ACT RESEARCH REPORT

No. 29

29

April, 1969

AN EMPIRICAL OCCUPATIONAL CLASSIFICATION DERIVED FROM A THEORY OF PERSONALITY AND INTENDED FOR PRACTICE AND RESEARCH

John L. Holland
Douglas R. Whitney
Nancy S. Cole
James M. Richards, Jr.

Published by Research and Development Division

American College Testing Program

P. O. Box 168, Iowa City, Iowa 52240

Summary

The origin, development, verification, and revision of an occupational classification is presented. The classification organizes occupations according to their degree of psychological "relatedness" following Holland's theory of personality. Because of its theoretical simplicity and empirical base, the classification has many potential practical applications for vocational guidance, industrial personnel work, and research in education, psychology, and sociology.

An Empirical Occupational Classification Derived from a Theory of Personality and Intended for Practice and Research

John L. Holland, Douglas R. Whitney, Nancy S. Cole
James M. Richards, Jr.[2]

This report presents a revision of the occupational classification scheme first proposed and tested in an earlier study (Holland, 1966b). The many desirable features of this revised classification enhance its potential value both for research and for vocational guidance and personnel work.

The Original Classification

In 1959, Holland proposed an a priori occupational classification of six categories. From 1959 to 1965, this classification was used in several theoretical studies, but it was neither directly tested for its value as a classification system nor explicitly defined for clear and easy use. Later Holland (1966b) defined the major categories of the classification--Realistic, Intellectual, Artistic, Social, Enterprising, and Conventional--in terms of the six Vocational Preference Inventory (VPI) scales having the same names. The assumption that occupational titles in the VPI scales define comparable categories in the classification made an explicit reconstruction of the classification possible.

To obtain the first empirical version of the classification (Holland, 1966a), a profile of VPI means was calculated for students planning to enter each occupation. An occupation's coded profile (highest scale mean first, next highest scale second, etc.) defined an occupation's place in the classification. For example, an occupation with a code of RIES was placed in the major category--Realistic. The remainder of the code indicated that occupation's particular subgroup within its major category. The application of this procedure to the VPI data for 12,432 college freshmen in 31 institutions (Abe et al, 1965) produced separate classifications for men and women. The classification for men included all six major VPI categories (Realistic, Intellectual, Artistic, Social, Enterprising, and Conventional), each with one or more subgroups. The VPI data for women yielded only four major groups (Intellectual, Artistic, Social, Conventional) with a number of subgroups within each of the major categories.

This first classification was tested for its usefulness in a series of studies. In the first study, Holland (1966a) obtained several favorable results: the classification developed from one

sample (N=12,432 college students) produced expected results when applied to another sample (N=10,646 college students). When students were grouped into six categories according to their occupational choice, their highest mean score occurred on the corresponding VPI scale; that is, students who chose occupations previously classified as "Realistic" had the Realistic scale of the VPI as their highest mean score. Also, their mean on that scale was higher than the Realistic mean of any other occupational group. Without exception, similar findings held for the remaining occupational groups of men and women.

In a second study, Holland (1968b) demonstrated that individual profiles using one, two, and three scales could be interpreted according to his theory of personality types. For example, Realistic peaks were associated with technical competencies and mechanical ability; Intellectual peaks were associated with scientific competencies, mathematical ability, etc. Students with the same high point scale can still be distinguished by their second highest VPI scale. And students whose first two highest scales were the same, can still be distinguished by their third highest scale. For these three levels of predictive difficulty, 64-84% of the theoretical predictions of peaks for students with different characteristics were correct for large samples of men and women.

In a third study, Holland and Whitney (1968) applied the classification to longitudinal data and obtained unusually efficient predictions of vocational aspirations over an 8 to 12 month interval. For example, 79% of the men and 93% of the women indicate successive vocational choices that were described as related or lawful rather than random. In this later study, a comparison of Holland's (1966a) and Roe's (1956) classification systems suggested that the original Holland classification appeared to be somewhat more efficient for prediction. (At the same time, Holland's scheme may have enjoyed some advantages because it was developed from earlier data using the same sample of college students.)

In an unpublished reanalysis of four-year longitudinal data from a national sample of college students (Astin & Panos, 1968), we applied the classification scheme and obtained closer relationships between successive vocational choices than had the original authors. In several other unpublished analyses, we again found higher relationships between successive occupational choices (Sharp & Krasnegor, 1966; Davis, 1965; and others). Generally, these gains in predictive efficiency were large because most informal classifications create categories consisting of occupations known to be psychologically diverse.

Finally, Richards (in Holland, 1968a) performed diagonal factor analyses to determine whether or not each VPI scale measures a dimension independent of what the scales have in common. The results of separate analyses for large samples (3,771 men and 3,492 women) clearly demonstrate that each scale does measure something different from the others; or, there are at least six kinds of people. There may be more, but not fewer.

In short, the original classification produces efficient predictions, contains a set of concepts each with some unique variance, and provides explicit interpretations of class membership.

