

## VOCATIONAL INTERESTS

William W. Cooley

Director, Project TALENT

The research I will summarize this morning is concerned with the interactions which take place during high school among interests, abilities, and career plans. Six sets of variables were examined: grade 9 interests and abilities, grade 12 interests and abilities, and grades 9 and 12 career plans. I was concerned with the ways in which responses to vocational interest inventories change as the student matures and gains a more realistic picture of his own abilities and motives and those needed for various occupations. I also wanted to see how interests (as motives) seem to affect the development of abilities and the career planning of the individual during the high-school years.

If student career plans are based in part upon the student's stereotypes of work and workers in relation to his concept of his own abilities and motives, then as these stereotypes and self-concepts change through education and general experience, his plans for a career will also change. When the student is asked on a vocational interest inventory whether or not he would like to be a plumber, he matches his stereotype of plumber with his current self-concept and responds accordingly. Therefore, career plans and interest inventory responses would be expected to co-vary as the student gains further knowledge of himself, and of work and workers. As the high-school student becomes more familiar with his abilities and more familiar with the types of ability needed by different types of workers, his interest scores should shift to be more consistent

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Paper read at the Annual Meeting of the American Educational Research Association, February 18, 1967. A monograph reporting the details of this research will be available in the near future.

with his abilities.

Interests as measured by inventories may also be related to basic dimensions of personality which tend to orient the behavior of individuals in certain directions. Therefore, it is reasonable to expect to find increased abilities in areas related to earlier interests. For example, if an individual had a high interest in science, it might result in increasing scores on measures of science-related abilities such as mathematics. If the interest scales measure those cognitions of the environment to which a person attends, then it is reasonable to expect that his proficiency in these areas would increase over the years. In this sense, vocational interest inventories measure dimensions of motivation.

#### The Sample and the Interest Inventory

Since what is learned in any study of interests depends in part upon the sample of people included and the nature of the interest inventory used in the investigation, a brief description of the sample and the TALENT Interest Inventory used here is necessary.

In the spring of 1960, Project TALENT tested a national probability sample of over 400,000 students from the entire high-school population. Through this testing, data were obtained about the interests, abilities, and career plans of over 100,000 ninth graders. In the spring of 1963, 10 per cent of the schools in the 1960 sample were selected for a retest of the twelfth graders. Only part of the original TALENT battery was administered to any one of the 10,000 twelfth graders retested. Of these retested students, 8,000 had been tested as ninth graders in 1960. From this sample of 8,000 for whom both ninth- and partial twelfth-grade records were available, about 1,500 males and 1,500 females had complete interest and ability data needed for the analyses upon which the following results are based.

The interest inventory which was developed for Project TALENT produces a small number of broad occupational scores as in the Kuder. The TALENT inventory includes 204 items which are a mixture of occupational titles (122 items) and activities (82 items). Individual responses are ratings as in the Strong rather than rankings as in the Kuder. The student rated each item on a five-point scale from "I would like this very much" to "I would dislike this very much." The resulting 17 broad interest area scores are essentially the average ratings given by students to the items assigned to each of the 17 scales.

#### Correlations between Grade 9 and Grade 12 Interests

This retest exploration began with an examination of differences and relationships between interests measured at grade 9 and interests measured at grade 12. There were no major changes from grade 9 to grade 12 in either the means or the variances for these 17 interest scales. The amount of variance in interests increased only slightly between grade 9 and grade 12. The correlations between corresponding grade 9 and grade 12 interests were all about the same order of magnitude, in the .40's or .50's. These TALENT retest interest correlations are quite consistent with other results reported in the literature for this age group.

Canonical correlations between grade 9 and grade 12 interests were computed in order to identify pairs of factors, one from each of the two sets, that were more highly correlated than any single pair of the original 17 interest scales. The four largest canonical correlations for males ranged from .75 to .58 and similarly for females, .72 to .57.

The largest canonical relationship extracted from the males' interest scores measures whether or not the boy would prefer professional or at least "white-collar" work to nonprofessional or skilled labor of the "blue-collar" type. This level of aspiration factor is the most stable component in this

inventory between grade 9 and grade 12 for males.

The other three large canonical relationships for the males were bipolar factors interpreted as masculine versus feminine, introversion versus extroversion, and science-technology versus assorted nonscience scales.

