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ABSTRACT

This paper describes a study which was intended to identify those characteristics of ninth grade males which differentiated among the following four tenth grade groups: successful vocational; unsuccessful vocational; successful academic; and unsuccessful academic. The criterion for the findings was composed of four mutually exclusive categories combining variables of course selection and success. The results of the study confirm the hypothesis that successful and unsuccessful students in the academic and vocational curricula differ on many of the characteristics used in the study. Therefore, when discussing characteristics of ninth grade students and their relationship to the vocational vs academic curriculum decision, the distinction between successful and unsuccessful students is useful and necessary. In order to make the study most meaningful to counselors, a number of possible implications which follow from the findings are given: (1) Unsuccessful academic male students may choose the vocational curriculum and become potentially successful vocational students. (2) By increasing the prestige of the vocational program, more students may choose it and be successful in it. (3) Verbal and numerical ability is less necessary for success in the vocational programs than it is in the academic programs. (4) Factors not mentioned in the study are more related to success in the vocational curriculum. (Author/WS)

Using Ninth Grade Information for Tenth Grade Prediction*

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USING NINTH GRADE INFORMATION FOR TENTH GRADE PREDICTION

Introduction

Informal theories concerning why people choose to engage in a particular kind of work have existed since before the time of Christ. In recent years, formal theories concerning the vocational development process have been postulated and researched. The most researched and productive theory currently appears to be that proposed by Super (1953) and Super and others (1957). Aspects of Super's theory which emphasizes stages of vocational development have been applied and extended by a number of other researchers including Cooley and Lohnes (1968). The specific focus of interest in this study is the "Career Development Tree" as proposed by Cooley and Lohnes which is based on a series of four dichotomous decision points which yield 12 terminal occupational categories. Using student characteristic information for a sample of ninth grade boys, Cooley and Lohnes have been able to significantly predict group membership at each of four subsequent decision points over a ten-year time span.

The second decision point in the Cooley and Lohnes model is choice of a college vs. non-college high school curriculum at the end of ninth grade. The focus of this study is on this ninth grade decision point with the additional descriptor of success added to the Cooley and Lohnes original dichotomy. From previous studies reviewed by Prediger and others (1968) success in high school level vocational education programs was found to be related to numerous ability measures in addition

to past performance. One of the conclusions of this review was that verbal IQ was not the best predictor of success in vocational courses as it was often found to be in academic courses. Impellitteri and Kapes (1969) found success in tenth grade vocational courses to be related to a number of ninth grade GATB aptitudes including several manipulative aptitudes. In other studies, Impellitteri et al. (1969), and Impellitteri and Kapes (1971b) found Vocational and Academic boys to differ on other ninth grade characteristics such as Occupational Values and Vocational Maturity. On the basis of previous research, it appeared plausible to extend the Cooley and Lohnes dichotomous college vs. non-college category at the end of ninth grade to include a measure of tenth grade success. It was hypothesized that the addition of success information is a useful and necessary distinction when considering the tenth grade curriculum choice of Vocational vs. Academic.

Statement of the Problem

This study was partly a replication of the Cooley and Lohnes' study to the extent that it used an alternate set of personality trait measures to predict curriculum categories. At the same time it was an extention of the Cooley and Lohnes' work in that it attempted to differentiate between successful and unsuccessful students within their chosen curriculum.

The purpose of this study was to identify those characteristics of ninth grade males which differentiated among the following four tenth grade groups: successful vocational;

unsuccessful vocational; successful academic, and unsuccessful academic.

Procedure

The sample utilized in the study consisted of 458 male students who had completed tenth grade in a large central Pennsylvania senior high school, and who were enrolled in either the vocational or academic curriculums. The vocational students were enrolled in one of the following 17 vocational-technical programs: Auto Body, Auto Mechanics, Building Maintenance, Carpentry, Computer Technology, Drafting and Design Technology, Electricity, Electronics Technology, Engineering Related Technology, Home Appliance Repair, Machine Shop, Plumbing, Planing Mill, Printing, Sheetmetal, Trowel Trades, and Welding. Preliminary student characteristic data had been gathered the previous year when the students were enrolled in ninth grade in the three public junior high schools in Altoona. Criterion information was collected at the end of tenth grade. All data were gathered as a part of a longitudinal study of vocational development being conducted in the Department of Vocational Education at The Pennsylvania State University (Impellitteri and Kapes, 1971a).

