

THE BIGLAN CLASSIFICATION REVISITED

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The American professoriate is a remarkably homogeneous group as well as one characterized by its diversity. Clark (1987) has described the experiences, activities, and beliefs of faculty as a professorial matrix in which "niches are defined for individuals by their dual memberships in institutions and subjects" (p. 42). Upon close inspection of this matrix, these dual memberships appear to lead faculty along divergent pathways. Within each discipline, a unique subject matter defines the dimensions of knowledge, the modes of inquiry, the significant reference groups, the work experiences, and the rewards of the faculty within them. Within institutions, a stratified system of multiple faculty roles preserves a hierarchical arrangement of diverse goals and achievements. Although both the disciplinary and the institutional components of the matrix can be strong, Bowen and Schuster (1986) as well as Ladd and Lipset (1975) conclude that disciplinary characteristics are stronger influences on faculty than institutional affiliations.

The influence of unique disciplinary attitudes, beliefs, and behaviors is so obvious to some that they have characterized the faculty as academic tribes and half-humorously and half-seriously revealed the secret rituals of the tribes in rich prose (Adams, 1976). Others see the quantitative side of a diverse national group whose complexity provides enough descriptive data for more than one national study. One of the few conceptual approaches to studying the diversity of the academic disciplines is the work of Biglan (1973*a*, 1973*b*). Emphasizing that the disciplinary subject matter characteristics may be the critical elements of the academic puzzle, he developed a classification scheme for the academic disciplines. Although a number of researchers have confirmed the validity of the classification scheme, more current Carnegie data allow continued investigation of faculty. It is the purpose of this study to replicate previous work on the validity of the classification scheme, as well as to continue classification of disciplines not formerly classified by Biglan.

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BACKGROUND

Biglan (1973a) surveyed the perceptions of academic faculty at one large university and one small college regarding the similarities among academic disciplines. Analysis of the data, using multidimensional scaling techniques, resulted in the now well-known three dimensions of the Biglan classification: the hard-soft dimension, the pure-applied dimension, and the life-nonlife dimension. Biglan concluded that these three dimensions were characteristics of the disciplinary subject matter and relevant to the cognitive style of the discipline. In a subsequent study, Biglan (1973b) applied these dimensions to the study of the characteristics of departments and the output of their faculty. The faculty in the hard disciplines were found to be more socially connected, more interested and involved in research, and more likely to publish in the form of journal articles, when compared with the soft disciplines. Applied scholars were more socially connected, more interested and involved in service activities, and more likely to publish in the form of technical reports than their counterparts in the pure areas of study. A comparison of life and nonlife disciplines suggested that while life scholars were more socially connected, they were less interested and involved in teaching than nonlife faculty.

Other investigations of this classification system have shown that it can consistently discern systematic differences in the academic disciplines. Smart and Elton (1975) examined the goal orientations of academic departments as expressed by the department chairperson. The hard departments placed greater emphasis on goals related to research, graduate education, and development of faculty and students. Applied departments promoted development of students, graduate programs, and the provision of direct services in their goals. Life department goals included not only an interest in direct service but also focused on research and administrative efficiency. Results indicated that the differences in the departmental goals were generally consistent with the three Biglan dimensions.

Further research by Smart and McLaughlin (1978) investigated the reward structures within the academic disciplines. After surveying faculty on time spent on selected categories of professional responsibilities, they attempted to predict faculty salaries. They concluded that the financial rewards associated with disciplinary responsibilities were highly variable and were best predicted using eight separate regressions based on the eight disciplinary clusters of Biglan. A similar finding on faculty salary variability across the Biglan academic clusters was noted in a study by Muffo and Langston (1981). In addition to salary, Muffo and Langston also looked at department organizational parameters such as faculty staffing and instructional work-load patterns. Despite the large number of faculty FTEs in the hard and nonlife disciplines, the pure and

nonlife disciplines had the greatest number of students and the soft, pure, and nonlife disciplines had the highest instructional ratios.

Further testing of the Biglan classification on a multiinstitutional national sample was done by Creswell and Bean (1981) using the 1977 Survey of the American Professoriate. Focusing on research output and sources of faculty funding, they found clear distinctions among faculty outputs consistent with the Biglan dimensions. The scholarly output in the hard disciplines was most often journal articles whereas scholars in the soft disciplines published most in the form of books and monographs. Research funding distinguished pure faculty who received more federal money from applied faculty who received more money from private sources. Life and nonlife faculty were also distinguished by funding sources with life disciplines receiving more state-level support and nonlife disciplines receiving more federal support.