Turning to the four largest canonicals for the females, the first one was of the same order of magnitude as that for the males, but the loadings were quite different. The largest female canonical factor seemed to be measuring whether or not the girl preferred to work in a business office, with positive loadings on office work, computational, and business management.

The second female canonical relationship was very similar to the large white-collar versus blue-collar factor found in the males' interest data. Music interest versus all others is basically the definition of the third canonical, while interest in art was the major loading of the fourth canonical.

These canonical correlation results between grade 9 and grade 12 interests have revealed several dimensions of vocational interest which are more temporally stable than are the original 17 interest scales. These results should prove useful in the development of new, more stable interest scales. They also suggest factors which more nearly resemble basic motives than do scales defined in terms of specific occupational groups.

#### Career Plans Discriminant Analyses

An item in our Student Information Blank (SIB) asked the student to indicate which of 36 career areas he was planning to enter. Using this as a basis for determining the primary career plan of the student, 952 males were classified into one of six broad career categories; four college bound groups: (1) science-technology, (2) biological-medical, (3) sociological-cultural, (4) business; and two noncollege groups: (5) technology and (6) business-service. Our concern

here is the way in which the relationships between interests and broad career categories change over time.

Insofar as interests are a function of a changing self-concept, grade 9 interests would be more highly related to grade 9 plans than to grade 12 plans. Also, as the boy matures, his currently expressed interests should become more consistent with his currently expressed plans. Therefore, his grade 12 interests would be quite closely related to his grade 12 plans, more so than the two previously outlined relationships. To test this proposition, three discriminant analyses were conducted:

- (1) Grade 9 interests predicting grade 9 plans,
- (2) Grade 9 interests predicting grade 12 plans,
- (3) Grade 12 interests predicting grade 12 plans.

The same students were involved in all three discriminant analyses, but different data were used either as predictors or as criteria.

In terms of the six broad career categories, 54 per cent of these boys had the same plans in grade 12 as they had in grade 9. The grade 12 plans can be predicted with about the same degree of accuracy from grade 9 interests as from grade 9 plans, 53 per cent and 54 per cent, respectively. Also, comparing the 59 per cent hit rate for grade 9 plans from grade 9 interests with the 65 per cent hit rate for grade 12 plans from grade 12 interests, plans in grade 12 appear to be more consistent with grade 12 interests than grade 9 plans were with grade 9 interests. Wilks lambda criteria associated with the discriminant functions also show that grade 12 plans are most closely related to the grade 12 interest predictors, and the grade 9 interest predictors are more closely related to grade 9 plans than to grade 12 plans. These results are consistent with the proposition that expressed interests and stated plans are converging and becoming more internally consistent as the student matures.

### Stable versus Unstable Planners

A hypothesis suggested by Bordin is that students with the same career plans at grade 9 and at grade 12 will exhibit more consistent interest inventory responses from grade 9 to grade 12 than will students who changed their career plans. The data used to test this hypothesis were the two sets of interest scores for the 952 boys represented in the previous discriminant analyses. Five hundred twelve boys had the same broad career plans at grades 9 and 12, thus representing the stable group, and the other 440, who changed their plan category, compose the unstable group. Fourteen of the 17 pairs of retest correlations between corresponding interest scales for these two groups (stable and unstable planners) were in the hypothesized direction. The three differences which were not consistent with the hypothesis were for scales which are more avocational; namely, artistic, sports, and hunting-fishing interests.

Since the differences were all very small, these results certainly do not provide overwhelming support for Bordin's hypothesis, but they do indicate a tendency for inventoried interests to be more stable for those boys who did not change their career plans between grades 9 and 12 than for those who did.

### Interest-Ability Relationships

The posited interactions between interest and ability mentioned earlier appear to contradict each other. On one hand, I am claiming that interests will affect the development of abilities, while at the same time suggesting that vocational interests will change during high school to become more consistent with abilities. This is exactly what the TALENT data reveal, however, at least for the male data which are all we have analyzed to date.

Let us turn first to a multivariate test of the hypothesis that a significant portion of the variation in grade 12 interests that is not related to grade 9 interests is related to variance in grade 9 abilities that is not related to grade 9 interests.