A total of 16 student characteristic variables were selected as independent variables for this study. These independent variables included: the General Aptitude Test Battery (GATB) aptitudes of Verbal, Numerical, Spatial, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity; the Occupational Values Inventory (OVI) values

of Interest and Satisfaction, Salary, Prestige, and Security; the construct of Vocational Maturity as measured by the Vocational Development Inventory (VDI), the family background measures of Father's Education and Father's Occupational Level and the student's realistic Occupational Aspiration Level. Father's Education was coded into seven cateogires and Father's Occupational Level and the student's Occupational Aspiration Level were coded according to the six categories of Roe's (1956) Level classification. The dependent variable was composed of the four tenth grade groups mentioned previously. These four groups were obtained by first dividing the students in the sample into either a vocational or academic curriculum classification and then further categorizing each curriculum group as successful and unsuccessful by dividing each group at the median GPA.

Analysis of the Data utilized the technique of multiple discriminant function analysis (MDFA) in comparing the four groups. Teideman (1951), Tatsuoka (1957), and Cooley and Lohnes (1968) have shown the application of MDFA to vocational development type research.

Findings

The criterion was composed of four mutually exclusive categories combining the variables of course selection and success. In this way it was possible to ascertain the overall predictive strength of the 16 independent variables when they were used to differentiate among the four categories.

In order first to examine the ability of each of the 16 independent variables to differentiate among the four groups, means for each group were computed on each variable and tested using the F-ratio with k-1 and N-1 degrees of freedom. This type of analysis does not consider the intercorrelations among variables and therefore the total amount of discriminant information is considerably less than the sum of the discriminant information available from each variable. The results of the preliminary analysis are presented in Table 1. By examining the table, it can be seen that 14 of the 16 independent variables significantly discriminante among the four groups, and all but one at the .001 level. Only the GATB variables F and M do not have statistically significant F-ratios over the four group means. The size and direction of differences among group means can be observed from inspection of Table 1.

To arrive at the combined discriminant strength of the 16 independent variables in maximizing the total differences among the four groups, MDFA was undertaken. This technique seeks to maximize the ratio of between group sum of squares to within group sum of squares. The results of this analysis are presented in Table 2. After examining the correlations between the DF and the independent variables, it was decided to name DF I Cognitive-Socioeconomic because of its high loadings on cognitive and socioeconomic type variables. Likewise, DF II was named Vocational Maturity vs. Prestige because these two variables appeared to best describe that function.

Table 1. Group Means and Overall F-Ratio for the 16 Independent Variables Among the 4 Groups: Successful Vocational, Unsuccessful Vocational, Successful Academic, Unsuccessful Academic

Variables No.	Name	(N = 125) Successful Vocational 1	(N = 125) Unsuccessful Vocational 2	(N = 104) Successful Academic 3	(N = 104) Unsuccessful Academic 4	F-Ratio
1.	GATB-V	94.45	87.98	100.96	92.05	35.73**
2.	GATB-N	98.19	89.39	105.69	94.88	42.98**
3.	GATB-S	103.94	96.89	106.63	98.08	9.86**
4.	GATB-P	99.42	94.91	106.29	98.23	9.65**
5.	GATB-Q	100.82	95.75	107.21	100.30	21.44**
6.	GATB-K	88.51	84.93	94.62	91.96	10.09**
7.	GATB-F	93.45	91.33	94.62	90.89	1.09
8.	GATB-M	90.19	86.22	91.31	87.83	2.01
9.	Interest and Satisfaction	18.58	17.04	20.56	17.82	10.75**
10.	Salary	14.51	15.71	13.36	13.41	3.10*
11.	Prestige	9.67	11.58	11.39	12.60	5.91**
12.	Security	12.66	12.87	10.08	12.24	5.79**
13.	Vocational Maturity	35.71	33.33	36.97	33.41	17.16**
14.	Father's Education	3.74	3.56	4.60	3.97	19.70**
15.	Father's Occupation	4.30	4.26	3.79	3.98	5.77**
16.	Occupational Aspiration	3.30	3.46	2.25	2.92	31.98**

* Significant at .05
** Significant at .001

Table 2. Zero-Order Correlations Between the Three Discriminant Functions Generated (Among the 4 Groups) and the 16 Independent Variables. (N = 458).