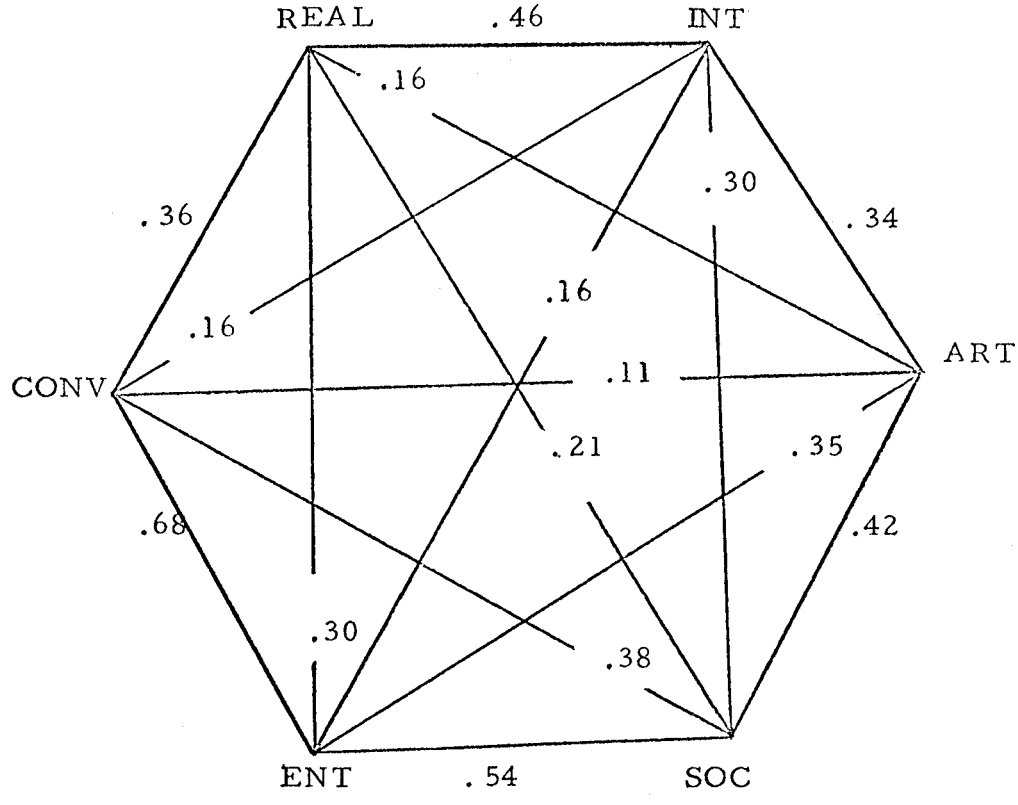
The Revised Classification

The following is the latest revision of Holland's (1966a) classification. For this revision, Vocational Preference Inventory (VPI) data for a large sample of two-year college students (12,345 men and 7,968 women) were added to the data obtained in 1966 for four-year college students. Data from some samples of employed adults were also added to the classification. These additions made the classification more comprehensive and reliable.

In this revision, occupations were assigned to classes exactly as before; that is, coded mean VPI scores of all students aspiring to an occupation indicated an occupation's place in the classification.

In the first classification, the arrangement of subgroups within a major class had no special meaning. In the revision, however, the major classes and subclasses were arranged according to the following hexagonal model. (See Figure 1) The hexagonal model was discovered somewhat accidentally when we noticed that an intercorrelational matrix for the VPI scales used in the classification could be approximated by the distances within the hexagon. Subsequent examination of correlation matrices for nine different samples revealed that the hexagonal model provided satisfactory approximations.

Figure 1: A Hexagonal Model for Interpretating Inter- and Intra-Class Relationships



The Revised Occupational Classification

In the following classification note these abbreviations. Under the heading "sample" "2" indicates two year college students and "4" indicates four year college students and "E" indicates a sample of employed adults. Underlining indicates "tied codes" or identical average scores on the Vocational Preference Inventory.

If two and four year samples were obtained for an occupation they are placed together. Note that the codes obtained from different samples are usually similar. The placement of occupations with different codes (two year versus four year) was sometimes an ambiguous decision.

REALISTIC CLASS (MEN)

Sample	Occupation	Code	N
4	Architect	RIAE	83
2	Architectural Draftsman	RIAE	237
2	Forester	RISE	151
4	Forester	RISE	105
4	Geographer	RISE	12
4	Industrial Arts Teacher	RISE	50
2	Industrial Arts Teacher	(RSIE)	39
4	Trades & Industrial Teacher	RISE	27
2	Draftsman	RIEA	256
2	Aviation Worker	RIES	149
2	Farmer	RIES	190
4	Farmer	RIES	61
2	Architectural & Civil Eng. Tech.	RIEC	265
4	Civil Engineering	RIEC	185
2	Electrical Worker	RIEC	604
2	Electronic Eng. Technician	RIEC	163
2	Engineer	RIEC	246
2	Industrial Eng. Technician	RIEC	106
4	Industrial Engineer	RIEC	37
2	Mechanical Eng. Technician	RIEC	398
4	Mechanical Engineer	RIEC	152
2	Metal/Machine Worker	RIEC	102
4	Agronomist	REIS	166
2	Construction Worker	REIS	103
2	Air Conditioning Eng. Technician	REIC	55
2	Mechanics Worker	REIC	248
2	Printer	RESI	66

