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ABSTRACT

Research examined the relative desirability of categories of information supplied by a keysort search procedure, as judged by users. The Career Information System was used as the framework for obtaining occupational information organized around the concept of the Worker Trait Group (WTG). Four groups of students in each of grades 9 through 12 identified occupations based upon the following four pairs of binary personal preference variables: 1) vocational interest; 2) preference for data, people, or things; 3) interest factors; and 4) temperament. Keysort cards, each representing a WTG, were obtained, randomized, and classified by the students as preferred, acceptable, or unacceptable. Results indicated that only the vocational interest variable led to the selection of preferred WTG's. It was hypothesized that this was partially due to the fact that the instrument used to obtain scores for this variable, the Ohio Vocational Interest Survey, was superior to those used to obtain the other variable scores, which were open to student misinterpretation. Additional research was recommended to determine if revision of these instruments or the means of administering them would produce variable scores leading to the retrieval of more desirable information. (PB)

Validation of a Career Information Retrieval Procedure

by

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Introduction

The Career Decision-Making Program at the Appalachia Educational Laboratory has developed, as one of its products, a system for organizing occupational information for use in counseling and guidance. The system utilizes materials and organizational structures developed by the United States Department of Labor, primarily for use in placement, and augments these materials for use by both counselors and counselees. The central organizing concept is the Worker Trait Group (WTG) which groups occupations according to requisite characteristics of workers for those occupations. Volume II of the Dictionary of Occupational Titles, published by the Department of Labor, lists approximately 25,000 occupations under 114 WTGs.

The Career Information System (CIS) provides additional information, including bound volumes indexed by WTGs and unbound occupational briefs filed by WTG. Through the file it is also possible to identify books, films, filmstrips or other materials which, while they cannot be physically placed in the file, can be referenced by it. Thus, once a WTG has been selected by a user of the system, a wide variety of resources can be made available, all of which relate to the WTG.

The CIS also provides a variety of ways in which a user may access WTGs that have a high degree of relevance to him/her personally. These access routes include an alphabetical index which can be entered witha specific occupational title and which yields a WTG. This

method is particularly appropriate for a user who can identify one or more occupations that seem attractive to him/her. By identifying the WTG to which the specific occupation belongs, the user can find other occupations that are closely related in terms of worker traits.

Another method of entry is available to users who begin by browsing through the bound volumes that are indexed, i.e., the Encyclopedia of Careers or the Occupational Outlook Handbook. The indexing system enables the user to identify the WTG for any entry in these volumes, and so to pull together all the associated information within the system.

The access device treated in this study is a Keysort index in which each WTG is represented by a card, and worker characteristics required for the occupations within the WTG are represented by notches around the edge of the card. The user sorts on the basis of his/her own characteristics in order to identify WTGs that are relevant to him/her personally. The characteristics coded into the Keysort cards include the Ohio Vocational Interest Survey, the General Aptitude Test Battery, Data-People-Things skills, and Worker Trait Components. The Data-People-Things skills are based upon studies of functional job analysis conducted for the Department of Labor as part of the research that led to the definition of Worker Trait Groups arrangement of occupations in the Dictionary of Occupational Titles. The Worker Trait Components were also a part of that general research effort. The Components coded on the cards are: Interest Factors, Temperaments, General Educational Development Level, Specific Vocational Preparation Level, and Physical Demands.

The purpose of providing the Keysort index and the other access devices as part of the Career Information System is to facilitate exploration of occupational information. Specifically, an index facilitates search if it enables its user to locate desired information more efficiently or more effectively than would be possible without it. One could also focus on specifics of the logical structure of the Keysort index, particularly if the goal were to revise it, but its effectiveness in its present state of development can be assessed most easily by examining the relative desirability of the categories of work information it selects, as judged by typical users.

Method

Materials

Four indicators on the Keysort cards were selected for use in this study: The Ohio Vocational Interest Survey (OVIS) scores, the Data-People-Things scores, the Interest Factors scores, and the Temperaments scores. The Keysort cards have a single row of holes all around the four edges of each card. Each card in the deck has a pattern of notches around the edge, each notch corresponding to one of the Interest Factors, one of the Temperaments, or some other indicator. Each card carries brief printed material identifying and explaining a single WTG.

For the OVIS, the coding consists of a notch at one of twenty-four locations, indicating which of the twenty-four scales of the OVIS is most important for the WTG. The Data-People-Things coding indicates kinds of functions which involve processing information, dealing with people, or working with objects. For each of the three major categories, six to seven kinds of activities are coded by a notch located at a reference number. Similarly, Temperaments and Interest Factors are coded by a notch at a reference number.

