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ABSTRACT

This study attempted to distinguish high school dropouts from non-dropouts by the use of discriminant analysis from data obtained in a dropout intervention project. The variables examined were taken from data forms used in the project and based on past literature on the subject of high school dropout prevention. It was found that significant differences between dropouts and non-dropouts do exist. Those factors which appear highly significant include year in school, IQ scores, grade point average, race, number of siblings in the family, number of skipped classes, and number of detentions. It was also found that these differences accounted for approximately 13 percent of the variability between the two groups. (Author)

The Application of Discriminant Analysis to Determine High School Dropouts from Non-Dropouts

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There is no such thing as a typical school dropout syndrome, for the characteristics of dropouts are as varied as the characteristics of those who remain in school to graduate. A number of characteristics among dropouts occur frequently enough in the literature, however, to merit attention. Studies bear out the notion that dropouts are typically male (Blough, 1956), non-white (Cowhig, 1964), of lower intelligence than non-dropouts (Penty, 1960; Stice, 1960), more likely to have had a grade failure (Bowan and Mathews, 1960), and tend to experience frequent absences (Van Dyke and Holt, 1958). Constructing a profile of the potential dropout, Delaney and Goodyear (1972) conclude:

> The potential dropout is more likely to be frequently absent from school and skip classes when he is there. Although he is less concerned about being treated with understanding or about doing things for other people, he is quite dependent upon his peer group for social support and is, accordingly, a more submissive person who values conformity, who worries about how he is perceived by others, and who tends to be more calculating and shrewd in his dealings with people. Further, he is more introverted and experiences lower levels of anxiety and tension, possibly because he has lower aspiration levels. Intellectually, he tends to think more concretely as opposed to abstractly, to deal with problems emotionally rather than rationally, and to be less creative (p. 6).

It was the purpose of this present study to compare differences between dropouts and non-dropouts using discriminant analysis, a method of describing group differences developed by Tatsuoka (1970).

METHOD

Subjects

The subjects included 165 sophomore and junior students from the two high schools in Kankakee, Illinois. These students were identified as potential dropouts by the Kankakee Holding Power Project (Delaney and Goodyear, 1972). The subjects were at no time led to believe that they had been identified as potential dropouts.

Data Form

Information was compiled for each student at the end of the school year to determine whether they had stayed in or dropped out of school. It was found that 30 subjects had dropped out and 135 had remained in school.

[For the purposes of this study, "dropout" refers to a student not attending school anywhere, verified by no request for a transfer of the student's records. Whereas a "stayin" or "non-dropout" refers to a student either attending the Kankakee high schools or some other school in another location as verified by a request for a transfer of the student's records.]

The following information was gathered for each S from existing school records and placed on a data form:

(1) present age; (2) present grade in school; (3) grade retention, total years; (4) total number of days absent for first semester of year; (5) California Test of Mental Maturity Score (highest, where more than one); (6) grade point average for year; (7) Differential Aptitude Test Scores (Verbal Reasoning and Numerical Ability); (8) Racial classification; (9) number of siblings

in family; (10) number of class skips for previous semester; and (11) number of detentions for previous semester.

These data were punched into IBM cards and a linear combination (weighted sum) constructed of the set of variables that differentiated the two groups. The groups were then ranked in terms of this linear combination (discriminant function) and examined with the relative weights assigned to the variables in this linear combination. The pattern of weights indicated how much or how little each factor contributed, and in which direction, to the differentiation between the groups (Tatsuoka, 1970).

RESULTS AND DISCUSSION

For each of the two groups, dropouts and non-dropouts, a mean score was computed for each of the eleven variables. In Table 1 appear group and sizes and mean values for the eleven variables. Since the source of variance is based upon two groups, a single criterion function, or an eigenvalue, is formed and may be evaluated by use of the F distribution. The criterion function and its test of significance appear in Table 2.

Table 1 about here

Discriminant analysis performed on the data yielded a single discriminant function statistically significant at the .025 level. The normalized discriminant vectors (i.e., the weights to be applied to the raw scores of the eleven variables to get the discriminant function scores in the same scale) are shown in Table 3(a). Also shown in the corresponding eigenvalue, which is the value of the discriminant criteria for that function.