INTELLECTUAL CLASS (MEN)

Sample	Occupation	Code	N
4	Anthropologist	IASR	12
4	Physical Therapist	IASR	9
4	Physician	ISAE	354
2	Physician	(ISAR)	101
4	Biological Scientist	ISRA	36
4	Biologist	ISRE	55
4	Natural Science Teacher	ISRE	86
4	Physical Scientist	ISRE	5
4	Mathematics Teacher	ISRC	138
4	Home Economist	IESA	5
4	Physiologist	IESA	12
a	Pharmacist	IESR	374
4	Pharmacist	IESR	51
2	Pharmacist	(IERS)	48
4	Dentist	IERS	120
2	Dentist	(ISER)	67
4	Astronomer	IRAS	14
4	Chemist	IRAS	87
4	Geologist	IRASE	19
4	Physicist	IRAS	61
E	Engineer/Technician	IRAS	58
4	Engineering Scientist	IRAC	44
4	Biochemist	IRSA	15
2	Biological Scientist	IRSA	136
4	Botanist	IRSA	12
2	Medical Technologist	IRSA	53
4	Medical Technologist	IRSA	9
4	Oceanographer	IRSA	9
2	Physical Scientist	IRSA	54
4	Zoologist	IRSA	33
2	Optometrist	IRSE	20
4	Veterinarian	IRSE	120
2	Veterinarian	IRSE	76
2	X-Ray Technician	IRSE	39
4	Chemical Engineer	IREA	94
4	Electrical Engineer	IREA	259
2	Metal. Eng. Tech.	IREA	19
2	Aerospace Eng. Tech.	IRES	188
2	Chemical Eng. Tech.	IRES	80
4	Military Officer	IRES	80
4	Aeronautical Eng.	IREC	77
4	Metallurgical Eng.	IREC	14
4	Mathematician/Stat.	IRCE	80
2	Mathematician	(IRSE)	74

[a]Students and faculty from three schools of pharmacy.

ARTISTIC CLASS (MEN)

Sample	Occupation	Code	N
4	Speech Teacher	ASER	10
4	Actor-Drama Coach	ASEI	19
2	Cosmetologist	ASEI	5
4	English Teacher	ASEI	67
2	Speech/Drama Teacher	ASEI	40
4	Art Teacher	ASIE	29
4	Music Teacher	ASIE	63
2	Musician	ASIE	86
4	Musician	(ASEI)	41
4	Philosopher	ASIE	10
4	Writer	ASIE	42
E	Advertising Man	AESI	46
4	Journalist	AESI	58
2	Journalist	(ASEI)	62
2	Photographer	ARIS	100
4	Foreign Language Interpreter	AISE	6
4	Literature Teacher	AISE	10
2	Artist	AIRS	179
4	Artist	(AISE)	45

SOCIAL CLASS (MEN)

Sample	Occupation	Code	N
2	Physical Ed. Teacher	SERI	274
4	Physical Ed. Teacher	(SRIE)	272
E	Counselor	SEIA	58
4	Counselor	(SEAI)	36
4	Educational Psychology	SEIA	9
4	Historian	SEIA	57
2	Historian	SEIA	123
4	History Teacher	SEIA	202
E	Jr. Col. Administrator	SEIA	16
4	Foreign Service Officer	SEAI	35
4	Industrial Psychologist	SEAI	17
2	Sociologist	SEAI	57
4	Sociologist	SEAI	15
2	Teacher	SEAI	739
2	Policeman	SREI	318
4	Librarian	SRIA	6
2	Librarian	(SIAR)	5
4	Special Ed. Teacher	SRIA	8
2	Dental Technologist	SIER	8
4	Elementary Teacher	SIER	117
2	Social Scientist	SIER	50
4	Experimental Psychol.	SIEA	23
2	Foreign Language Inter.	SIEA	21
4	Social Worker	SIEA	19
2	Mortician	SIRE	13
2	Therapist	SIRA	23
2	Nurse	SIAE	34
2	English Teacher	SAER	39
4	Foreign Lang. Teacher	SAER	17
2	Social Service Worker	SAEI	76
E	Clergyman	SAIE	32
4	Clergyman	SAIE	77
2	Clergyman	(SAER)	47
4	Clinical Psychologist	SAIE	42
2	Psychologist	SAIE	137

ENTERPRISING CLASS (MEN)

Sample	Occupation	Code	N
4	Buyer	ECRI	16
2	Clothing Technologist	ECRS	9
2	Real Estate Agent	ECRS	43
2	Economist	ECSR	45
4	Economist	(ECIS)	14
4	Manager/Administrator	ECSR	360
2	Manager/Administrator	ECSR	1178
2	Salesman	ECSR	309
4	Salesman	(ECRS)	64
4	Marketing Man	ECSI	45
2	Radio/TV Announcer	ERAS	157
4	Public Relations & Advertising	EACS	40
4	Lawyer	EASI	288
2	Lawyer	(ESAI)	244
4	Government Officer	ESCA	19
2	Secretary	ESCA	15
2	Food & Hotel Technologist	ESRC	137
4	Educational Administrator	ESAI	8
4	Political Scientist	ESAI	76
2	Political Scientist	(SEIA)	54
E	Security Salesman	ESAI	37