For each of these indicators there is an instrument through which the user can identify his/her number on that indicator. Having obtained a number, the user can use the Keysort deck by inserting a 'needle' in the appropriate code hole in the deck. The notched cards

will then fall off. The instrument for the twenty-four OVIS codes is, of course, the OVIS, and inventory that identifies broad types of occupations on the basis of responses to highly specific questions. The other instruments consist of a single item for each of the codes appearing on the Keysort cards. For example, there are thirteen codes for Temperaments, and there are consequently thirteen items corresponding to them.

For the OVIS, a score is obtained on each of the twenty-four scales, and the scales are rank ordered as a part of the scoring service. These scores may be analyzed in a variety of ways to determine which of the codes on the Keysort cards will be employed. For the other instruments, a rating is assigned to each item, and the ratings are used to select codes on the Keysort cards. For example, the Temperaments instrument appears in Appendix .

Sample

The sample was defined as ten students from each of grades 9, 10, 11, and 12 for each of the four indicators, all from the same school. No attempt was made to equalize or proportion the sexes for each group. The samples were reduced due to one absentee who could not be rescheduled, occasional scheduling problems, and a few instances of inconsistent or uninterpretable data.

All forty of the students taking the OVIS were assembled at one time. All other meetings involved use of the Keysort cards and were limited to ten students at a time.

Procedure

Each of the instruments was administered and interpreted to yield a rank ordering of its elements. The upper ranking elements of each were then used to determine how the Keysort cards would be sorted. The procedure varied somewhat from one variable to another, and so is reported separately for each variable below.

Ohio Vocational Interest Survey (OVIS): The OVIS was administered to forty students, and the answer documents were mailed away for scoring. The materials returned by the scoring service included a listing of the twenty-four scales in rank order by scores and a consistency index for each scale. Scales rated as inconsistent were excluded. Of the remaining scales, the three highest rank scales were selected.

Each student then entered the Keysort index with the identification number of his/her first scale. The Keysort cards not selected on the first-rank scale were then sorted on the second-rank scale, and those still remaining unselected were sorted on the third-rank scale. The cards selected were listed separately for each of the three sorts, and the cards were kept in separate stacks.

The smallest stack of cards was retained for the next step, and an equal number of cards was selected at random from the other three stacks, with the restriction that no more than fifteen cards per stack were ever used. These cards were then given to the students to classify according to preference: on the basis of the information shown on the card, the student was asked to list the number of the WTG as Preferred,

Acceptable, or Unacceptable. The headings of these categories were also paraphrased for the students, e.g., "really great", "okay", and "no way."

Temperaments: Twelve temperaments were rated by students on the instrument shown in Appendix A. The students were then asked to pick the item with the highest rating as their first choice. In case of a tie they were told to try to identify one that was slightly preferred over the other(s). Then they were asked to select the second and third highest-rated items. They were given whatever aid was needed to complete their selection of their first three choices. This activity was followed immediately by the activity with the Keysort cards. The Keysort index was sorted first on the first-rank temperament. Next the cards selected on the first sort were sorted again on the second-rank temperament. The cards selected on both sorts are those that are coded for both the first-rank and the second-rank temperaments of the individual. Those that are not selected in the second sort are coded for the first-rank but not the second-rank temperament. Next, the cards not selected on the first sort were sorted on the second-rank temperament, yielding a set of cards that are coded for the second-rank and not the first-rank temperament and a set that are coded on neither.

In some cases no cards were selected on the first two temperaments. Students who encountered this situation were asked to sort on their third-rank temperament, using it as a substitute for the second. If this combination did not work, they were asked to sort on the second and third. If no combinations could be found, these students were

instructed to identify only three sets of cards, rather than four: those that are coded on the first temperament only, those coded on the second only, and those coded on neither.

On the basis of these sorts, four stacks of cards were determined and representative cards selected from the four stacks as above. These cards were also sorted in the same manner described for the OVIS exercise.

Interest Factors: The procedure for Interest Factors was exactly as described just above for the Temperaments. The Interest Factors instrument appears in Appendix B.

Data-People-Things: In the instrument in Appendix C, this three-part arrangement is treated as a whole. For the sorting activity, however, it was decided (somewhat arbitrarily) to select the highest rating as the first choice, but to select the second choice from a second part (e.g., if the first choice was a Data-oriented activity, the second would have to deal with People or Things), and the third choice from the remaining part.