Variable No.	Name	DF I	DF II	DF III
1.	GATB--V	.70	.22	.10
2.	GATB--N	.74	.27	.24
3.	GATB--S	.34	.36	.03
4.	GATB--P	.40	.06	-.07
5.	GATB--Q	.56	.05	.15
6.	GATB--K	.37	-.22	.43
7.	GATB--F	.11	.14	-.10
8.	GATB--M	.16	.14	.14
9.	Interest and Satisfaction	.41	.14	-.12
10.	Salary	-.18	.14	-.45
11.	Prestige	-.01	-.54	-.12
12.	Security	-.30	.10	.34
13.	Vocational Maturity	.44	.47	-.17
14.	Father's Education	.53	-.22	-.22
15.	Father's Occupation	-.26	.31	.11
16.	Occupational Aspiration	-.64	.37	.23
Chi Square		213.41*	59.91*	10.25
% Variance Extracted		78.59	18.43	2.98

Wilks' Lambda .531 Overall F-Ratio 6.455*

*Significant at .0001

To examine the efficiency of the DF the percent of each group classified correctly into its own group as well as those classified incorrectly into one of the other groups was computed. Table 3 presents the information concerning classification with the diagonal elements of the matrix representing correct classification. It can be seen that while 70.20 percent of the successful academic students were correctly classified, only 37.50 percent of the unsuccessful academic students were correctly classified. For vocational students the DF correctly classified 64 percent of the unsuccessful students and 52 percent of the successful students. It is interesting to note that when vocational students are misclassified, they are more likely to be classified into the opposite vocational group. However, when academic students are misclassified, they are more likely to be classified into the vocational groups with the successful vocational group receiving the majority.

The discriminant centroids for each group are presented on the right side of Table 3. To more easily visualize the four groups, they are graphically displayed in Figure 1 in the space defined by the two significant DF's. From this graphic presentation, it can be seen that DF I (Cognitive-Socioeconomic) separates successful academic from all three others, and unsuccessful vocational from the other two groups. DF II (Vocational Maturity vs. Prestige) separates successful vocational and unsuccessful academic with unsuccessful vocational and successful academic falling in the middle. Although each group is represented as a point on this graph, it must be

Table 3. Percent of Each Group Classified into the 4 Possible Groups and Group Centroids for Each of the 3 Discriminant Functions

	% Classified in Each Group					Group Centroids		
	Group 1	Group 2	Group 3	Group 4	Total	DF I	DF II	DF III
Group 1 Successful Vocational	52.00	26.40	15.20	6.40	100%	16.47	17.70	.60
Group 2 Unsuccessful Vocational	20.00	64.00	2.40	13.60	100%	15.02	16.63	-.06
Group 3 Successful Academic	17.30	4.80	70.20	7.70	100%	18.87	16.65	-.03
Group 4 Unsuccessful Academic	23.08	23.08	16.34	37.50	100%	16.43	15.80	.77