CONVENTIONAL CLASS (MEN)

Sample	Occupation	Code	N
4	Clerk	CRES	6
4	Business(Commercial) Teacher	CSER	23
2	Data Processing Worker	CERI	502
4	Finance Expert	CEIS	91
2	Accountant	CESR	605
4	Accountant	(CERS)	279

INTELLECTUAL CLASS (WOMEN)

Sample	Occupation	Code	N
4	Architect	IASE	8
4	Agronomist	IASR	15
2	Veterinarian	IASR	28
4	Veterinarian	(ISAR)	16
2	Farmer	IACSR	8
4	Physicist	IARS	7
4	Biologist	ISAE	40
2	Chemical Eng. Technician	ISAE	10
2	Medical Technologist	ISAE	127
4	Medical Technologist	(SIAE)	111
4	Natural Science Teacher	ISAE	45
2	Physical Scientist	ISAE	6
4	Physician	ISAE	79
2	Physician	ISAE	38
4	Zoologist	ISAE	13
4	Biochemist	ISAR	12
2	Biological Scientist	ISAR	42
4	Biological Scientist	ISAR	21
4	Chemist	ISAR	25
4	Mathematician/Statistician	ISCA	54
2	Mathematician	(SCIA)	36
a	Pharmacist	ISEA	46
2	Pharmacist	(ISCE)	7
4	Pharmacist	(SIAE)	15

[a] Students and faculty from three schools of pharmacy.

ARTISTIC CLASS (WOMEN)

Sample	Occupation	Code	N
4	Actress/Drama Coach	ASEI	18
4	Foreign Language Interpreter	ASEI	42
4	Foreign Service Worker	ASEI	36
2	Industrial Arts Teacher	ASEI	5
4	Industrial Psychologist	ASEI	8
4	Journalist	ASEI	57
2	Journalist	(ASIE)	54
4	Music Teacher	ASEI	74
2	Musician	ASEI	50
4	Musician	(ASIE)	43
2	Printer	ASEIC	5
2	Radio/TV Announcer	ASEI	15
2	Speech/Drama Teacher	ASEI	38
2	Draftsman	ASRE	8
4	Art Teacher	ASIE	93
2	Artist	ASIE	217
4	Artist	ASIE	92
4	Literature Teacher	ASIE	22
4	Writer	ASIE	52
4	Civil Engineering	ASIC	6
2	Architectural Draftsman	ASIR	14
2	Photographer	AIES	17

SOCIAL CLASS (WOMEN)

Sample	Occupation	Code	N
4	Psychologist	SEIA	6
4	Buyer	SEAC	55
4	Educational Psychologist	SEAC	15
2	Food & Hotel Technician	SEAC	53
2	Saleswoman	SEAC	95
4	Saleswoman	SEAC	25
4	Business Teacher	SCEA	89
4	Clerk	SCEA	94
2	Industrial Eng. Tech	SCEA	6
2	Manager	SCEA	77
4	Manager	(SEAC)	22
2	Secretary	SCAE	1024
4	Secretary	SCAE	267
2	Dental Technologist	SIAE	6
2	Nurse (Professional)	SIAE	952
4	Nurse (Professional)	(SAIE)	301
2	Nurse (L. P. N.)	SIAE	75
4	Physical Therapist	SIAE	32
2	X-Ray Technician	SIAE	62
4	Mathematics Teacher	SIAC	114
2	Optometrist	SIAC	5
2	Housewife	SAEC	166
4	Housewife	(SAEI)	122
2	Lawyer	SAEC	48
4	Lawyer	(SAEI)	32
4	Public Relations & Adv.	SAEC	13
2	Clothing Technologist	SAEI	43
E	Counselor	SAEI	28
4	Counselor	SAEI	76
4	Elementary Teacher	SAEI	1497
4	English Teacher	SAEI	306
2	English Teacher	SAEI	78
4	Foreign Language Teach.	SAEI	117
2	Foreign Language Teach.	SAEI	50
4	Historian	SAEI	24
2	Historian	(SAIE)	50
4	History Teacher	SAEI	154
4	Home Ec. Teacher	SAEI	153
4	Home Economist	SAEI	184
2	Home Economist	(SEAI)	72
4	Phys. Ed. Teacher	SAEI	239
2	Phys. Ed. Teacher	SAEI	163
2	Policewoman	SAEI	12
4	Social Worker	SAEI	140
4	Speech Teacher	SAEI	22
4	Special Ed. Teacher	SAEI	145
2	Cosmetologist	SACE	30
2	Medical Secretary	SACI	201
4	Aeronautical Engineer	SAIE	9
4	Astronomer	SAIE	6
4	Church Worker	SAIE	34
2	Church Worker	(SAEI)	11
4	Clinical Psychologist	SAIE	48
4	Dentist	SAIE	32
2	Dental Hygienist	SAIE	209
4	Experimental Psych.	SAIE	12
2	Librarian	SAIE	33
4	Librarian	(SAEI)	32
4	Political Scientist	SAIE	32
2	Political Scientist	(SAEI)	16
2	Psychologist	SAIE	98
2	Social Service Worker	SAIE	190
2	Social Scientist	SAIE	30
2	Sociologist	SAIE	55
4	Sociologist	(SAEI)	34
2	Teacher	SAIE	1477
2	Therapist	SAIE	84
2	Aviation Worker	SAIC	10
2	Dental Assistant	SAIC	110