A new multivariate computer system recently developed at Project TALENT by B. G. Wingersky allows us to ask this question using multiple partial canonical correlation. With this technique it is possible to remove the variation in the set of grade 9 abilities and grade 12 interests that is associated with grade 9 interests and then see whether any significant relationships exist between the two sets of residuals. Any resulting significant canonical relationships will allow inferences regarding the ways in which interests are changing between grades 9 and 12 to be more consistent with earlier abilities.

The largest partial canonical correlation between the two sets of residuals was .42. Inspection of the first set of loadings reveals that this first, largest correlation was between a general ability dimension extracted from 60 TALENT ability tests and a general level of aspiration factor (professional versus non-professional) from the 17 interest scales. Thus some boys who did well on the grade 9 ability measures but planned nonprofessional careers tended to change to professional plans by grade 12, while some boys low on general ability yet with high expectations tended to lower their aspirations by twelfth grade.

The second pair of canonical variates primarily utilized sports information on the ability measures, while sports interest dominated the definition of the interest dimension.

The third and fourth canonical coefficients were of equal magnitude (.33). A boy will be high on the third grade 9 ability canonical if he is higher on knowledges associated with tinkering activities (electricity, mechanical gadgets, etc.) and lower on mathematics abilities than you would expect from his grade 9 interests. When a boy was low on that ability canonical, he tended to change his interests toward computation and office work. The fourth canonical had a very interesting set of loadings. There the ability loadings emphasized the nonverbal ability measures such as mechanical reasoning and spatial visualization, while

the largest positive interest loading was on physical science, engineering, and mathematics interests, and the largest negative loading on sales interest.

Because the above results are in terms of partial multivariate correlations, it can be concluded that there are several distinct ways in which interests are shifting between grade 9 and grade 12. These interest changes are in turn related to that variation in grade 9 abilities which was not related to grade 9 interests. That is, at least some boys are changing their interests to be more consistent with their abilities.

A second hypothesis relating interest and ability suggests that grade 9 interests (as motives) are influencing the development of abilities between grades 9 and 12. In terms of multiple partial canonical correlation, this hypothesis was explored by relating grade 9 interests with grade 12 abilities after removing variation in both sets that was related to grade 9 abilities. With the previous "interest follows ability" hypothesis and analysis, I was concerned with how and to what extent interests were shifting to be more consistent with earlier abilities. Now I am talking about how and to what extent abilities were changing in a manner consistent with earlier interests.

The design of the Project TALENT retest study made it necessary to divide the analysis of this hypothesis into three parts, each part composed of a different subset of the 60 ability measures in the previous analysis.

In the first analysis, 38 ability tests formed a canonical relationship with the 17 interest scales with a canonical correlation of .51. The pattern of loadings for the interest side was a white-collar versus blue-collar grade 9 interest factor (unrelated to grade 9 abilities) which correlated .51 with a bipolar ability factor, indicating that grade 9 boys who showed up more interested in white-collar work than would be expected from their grade 9 abilities tended to do better on grade 12 music, mathematics, and sports information than would be



expected from grade 9 abilities; and those who were more interested in blue-collar work than expected, tended to gain more on the negatively loaded mechanics and hunting information than would other grade 9 boys.

A second canonical correlation analysis between grade 9 interests and 12 of the 60 grade 12 abilities, with corresponding grade 9 abilities partialled out, showed that the ninth-grade boy who wanted to become a scientist produced greater gains in the mathematics areas during high school than would be expected from his grade 9 ability.

The third canonical analysis used a subset of 11 ability measures and again yielded the professional versus nonprofessional interest factor which was related to changes in general ability. In the second canonical from this analysis the two science interest scales were loaded negatively, while most of the other interest scales loaded high positive. The ability loadings were zero or negative, with the highest negatives being Mechanical Reasoning, Creativity, and Visualization in Three Dimensions. Thus these types of abilities tend not to be developed in high school by boys not interested in science, at least not to the degree expected from grade 9 abilities.

These canonical results show that grade 9 abilities are related to changes in interest during high school, while at the same time grade 9 interests are related to changes in abilities during high school. These are not contradictory findings but demonstrate the dual nature of our interest measures. The interest scales appear to be tapping both basic motivational dimensions which direct the development of abilities and self-concept dimensions which are modified as the boy achieves greater insights into his own abilities and those needed by the different career areas.

Conclusion

The major conclusion that one may draw from these results is that inventoried vocational interests reflect aspects of self-concept and basic motives. Insofar as interests measure self-concept, they are subject to change as the student matures and gains a more realistic picture of his own abilities and motives and those needed for various occupations. Insofar as interests measure basic motives they will affect the development of abilities and the career planning of the individual.