The procedure was the same as that for the Interest Factors and the Temperaments, described above, but so few of the students obtained a set of cards that met two of the three sorting criteria that this set was disregarded and the preference ratings were given only for cards from three categories: those selected on the first sort, and those not selected on either sort. Cards were selected from these three sets for preference rating just as they were selected from the four sets for each of the other variables.

Results

This section describes the conversion of student responses into numerical data, the analysis of the data, and the outcome of the analysis.

Data Representation

Each of the sets of cards resulting from the Keysorting procedure were equally represented in the cards subsequently sorted according to the student's preference. Numerical weights were assigned to the preference categories: 0 for Unacceptable, 1 for Acceptable, and 2 for Preferred. For each Keysort set, then, a score was obtained for each student by summing the preference scores for the WTGs in that set. Thus for each student there is one numerical score for each Keysort set.

Analysis

A two-way factorial analysis of variance was applied to data for each of the four access variables. Due to unequal numbers of observations in the cells, an approximate method based upon unweighted means was used (Winer, 1962). The summary table for the analysis of the OVIS results follows:

Table 1

Ohio Vocational Interest Survey

Source	df	Mean Square	F Ratio	p
Grade (G)	3	8.63	2.36	NS
Sort Category (S)	3	28.87	7.91	$<.01$
G x S	9	3.19	<1	NS
Error	140	3.65		

Only the main effect for sort categories was significant. Grade level is not significant as a main effect and does not interact with sort categories.

The correlation ratio (eta squared) was computed indicating the proportion of variance accounted for by the one significant difference to be 0.17 (seventeen per cent).

Planned comparisons among the four means included a comparison of the aggregate of the three means of the selected categories against the unselected one, a comparison of the first selection against the second and third, and a comparison of the second against the third. The difference between the selected categories and the unselected one was the only significant result. The means appear in Table 2.

Table 2

Means for the Sort Categories

First Selection	Second Selection	Third Selection	Residual Stack
3.57	2.78	2.62	1.48

The Interest Factors data were analyzed in the same way. The summary table follows:

Table 3

Interest Factors

Source	df	Mean Square	F Ratio	p
Grade (G0	3	9.47	< 1	NS
Sort Category (S)	3	18.16	1.48	NS
G x S	9	11.62	< 1	NS
Error	125	12.23		

None of the differences approached significance in this analysis.

The summary table for the analysis of the data on Temperaments follows:

Table 4

Temperaments

Source	df	Mean Square	F Ratio	p
Grade (G)	3	9.18	< 1	NS
Sort Category (S)	3	8.97	< 1	NS
G x S	9	2.65	< 1	NS
Error	131	12.57		

Neither main effect nor the interaction is significant.

The summary table for the Data-People-Things analysis follows:

Table 5

Data-People-Things

Source	df	Mean Square	F Ratio	p
Grade (G)	3	1.96	< 1	NS
Sort Category (S)	2	2.90	1.13	NS
G x S	6	0.38	< 1	NS
Error	102	2.56		

Again, no significant differences appear.

Discussion

Of the four access variables utilized in this study, only the OVIS resulted in the selection of significantly preferred WTGs. Several conclusions can be drawn from this pattern of results. First, the assessment procedure, analysis, and sample size were sensitive enough to indicate a clear-cut difference for this variable, and so the failure to find selectivity in the other variables indicates relatively weak selection of desired information.

Second, there is one obvious difference between the instrument that was most effective and those that were not. The OVIS is an inventory with a large number of items, each dealing with a specific kind of activity. Response to items of this kind does not involve knowledge about the structuring of occupations; the test maker fills this gap by interpreting the specific items as contributions to broader scales. The other instruments, in contrast, are composed of items that describe broad categories of activities which the students may interpret inaccurately for lack of adequate examples in their own experience.

These instruments were designed to be used in conjunction with a series of instructional units in which Temperaments, Interest Factors, and other Worker Trait Components are explained. A natural question for further study is whether students exposed to such instruction would find the instruments more effective in selecting preferred WTGs. This question will be pursued as students with this training become available.

Other possibilities for further development include revision of the items comprising the instruments to make them easier for students to understand and constructing several items for each Temperament, (for example) evaluating the survey format of the OVIS. Other sorting strategies to be used in selecting WTGs are being investigated, and another study is being considered in which each user would sort on several variables rather than just one. For example, one person could sort on the OVIS, on Temperaments, and on Interest Factors, and use the sort that optimizes for him/her. This procedure would more closely resemble the usual application of the Keysort index, in which the user has a choice of variable.