ENTERPRISING CLASS (WOMEN)

Sample	Occupation	Code	N
4	Marketing Woman	ECSA	5
2	Real Estate Agent	ESAC	13

CONVENTIONAL CLASS (WOMEN)

Sample	Occupation	Code	N
2	Accountant	CSEA	174
4	Accountant	CSEA	42
2	Data Processing Worker	CSEA	251
4	Finance Expert	CESI	7

A mathematical verification of the hexagonal configuration was obtained by using factor analysis to locate the six VPI scales in a three dimensional space.[1] Since all six variables had high positive loadings on the first factor, which represents an overall checking rate on the VPI (one kind of response set), they lay very nearly in a plane approximately perpendicular to the first factor. Fitting a plane to minimize the deviation of the points from it and projecting the six points onto this "best-fitting" plane resulted in the configurations for men in Figure 2 and for women in Figure 3.

The data in the illustrative hexagon is for a 10% sample of 1,234 out of 12,345 male two-year college students in 65 colleges. A sample of 796 out of 7,968 females in the same colleges produces similar results. This simple geometric model arranges student occupational aspirations according to their psychological relatedness, thereby making the classification more useful for vocational guidance and research in careers. The hexagonal model arranges the main categories in the following order--Realistic, Intellectual, Artistic, Social, Enterprising, and Conventional (proceeding around the hexagon in a clockwise direction)--so that adjacent main categories are most closely related. (See the hexagon on Page 4.) In general, close relationships are represented by short distances on the hexagon.

We can apply the same principle of arrangement to the subgroups within a major category by observing the following rules. Within a major category, arrange the subgroups so that the second code letters follow in clockwise order starting from the major category's first code. In the same manner, arrange subgroups whose first two letters are identical by the third (and finally, fourth) letter. For example, in the Realistic category, RI(Realistic-Intellectual) subgroups precede RA (Realistic-Artistic) subgroups, RAE (Realistic-Artistic-Enterprising) precedes RAC (Realistic-Artistic -Conventional), and RIAS (Realistic-Intellectual-Artistic-Social) precedes RIAC (Realistic-Intellectual-Artistic-Conventional). The application of this simple rule places the first subgroup in a main category close to the major category on the right, places the middle subgroups at a neutral or distant point, and places the last subgroup closest to the major category on the left.

The practical outcomes of rearranging the main categories and subcategories following the hexagonal model are largely unclear

Figure 2. Configuration of six VPI scales in a "best-fitting" plane from analysis of the correlation matrix for men.

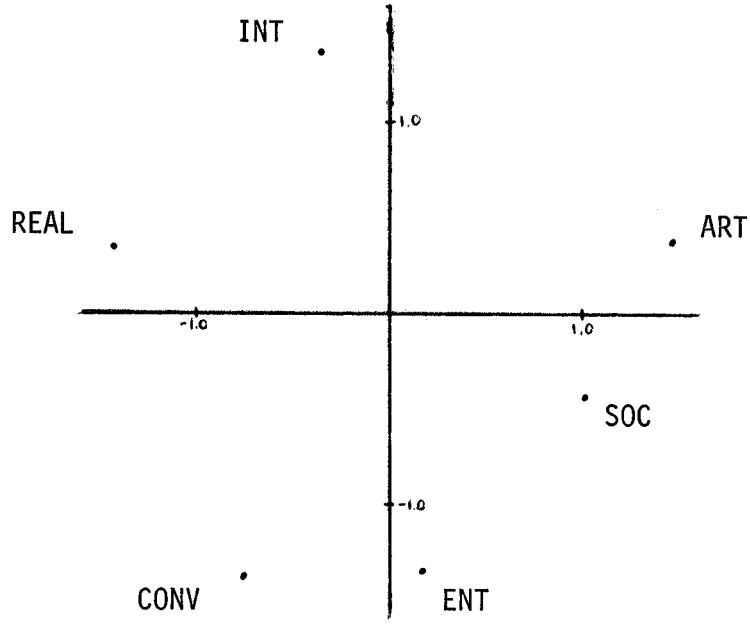
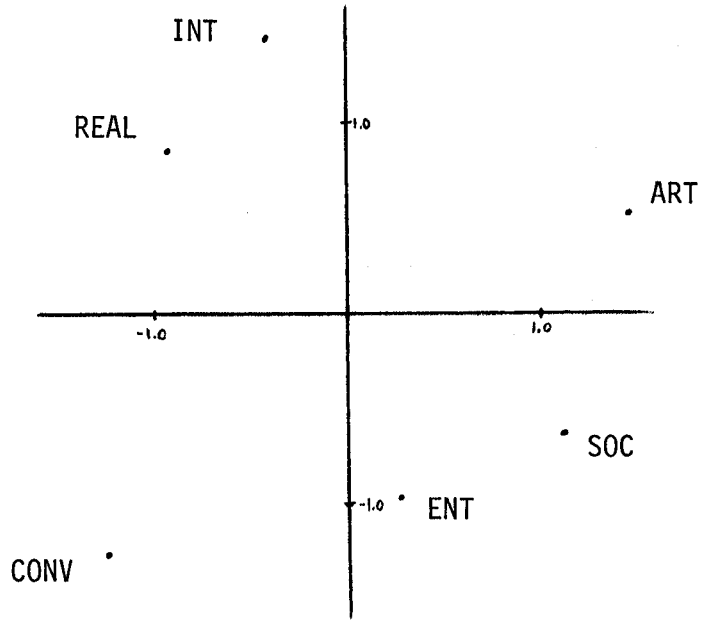