——— Diagonal Elements Represent Percent Correctly Classified

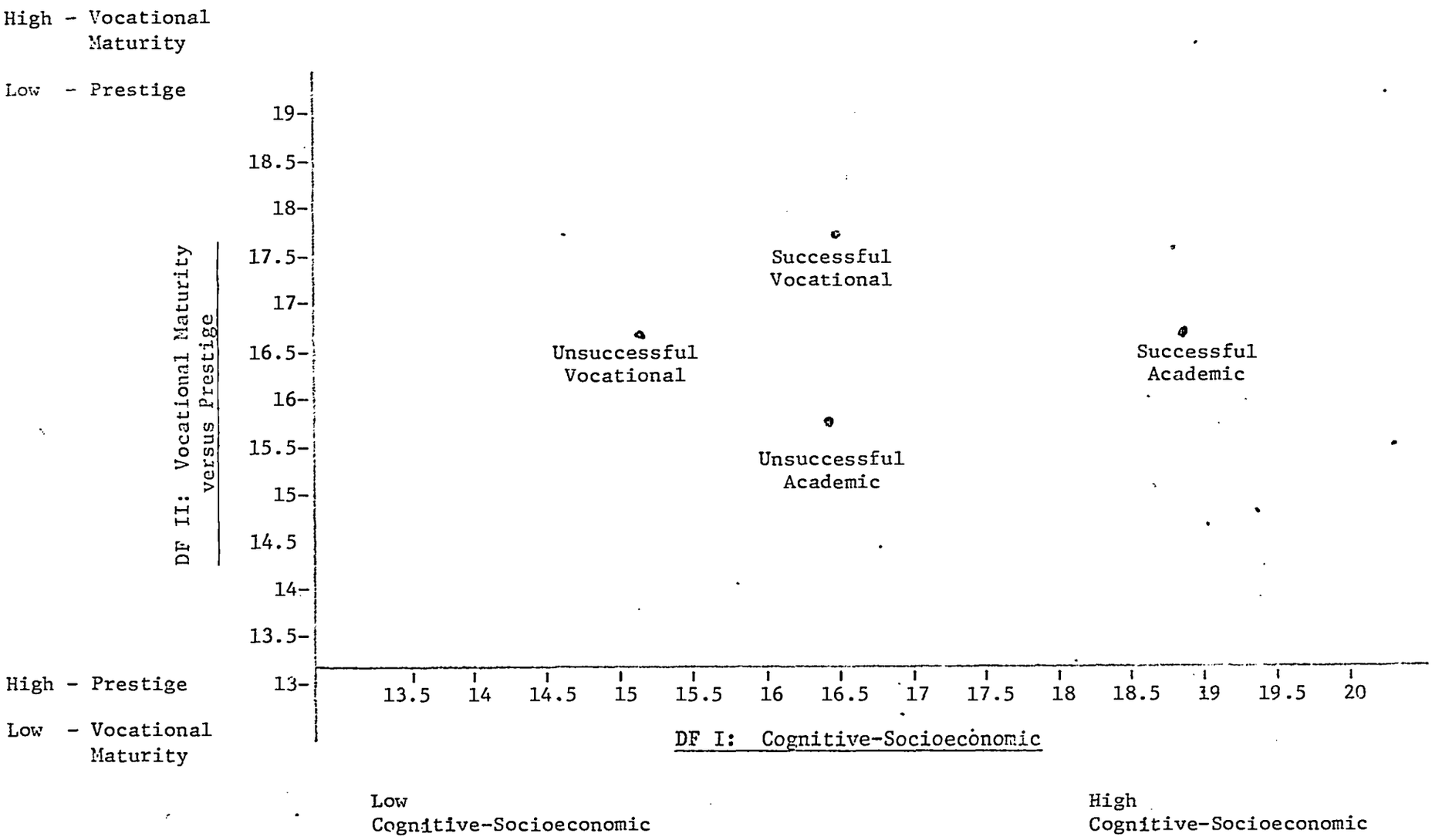

Figure 1. Centroids of Four Groups in Two Discriminant Space

remembered that the members of each group are scattered over the graph around the point. The density of each point can be summized from the percent correctly classified for each group as presented in Table 3.

Discussion

The results of this study do confirm the hypothesis that successful and unsuccessful students in the academic and vocational curricula differ on many of the characteristics used in this study. Therefore, when discussing characteristics of ninth grade students and their relationship to the vocational vs. academic curriculum decision, the distinction between successful and unsuccessful students is useful and necessary. From examining the group means presented in Table 1, the exact differences and their directions can be ascertained for each variable. If one is interested in maximizing differences among these groups, the results of the DF analysis is most useful. In looking at DF I, it appears that cognitive ability and higher level socioeconomic background is more characteristic of successful students than unsuccessful students in either curriculum although successful vocational students are identical to unsuccessful academic students on this dimension. From DF II, it appears that a low prestige value and high vocational maturity are the characteristics of the successful vocational group which differentiate them from the unsuccessful academic group. DF II appears to be a realism factor with successful vocational students being more realistic in their occupational plans than unsuccessful academic students.

In order to make the results of this study most meaningful to counselors, a number of possible implications which follow from the findings are provided here. While these implications appeared to the author to be the most plausible interpretations of the findings, it is certainly true that other equally valid conclusions can be reached.

Possible Implications

1. By lowering their prestige values, unsuccessful academic male students may choose the vocational curriculum and become potentially successful vocational students.

2. By increasing the prestige of the vocational program, more students may choose and be successful in the vocational program.

3. While verbal and numerical ability is related to success in both the vocational and academic curriculums, a lesser amount of that ability is necessary for success in many of the vocational programs. This finding could reflect a conscious effort in this direction on the part of those involved in vocational education.

4. Since success in the vocational curriculum is less related to verbal and numerical ability than in the academic curriculum, other factors not identified by this study apparently play a bigger role in determining success in the vocational curriculum.

5. Since lower socioeconomic status is related to success in the academic curriculum, but not in the vocational curriculum, it is possible that these students feel less motivated by the

academic curriculum than by the vocational curriculum.

6. It is possible that the reason lower socioeconomic male students are less successful in the academic curriculum than in the vocational curriculum may be due to the existence of a form of discrimination in the former, but not the latter curriculum.

7. A lack of vocational maturity appears to be more costly to those male students who are unsuccessful in the academic curriculum. An increase in vocational maturity could facilitate unsuccessful academic students choosing and being successful in the vocational curriculum.

8. A broad based and flexible vocational curriculum could provide those unsuccessful academic male students with an opportunity to explore the vocational world further and provide meaning to their educational endeavor until which time they become vocationally mature enough to make a commitment.

9. While it is apparent that male students with a high level of ability and socioeconomic background are likely to be successful in either curriculum, additional information is useful in predicting the success of students with a moderate or lesser amount of such characteristics. For this latter group, those who have chosen the vocational curriculum, those who place relatively little value on prestige, and those who possess a high degree of vocational maturity appear to have the greatest chance of success in school as measured by GPA.

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