Another variation on the sorting procedure would be to allow the user to sort on his/her first choice and on whatever number of further choices are required to get the number of selected cards down to some specified range. The number of sorts required would depend upon the particular choices, but the final number of cards selected (which is a rough measure of the amount of information processed) would be comparable across users.

Reference

Winer, B. J. Statistical Principles in Experimental Design. New York, McGraw-Hill, 1962.

Appendix A

Temperaments Instrument

TEMPERAMENTS

A person's liking for certain kinds of work situations reflects his general disposition, or temperament, as it relates to work. Below is a list of twelve such situations. Read each description and express how you would feel about working on a job that would involve you in that situation. Use the following procedure.

First, notice that we have already placed a number (100) next to the first item to indicate its rating. So your liking for the first activity is defined as a rating of 100, whether you like it very much, dislike it very much, or are completely indifferent. Now, look at the second item. If you like the activity half as much as the one in the first item, you should score the item 50. If you like it ten times as much, score the item 1000, and so on. For the rest of the items, simply compare each one with the first item, just as you have done for the second item.

	Situation	
1.	Performing a variety of duties which may often change.	100
2.	Repeating activities or tasks of short duration according to a required routine procedure or sequence.	_____
3.	Doing things only under specific instruction, allowing little or no room for independent action or judgment in working out job problems.	_____
4.	Directing, controlling, and planning an entire activity or activities of others.	_____
5.	Dealing with people in actual job duties beyond giving and receiving instructions.	_____
6.	Working alone and away from others workers, although the work may be related to work other people are doing.	_____
7.	Influencing people's opinions, attitudes, or judgments about ideas or things.	_____
8.	Working well under pressure when faced with critical or unexpected situations or when taking necessary risks.	_____
9.	Rating information by using personal judgment.	_____
10.	Rating information using standards that can be measured or checked.	_____
11.	Interpreting feelings, ideas, or facts from a personal point of view.	_____
12.	Working with precise limits or standards of accuracy.	_____

Now that you have rated each situation, indicate your first three and last three choices below by number.

_____ _____ _____ _____ _____ _____

First Second Third Tenth Eleventh Last(Twelfth)

Apperdix B

Interest Factors Instrument

WORK ACTIVITY PREFERENCES

Most people have an interest in or a preference for certain types of work activity. Below is a list of ten broad types of work activity. Read each activity and express how you would feel about working on a job which would involve you in that activity. Use the following procedure.

First, notice that we have already placed a number (100) next to the first item to indicate its rating. So your liking for the first activity is defined as a rating of 100, whether you like it very much, dislike it very much, or are completely indifferent. Second, look at the second item. If you like the activity half as much as the one in the first item, you should score the item 50. If you like it ten times as much, score the item 1000, and so on. For the rest of the items, simply compare each one with the first item, just as you have done for the second item.

	Activity	
1.	Activities dealing with things and objects.	100
2.	Activities involving business contact with people.	
3.	Activities of a routine, definite, organized nature.	
4.	Activities which involve direct personal contact to help people or deal with them for other purposes.	
5.	Activities which bring recognition or appreciation by others.	
6.	Activities concerned with people and the communication of ideas.	
7.	Activities of a scientific and technical nature.	
8.	Activities of an unusual, indefinite nature which require creative imaginations.	
9.	Activities which are nonsocial and involve the use of machines, processes, or methods.	
10.	Activities which bring personal satisfaction from working on or producing things.	

Now that you have rated each activity, indicate your first three and last three choices below by number.

First Second Third Eighth Ninth Last(Tenth)

Appendix C

Data-People-Things Instrument

ACTIVITIES INVOLVING DATA, PEOPLE, AND THINGS

Most people have an interest in or a preference for certain types of work activity. Below is a list of several broad types of work activity. Read each activity and express how you would feel about working on a job which would involve you in that activity. Use the following procedure.

> First, notice that we have already placed a number (100) next to the first item to indicate its rating. So your liking for the first activity is defined as a rating of 100, whether you like it very much, dislike it very much, or are completely indifferent. Second, look at the second item. If you like the activity half as much (for example) as the one in the first item, you should score the item 50. If you like it ten times as much, score the item 1000, and so on. For the rest of the items, simply compare each one with the first item, just as you have done for the second item.