Figure 3. Configuration of six VPI scales in a "best-fitting" plane from analysis of the correlation matrix for women.



and untested at this time. A review of this arrangement does suggest that the hexagonal model provides a more psychologically based arrangement; that is, subgroups of occupations that seem to go together--because of their codes and therefore their assumed psychological similarity--appear to be placed close to each other more frequently than in the original classification. The value of the hexagonal arrangement for the main classes is clearly supported by an earlier longitudinal study (Holland & Whitney, 1968). In that study, if students changed their occupational preference, the majority of such changes were accomplished by movement to an adjacent major category where "adjacent" is defined by the hexagonal model. Concretely, a change from a Realistic choice to an Intellectual or Conventional choice is a change to an "adjacent" category. More investigation will determine the value of the hexagonal arrangement for subclasses although the arrangement implies some interesting hypotheses about the nature of relationships among similar occupations.

To summarize, we now assume that the revised classification has the following desirable characteristics: (a) an explicit theory for interpreting class membership, for organizing information about occupations, and for revising the classification, (b) mutually exclusive classes, (c) efficient forecasting ability for several purposes, and (d) provision for explicit extension to unclassified occupations by the application of a single, empirical technique. Since the VPI scales are measures of personality as well as interests, and since people with similar interests have similar personalities, we assume that the occupational classification organizes similar personalities in some practical and scientific ways.

At the same time, the revised classification still has some deficiencies. They include (a) a lack of comprehensiveness, despite classifying all the common occupations aspired to by 2- and 4-year college students and (b) unstable definitions, because different samples of occupational aspirants and employed adults for the same occupation produce similar but not always identical VPI profiles. Consequently, the precise place of an occupation in the classification is sometimes unclear. (c) The value of the hexagonal arrangement is only partially explored so that it should be termed promising rather than substantiated. Finally, (d) employed adult samples may provide different VPI profiles, although a few adult samples in the present classification imply that this occurrence is a remote possibility.

Some Practical Uses

The potential uses of the classification are most promising for vocational guidance, personnel work, and research. In vocational guidance, the classification can be used to organize vocational information files and readings. Because the classes and subclasses arrange materials according to their "relatedness"--how psychologically distant one occupation is from another, or how far one occupational group is from another--students can use the classification for occupational exploration with little help. For example, counselors can use a student's current occupational choice, history of choices, or interest inventory scores to direct a student to appropriate occupational materials and to encourage him to look also at closely related materials.

The classification should also help interpret interest inventories, student occupational choices, and other student data in terms of a single theory. To illustrate, a boy's choice of mechanical engineering would be coded RIEC. And, if his Kuder code were Mechanical-Scientific-Persuasive-Computational, his profile would be equivalent to the classification code of RIEC. A student's Kuder profile can be translated into the Holland categories. (See Holland, 1966b, p. 37.) The counselor could also assess a student for his resemblance to a person with a personality pattern of RIEC. The counselor might use the classification to show the student other RIEC occupations such as civil engineering or industrial engineering.

If he is unsure about his initial choice, the student can be directed to occupations in such related subgroups as aviation (RIES), farming, (RIES), or drafting (RIEA). "Undecided" students or students unable to make choices can first explore the entire classification and then use occupational files organized by the same classification to obtain specific information.

A person's conflicting occupational choices can also be classified and examined for their special character and psychological distance from one another. Using the theory, a counselor can explicitly and theoretically define a student's occupational conflict --a process which might aid both the student and his counselor. For example, a boy trying to decide between engineering (RIEC) and farming(RIES) should experience little conflict. A discussion of "C" and "S" or "Conventional" and "Social" types might simplify his decision.

In contrast, a boy who is trying to decide between chemistry (IRAS) and law (ESAI) has a much more difficult task because his interest in such diverse occupations mirrors diverse personal opinions about himself.

The classification may aid industrial personnel work; subgroups of similar occupations could be used in recruitment to center attention on potentially profitable recruitment areas. For instance, if recruiters need trainees for a specific occupation and cannot find enough prospects, the classification specifies related occupations which might yield interested candidates. Because most organizations find that some types of people are more successful than others, the classification provides a systematic nomenclature for interpreting this common occurrence and using the information accordingly. For example, employees with long and short tenure can be compared in terms of their VPI profiles.