Table 2 about here

At this point it should be noted, high statistical significance does not necessarily imply a large magnitude of difference (or association) between groups, especially when N is large. Thus, if the discriminant function measuring student status is highly significant, it does not automatically guarantee that the predictor battery exhibits a high degree of differentiation among the groups. To measure the extent of differentiation, or total discriminatory power, an additional statistic, "estimated W^2" can be derived (Tatsuoka, 1970). For this study, appearing in Table 2, "estimated W^2" or $\hat{W}^2 = 0.1306$. Therefore, about 13% of the total variability of the discriminant function is attributed to group differences.

In seeking to interpret the discriminant function, one would want to know which of the original eleven variables contribute most to the function. For this purpose, comparison of the relative magnitudes of combining weights as given in Table 3(a) is inappropriate because these are weights to be applied to the predictor in raw score scales and are affected by the particular unit used for each variable. To eliminate this effect of units on the magnitudes of the combining weights, the weights that would be applied to the predictors are computed in standardized form. These standardized discriminant weights appear in Table 3(b).

The discriminant function for student status is determined to be as in Table 4(b).

$$Y_s^* = 0.860X_1 - 4.100X_2 - 0.770X_3 - 0.003X_4 + 5.307X_5 - 4.656X_6 - 0.223X_7 - 3.299X_8 - 5.909X_9 + 6.419X_{10} - 3.143X_{11}$$

Table 3 about here

Recalling this discriminant function as significant, the pattern of weights can be examined for meaningful interpretations of the discriminant function obtained. Looking at those weights whose absolute values are no less than one half of the largest weight (i.e., Variable 9; 6.419), the factors which contribute the most in the positive direction are Variables 5 and 10, while those which contribute the most in the negative direction are Variables 2, 6, 8, 9, and 11.

"Positive direction" refers to the large positive value of the scaled weight compared to the larger mean of the two groups on that specific variable. "Negative direction" refers to the large negative value of the scaled weight compared to the smaller mean of the two groups on that specific variable.

One may conclude the following from the data:

(1) dropping out of school will occur during the sophomore year;

(2) dropouts have lower IQ (CTMM) scores than do non-dropouts;

(3) dropouts have lower grade point averages than do non-dropouts;

(4) dropouts tend to be non-white;

(5) dropouts tend to have more siblings in their families;

(6) dropouts have skipped more classes than non-dropouts;

(7) dropouts have received more detentions than non-dropouts.

TABLE 1

MEANS FOR GROUPS

(N=165)

	Variables	Means
Group 1 Dropouts (n_1=30)	1	15.93
	2	1.26
	3	0.20
	4	10.67
	5	103.78
	6	1.53
	7	46.22
	8	1.23
	9	4.20
	10	13.55
	11	19.00
Group 2 Non-Dropouts (n_2=135)	1	16.12
	2	1.50
	3	0.22
	4	9.92
	5	108.62
	6	1.89
	7	41.67
	8	1.33
	9	5.22
	10	7.23
	11	17.65

TABLE 2

TEST OF SIGNIFICANCE
(N=165)

(Eigenvalue)	λ_1	.1582
	F_1	11
	F_2	153
	df	10/120
	F	2.16*
(Number of Groups)	K_2	2
Estimated	W^2	.1306**

*p < .025

**p where "Estimated W^2" same as

TABLE 3

THE TWO SETS OF DISCRIMINANT FUNCTION WEIGHTS:

(a) TO BE APPLIED TO THE VARIABLE RAW SCORES;

(b) TO BE APPLIED TO STANDARDIZED SCORES

		(a)	(b)
Variable	Description	Y_s	Y^*_s
1	Age	0.07598	0.860
2	Grade Level	-0.65058	-4.100
3	Grade Retention	-0.13071	-0.770
4	Absenteeism	-0.00002	-0.003
5	CTMM IQ Score	0.00587	5.307
6	Grade Point Average	-0.49042	-4.656
7	Differential Aptitude Test	-0.00083	-0.223
8	Race	-0.54965	-3.299
9	Number of Siblings	-0.09526	-5.909
10	Number of "Skips"	0.03913	6.419
11	Number of Detentions	-0.02484	-3.143
Eigenvalue		-0.15187	

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