Involvement with Information

0 SYNTHESIZING: Discovering facts and/or developing logical conclusions or interpretations of ideas by bringing together the results of examining and determining the value of information. 100

1 COORDINATING: Determinig the time, place, and order of operations or actions to be performed as a result of analyzing information. (See Item 2, Analyzing.) Carrying out and/or reporting on actions decided upon. _____

2 ANALYZING: Examining and determining the value of information, which sometimes results in a need to choose the best course of action to be taken. _____

3 COMPILING: Gathering information and putting it together in proper order. Frequently involves reporting and/or carrying out activities indicated by the information. _____

4 COMPUTING: Performing arithmetic operations, reporting results, or carrying out activities as indicated by the results. Does not include counting. _____

5 COPYING: Transcribing information (rewriting from another copy or from shorthand notes), or posting data (entering it in ledgers or account books). _____

6 COMPARING: Judging information, people, or things according to what can be readily observed such as what they do, how they look or how they are made, and whether they are usual or differ from the usual. _____

Involvement with People

0 MENTORING: Dealing with individuals in terms of their total personality to advise or counsel them on problems by applying principles of law, science, medicine, religion, or other professions. _____

1 NEGOTIATING: Exchanging ideas, information, and opinions with others to make policies, plan programs, and/or arrive jointly at decisions, conclusions, or solutions. _____

2 INSTRUCTING: Teaching subject matter to others, or training others (including animals) through explaining, demonstrating, or supervised practice, using knowledge gained through specialized training, such as in medicine, law, or engineering, to make recommendations. _____

3 SUPERVISING: Determining or explaining work procedures for a group of workers, assigning tasks to them, encouraging them to get along well with each other and to do their best work. _____

4 DIVERTING: Amusing others. _____

5 PERSUADING: Influencing others in favor of a product, service, or opinion. _____

6 SPEAKING-SIGNALING: Talking with and/or signaling people to give or exchange information. Includes: assigning tasks or giving directions to helpers or assistants.

7 SERVING: Attending to the requests or needs of people or animals. Carrying out the wishes of people, either expressed or understood without being expressed. Immediate response is involved. _____

Involvement with Things

0 SETTING UP: Adjusting machines of equipment by replacing or altering tools, jigs, fixtures, and attachments to prepare them to perform their functions, change their performance, or restore their proper functioning if they break down. This group includes workers who set up one or a number of machines for other workers or who set up and personally operate a variety of machines. _____

1 PRECISION WORKING: Using parts of the body, usually with tools or work aids, to work, guide, or place objects or materials in such a way that rigid standards for the product or process will be met. Considerable judgment on the part of the precision worker is required in selecting the right tools, objects, or material and correctly applying the tool to the task. _____

2 OPERATING-CONTROLLING: Starting, stopping, controlling, and adjusting the progress of machines or equipment designed to manufacture and/or process objects or materials. Operating involves setting up the machine and adjusting it or the material as the work progresses. Controlling equipment involves watching gages, dials, etc.; and turning valves and other devices to control such factors as temperature, pressure, flow of liquids, speed of pumps, and reactions of materials. Frequent adjustments of the equipment may be needed. _____

3 DRIVING-OPERATING: Starting, stopping, and controlling the actions of machines or equipment which must be steered or guided to manufacture, process, and/or move things or people. Involves such activities as watching gages and dials; estimating distances, and determining speed and direction of other objects: turning cranks and wheels; pushing clutches or brakes; and pushing or pulling gear lifts or levers. Includes such machines as cranes, conveyor systems, tractors, paving machines, hoisting machines, and equipment for loading large industrial furnaces. Does not include machines powered by hand such as handtrucks and dollies, or power assisted machines like electric wheelborrows or electric handtrucks. _____

4 MANIPULATING: Using tools, special devices, or parts of the body to work, move, guide, or place objects or materials. Involves the use of some judgment with regard to the degree of accuracy needed and in selecting the proper tool, object, or material, but such judgments are usually not difficult to make. _____

5 TENDING: Starting, stopping, and watching the operation of machines and equipment. Involves adjusting materials or controls of the machine, such as changing guides, adjusting times and temperature gages, turning valves to allow flow of materials, and flipping switches in response to lights. Little judgment is involved in making these adjustments. _____

6 FEEDING-OFFBEARING: Throwing, dumping, putting, or feeding materials into or removing them from machines or equipment which may be automatic or may be tended or operated by other workers. _____

7 HANDLING: Using parts of the body, handtools, and/or special devices to work, move, or carry objects or materials. Permits little or no judgment in meeting standards or in selecting the proper tool, object, or material. _____

Now that you have rated each activity, indicate your first three choices below by number.

First Second Third