Finally, and equally important, the classification creates some exciting research possibilities. The four-letter codes provide theoretical descriptions for the typical person in each occupation. These theoretical descriptions should be helpful for interpreting occupational data and occupational differences. For example, a male social worker (SIEA) should display the characteristics of Social-Intellectual-Enterprising-Artistic types and in that order. (See Holland, 1966b for information about the types.) The classification allows a researcher studying vocational behavior to investigate a person's training, occupational aspirations, and work history within the framework of a single classification and theory. Literally, a person's life can be considered a series of coded choices which can be studied for their patterns, stability, and mathematical relationships. In other research, the classification can be used to organize and interpret occupational census information so that some educational and sociological studies which must now rely on crude, ambiguous classifications will have a more constructive alternative. Depending upon the variety of occupations studied and the size of the sample, a researcher can use the main six categories, the two-, the three-, or the four-letter subcategories. The earlier study (Holland, 1968b) demonstrated that categories become more homogeneous or clearly defined as one moves from single- to two- and three-letter codes. In short, a researcher can modify the classification to meet his particular needs.

Footnote

[1]From the correlation matrix of the six scale scores given in the GP Manual (Holland, 1968a, p. 35, 36) principal component analyses were computed separately for men and women. The first three dimensions or factors accounted for 78% and 76% of the trace respectively, and the succeeding steps used only these three dimensions.

All six scales had large positive loadings on the first factor. Thus, in the three-space defined by the three factors, the six points fell very nearly in a plane. By using the (6 x 3) factor loading matrix to locate the six points in this three-space, the smallest characteristic vector of the covariance matrix of the three factors is in the direction which minimizes the deviation from a plane fitting the six points. The two largest characteristic vectors correspondingly define this "best fitting" plane. When the points in three-space (the six VPI scales) are projected onto this plane, the result is a two-dimensional representation of the six points which is given in Figure 2 for men and Figure 3 for women.

The excellent fit of the points in the three-space to the plane is clear from the fact that the third characteristic root (showing deviation from the plane) accounted for only .2% and 1.1% of the trace for men and women, respectively. Thus the principal variation ignored in these analyses is that involved in the fourth, fifth, and sixth factors of the original correlation matrix, and even this, as noted, is a minor source of variation.

[2]We are indebted to the following people for their constructive assistance: Linda R. Shevel, Leonard L. Baird, Charles F. Elton, Evelyn A. Bollinger, and Janis S. Walton.

References

Abe, C., Holland, J. L., Lutz, S. W. & Richards, J. M., Jr. A description of American college freshmen. ACT Research Report No. 1. Iowa City: The American College Testing Program, 1965.

Astin, A. W. & Panos, R. J. The educational and vocational development of American college students. Washington, D.C.: American Council on Education, 1968.

Davis, J. A. Undergraduate career decisions. Chicago: Aldine, 1965.

Holland, J. L. A psychological classification scheme for vocations and major fields. Journal of Counseling Psychology, 1966, 13, 278-288. (a)

Holland, J. L. ACT Guidance Profile Manual. Iowa City: The American College Testing Program, 1968. (a)

Holland, J. L. Explorations of a theory of vocational choice: VI. A longitudinal study using a sample of typical college students. Journal of Applied Psychology Monographs, 1968, 52, No. 1. (b)

Holland, J. L. The psychology of vocational choice. Waltham, Mass.: Blaisdell, 1966. (b)

Holland, J. L. & Whitney, D. R. Changes in the vocational plans of college students: Orderly or random. ACT Research Report No. 25. Iowa City: The American College Testing Program, 1968.

Roe, A. The psychology of occupations. New York: Wiley, 1956.

Sharp, L. M., & Krasnegor, R. B. Five years after the college degree. Part II: Employment. Washington, D.C.: Bureau of Social Science Research, 1966.

ACT Research Reports

This report is the twenty-ninth in a series published by the Research and Development Division of the American College Testing Program. The research reports have been deposited with the American Documentation Institute, ADI Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington, D. C. 20540 (ADI Document numbers and prices are given below.) Photocopies and 35 mm. microfilms are available at cost from ADI; order by ADI Document number. Advance payment is required. Make checks or money orders payable to: Chief, Photoduplication Service, Library of Congress. Printed copies are available from the Research and Development Division, American College Testing Program.

The reports are also indexed by the CURRENT CONTENTS, EDUCATION, Institute for Scientific Information, 325 Chestnut Street, Philadelphia, Pennsylvania 19106.

Reports preceded by an asterisk (*) in the list below are available only from ADI.

