was significantly higher for students talented in English than for students talented in mathematics. Past research indicates that the personality of a student may be operative in his reactions to various learning experiences. This being the case, the results obtained from the present study suggest that to maximize student potential in English, it might be appropriate to use different teaching strategies for the student who is not highly sociable. If, as in this study, level of sociability is significantly higher for students talented in English than for students talented in mathematics, it would seem reasonable to assume that to maximize learning in an English class for students who are mathematically talented it would be advisable to institute different organizational patterns. For example, these students might fare better in an independent study program or in small seminar groups where a greater degree of interaction is possible.

Conversely, for students talented in English but not talented in mathematics, different educational procedures in mathematics might also be more appropriate. Because little interaction occurs in mathematics classes, probably shorter but more frequent classes or programmed instruction in mathematics might provide these students with a more suitable method of acquiring necessary specific mathematics abilities and skills.

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