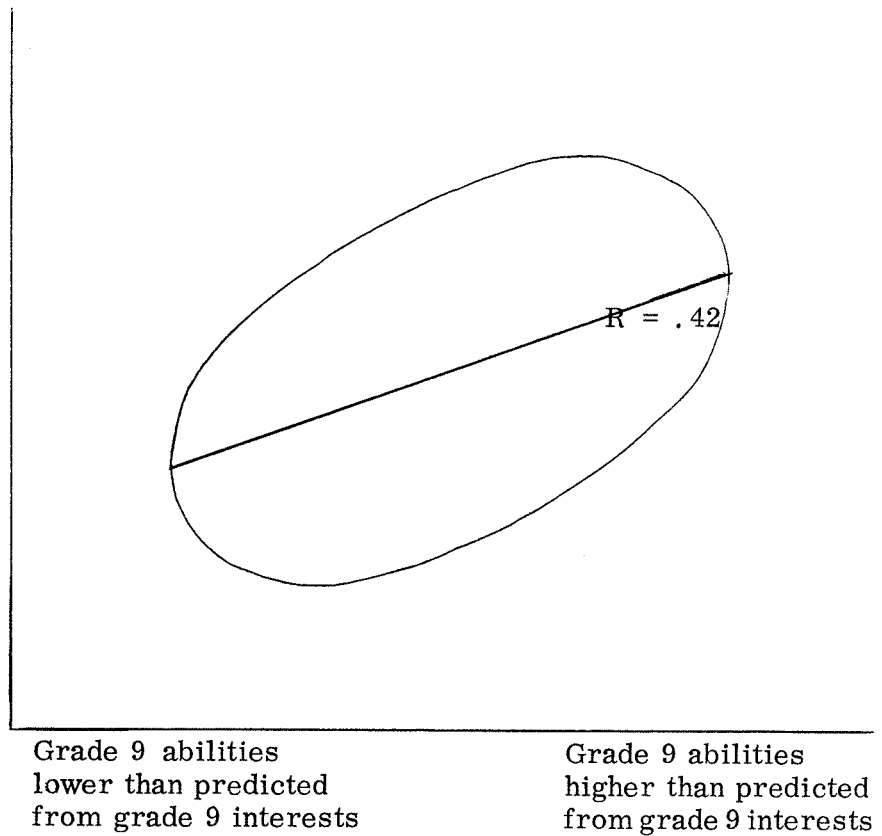
I am now engaged in a program of research which is exploring the relationship between these interest-ability interactions and the educational decisions which the student made during high school, such as curriculum choice or pattern of courses taken within the broad curriculum areas. It may be that abilities follow interests insofar as the interests influenced certain educational decisions. Such results would seem to be relevant for junior high school guidance.

Interests change to become more consistent with abilities

Increased interest in professional careers

Variation in grade 12 interests unrelated to grade 9 interests

Reduced interest in professional careers



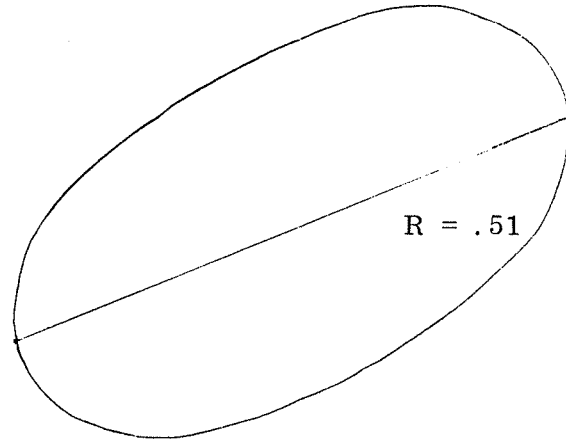
Variation in grade 9 general abilities unrelated to grade 9 level of aspiration

Abilities change to become more consistent with interests

Music, Mathematics,  
and Sports information  
higher than expected

Variation in grade 12 abilities  
unrelated to grade 9 abilities

Mechanics and Hunting infor-  
mation higher than expected



Blue-collar interests  
higher than predicted

White-collar interests  
higher than predicted

Variation in grade 9 interests  
unrelated to grade 9 abilities