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FACTOR ANALYSIS AS APPLIED TO CURRICULUM DEVELOPMENT

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Curriculum development is a current concern of vocational educators throughout the country. Several states have completed studies in which factor analysis was used to help identify curricula. Other states are in the process of completing studies to which factor analysis will be applied. An understanding of the factor analysis technique can aid readers as they consider the implications of these curriculum study reports.

Factor analysis as applied to data collected in the University of Illinois study, "Technical Education In and For Rural Areas," helped the researchers identify appropriate courses and course content. Data regarding ninety-one variables associated with curriculum development were collected for each of 511 observations. An observation was a job title in which an employee appeared to need a knowledge of agriculture; job titles of unskilled and professional nature were not included. The variables consisted of forty-four knowledges and and forty-seven activities related to the performance of jobs. For analysis purposes job titles were grouped into occupational families such as seed and fertilizer businesses, general agricultural sales and service businesses, feed mill and elevator businesses, agricultural machinery and construction businesses and horticultural businesses.

The Factor Analysis Solution

Factor analysis simplified these data in a way that facilitated curriculum planning. This statistical technique identified the groups of variables which clustered together and correlated highly with hypothetical variables (factors) that were relatively independent from each other. Each factor contained either several knowledge variables or several activity variables that accounted for the major portion of the variance in that factor. These variables determined the identity of each knowledge factor and each activity factor in the orthoganal rotation (varimax) factor analysis solution.

In this process an unrotated, principle component factor solution identified a general factor and remaining secondary factors that existed. The orthoganal rotation of the principle component solution simplified the factors. Table 1 illustrates the principle component general factor with associated secondary factors. The high correlations (H) identify the variables that describe the factor. Notice that the same variable appears in several factors. Table 2 illustrates how simple structuring occurs as the result of the orthoganal rotation. Ideally, a variable appears in only one factor.

TABLE 1

Model of Unrotated Principle Component Factor Analysis

Variables (knowledges or activities)	Factors I	II	III
1	H	H	
2	H		H
3	H		
4	H	H	H
5	H		H
6	H	H	
7	H		
8	H	H	

TABLE 2

Model of Orthagonally Rotated Factor Analysis

Variables (knowledges or activities)	Factors I	II	III
1	H		
2	H		
3	H		
4		H	
5		H	
6		H	
7			H
8			H

The Factor Score Solution

The computation of factor scores identified the relative influence of knowledge factors and activity factors upon individual job titles within each occupational family. In some cases one or more factors greatly influence nearly all job titles in an occupational family. This indicated a need for all employees in that occupational family to possess a core of common knowledge related to the variables most highly correlated with the factor or factors. Factors were found also that related only to a certain group of job titles within an occupational family. This indicated a need for employees in those job titles to possess specialized knowledge. An examination of factor score data for the five occupational families revealed certain factors common to job titles in several occupational families. Thus, a core of knowledge common to more than one occupational family was found to be needed by some employees.

Table 3 illustrates the concept of factor scores. The high factor scores (H) identify the job titles most influenced by the factor. An example of a core between two occupational families as well as within one occupational family is presented. Specialized groupings within the occupational families are also illustrated.

TABLE 3

Model of Factor Scores for Two Occupational Families

Occupational Family	Job Titles	Factors					
		I	II	III	IV	V	VI
A	1	H	H	H			
	2	H	H	H			
	3	H	H		H		
	4	H	H		H		
B	1	H				H	
	2	H				H	
	3	H					H
	4	H					H

Conclusion

Factor analysis appears to be appropriate for use in curriculum development. A large number of variables can be described according to the way a few important variables group together. The influence of these groups of variables (factors) upon employees can be determined through factor score computations. When factors are found to highly influence a group of employees, the variables in the factors can serve as a guide to curriculum development.