*No. 1 A Description of American College Freshmen, by C. Abe, J. L. Holland, S. W. Lutz, & J. M. Richards, Jr., (ADI Doc. 8554; photo, $8.75; microfilm, $3.00)

*No. 2 Academic and Nonacademic Accomplishment: Correlated or Uncorrelated? by J. L. Holland, & J. M. Richards, Jr., (ADI Doc. 8555; photo, $3.75; microfilm, $2.00)

*No. 3 A Description of College Freshmen: I. Students with Different Vocational Choices, by C. Abe, & J. L. Holland (ADI Doc. 8556; photo, $7.50; microfilm, $2.75)

*No. 4 A Description of College Freshmen: II. Students with Different Vocational Choices, by C. Abe, & J. L. Holland (ADI Doc. 8557; photo, $7.50; microfilm, $2.75)

*No. 5 A Description of Junior Colleges, by J. M. Richards, Jr., L. M. Rand, & L. P. Rand (ADI Doc. 8558; photo, $3.75; microfilm, $2.00)

*No. 6 Comparative Predictive Validities of the American College Tests and Two Other Scholastic Aptitude Tests, by L. Munday (ADI Doc. 8559; photo, $2.50; microfilm, $1.75)

No. 7 The Relationship Between College Grades and Adult Achievement: A Review of the Literature, by D. P. Hoyt (ADI Doc. 8632; photo, $7.50; microfilm, $2.75)

ACT Research Reports (cont)

*No. 8 A Factor Analysis of Student "Explanations" of Their Choice of a College, by J. M. Richards, Jr., & J. L. Holland
(ADI Doc. 8633; photo, $3.75; microfilm, $2.00)

No. 9 Regional Differences in Junior Colleges, by J. M. Richards, Jr., L. P. Rand, & L. M. Rand
(ADI Doc. 8743; photo, $2.50; microfilm, $1.75)

No. 10 Academic Description and Prediction in Junior Colleges, by D. P. Hoyt, & L. Munday
(ADI Doc. 8856; photo, $3.75; microfilm, $2.00)

No. 11 The Assessment of Student Accomplishment in College, by J. M. Richards, Jr., J. L. Holland, & S. W. Lutz
(ADI Doc. 8955; photo, $3.75; microfilm, $2.00)

No. 12 Academic and Nonacademic Accomplishment in a Representative Sample taken from a Population of 612,000, by J. L. Holland, & J. M. Richards, Jr.
(ADI Doc. 8992; photo, $3.75; microfilm, $2.00)

No. 13 The Prediction of Student Accomplishment in College, by J. M. Richards, Jr., J. L. Holland, & S. W. Lutz
(ADI Doc. 9020; photo, $5.00; microfilm, $2.25)

No. 14 Changes in Self-Ratings and Life Goals Among Students at Colleges with Different Characteristics, by R. W. Skager, J. L. Holland, & L. A. Braskamp
(ADI Doc. 9069; photo, $3.75; microfilm, $2.00)

No. 15 Can Computers Write College Admissions Tests? by J. M. Richards, Jr.
(ADI Doc. 9174; photo, $2.50; microfilm, $1.75)

No. 16 Changes in Self-Ratings and Life Goals as Related to Student Accomplishment in College, by R. W. Skager, & L. A. Braskamp
(ADI Doc. 9214; photo, $2.50; microfilm, $1.75)

No. 17 Family Income and the Characteristics of College-Bound Students, by L. L. Baird
(ADI Doc. 9378; photo, $3.75; microfilm, $2.00)

No. 18 Predicting a Student's Vocational Choice, by J. L. Holland & S. W. Lutz
(ADI Doc. 9433; photo, $2.50; microfilm, $1.75)

No. 19 The Educational Goals of College-Bound Youth, by L. L. Baird
(ADI Doc. 9472; photo, $5.00; microfilm, $2.25)

No. 20 Who Goes Where to Junior College? by J. M. Richards, Jr. & L. A. Braskamp
(ADI Doc. 9571; photo, $3.75; microfilm, $2.00)

No. 21 Predicting Student Accomplishment in College from the ACT Assessment, by J. M. Richards, Jr., & S. W. Lutz
(ADI Doc. 9594; photo, $6.25; microfilm, $2.50)

No. 22 The Undecided Student: How Different is He? by L. L. Baird
(ADI Doc. 9812; photo, $3.75; microfilm, $2.00)

No. 23 The Effects of Selecting College Students by Various Kinds of High School Achievement, by L. L. Baird & J. M. Richards, Jr.
(ADI Doc. 9955; photo, $3.75; microfilm, $2.00)

No. 24 Do They Do What They Say They Will Do? by S. W. Lutz
(ADI Doc. 9988; photo, $5.00; microfilm, $2.25)

No. 25 Changes in the Vocational Plans of College Students: Orderly or Random? by J. L. Holland & D. R. Whitney
(ADI Doc. 10051; photo, $3.75; microfilm, $2.00)

No. 26 The Flow of High School Students to Schools, Colleges, and Jobs, by L. L. Baird & J. L. Holland
(ADI Doc. 10053; photo, $6.25; microfilm, $2.50)

No. 27 Forecasting Academic Success in Specific Colleges, by D. P. Hoyt
(Naps No. 00254; photo, $3.00; microfilm, $1.00)

No. 28 A Description of Graduates of Two-Year Colleges, L. L. Baird, J. M. Richards, Jr. & L. R. Shevel
(Document number and price unavailable at this time.)