A later study on a national sample of faculty from a heterogeneous group of institutions was done by Smart and Elton (1982) to further validate the classification scheme using a more comprehensive set of output measures than in previous studies. Factor analysis of seventy-one variables resulted in four second-order factors (professional success, research opportunities, faculty conservatism, and character development) that were able to significantly distinguish among the academic disciplines. The hard disciplines were characterized by their conservative stance on issues and their emphasis on research. Conservative attitudes were shared by applied faculty; however, their time was more often spent in administrative functions. Life discipline faculty exhibited strong perceptions of professional success and satisfaction while nonlife faculty reported more interest and time in teaching activities.

These research studies contributed significantly to identifying how Biglan's concept of dimensions could be used to understand department and faculty characteristics; however, they did not continue the process of classifying previously unclassified disciplines. One study by Malaney (1986) that was done for the purpose of ascertaining graduate department support for a computerized information system used the Biglan dimensions as an independent variable. In that study, Malaney and administrative associates devised a 12-point Biglan scale and categorized 114 graduate academic degree programs at a large public research university. However, possibly because the article focus is not the Biglan classification, the author neither adequately specifies the sampling procedures used for coders nor does he specify the discussion methods that were used to arrive at the classifications. The Malaney study also is representative of a single institution only. My current study addresses these problems using an appropriate statistical classification procedure with a national data base.

The accumulating literature suggests that the Biglan classification system contributes to the recognition of the unique characteristics of academic disci-

pline clusters. It indicates that those disciplinary characteristics may result in specific types of department organization, as well as reveal a profile of the faculty within differing departments. The present study will build on this literature utilizing variables gleaned from the previous research to study faculty from a more current national survey and further classify previously unclassified academic disciplines.

METHOD

Variables

The variables for this study focused on four areas: (1) faculty time use, (2) the format of faculty scholarly output, (3) the source of research funding, and (4) the attitudes of the faculty. Each variable was selected on the basis of its conceptual ability, as well as on the basis of its tested ability, to distinguish faculty groups and each is assumed to result from inherent disciplinary characteristics. The variables and their influences are restated here from the literature review to clarify their anticipated discriminating effects.

The first set of variables was related to the manner in which faculty allocate their time. The use of time by faculty has been found to vary by discipline cluster (Biglan, 1973*b*; Smart and Elton, 1982). Faculty in the hard subject matter areas tend to have higher interest in research and devote more time to doing research than faculty in the soft areas. Preference for teaching and the amount of time spent teaching predominates in the soft subject matter areas, as it does in the nonlife areas when compared to the life areas. Faculty in applied disciplines prefer service activities and devote more time to them.

The second set of variables concerns the type of scholarly output of the faculty. Each academic discipline varies in the format of its published works (Biglan, 1973*b*); Creswell and Bean, 1981). Those faculty in the hard disciplines produce more journal articles whereas those in the soft disciplines produce more monographs. Applied disciplines tend to use more technical documents to report their work. The sources of the funding for scholarly work constitute the third set of variables. Each funding source seems to have a propensity to fund within a specific discipline cluster (Creswell and Bean, 1981). Federal dollars flow to the faculty in the pure fields of study while state and local funds are distributed to faculty in the life-oriented areas. Private industry money is more likely to be obtained by those in the applied fields.

The last set of variables is related to faculty attitudes. Although attitudes vary widely on a number of academic dimensions (Ladd and Lipset, 1975), they also vary specifically by discipline cluster (Smart and Elton, 1982). The most conservative ideas are shared by both applied and hard disciplines. The application of disciplinary knowledge evokes debate in the applied fields while

ideas on what is good scholarship are often quite uniform in the high-paradigm, hard disciplines. Full definitions of all variables are given in Table 1.

TABLE 1. Variable Definitions Used in the Study

Variable Name	Variable Definition
<i>Faculty Time Use:</i>	
1. Research Time	Hours per week the faculty member spends in research.
2. Teaching Time	Hours per week the faculty member spends in teaching activities. Includes instruction and preparation.
3. Consulting Time	Hours per week the faculty member spends in consulting.
<i>Type of Faculty Scholarly Output:</i>	
4. Monographs	The number of books or monographs published by the faculty member.
<i>The Source of Funding for Research:</i>	
5. Private Level	Source of funding in the last 12 months was from the private sector. Coded Yes–No
6. State Level	Source of funding in the last 12 months was from the state level. Coded Yes–No
7. Federal Level	Source of funding in the last 12 months was from the federal level. Coded Yes–No
<i>Faculty Attitudes:</i>	
8. Conservative View	Faculty response to the question, How would you characterize yourself politically? Coded 1–5 Left to Strongly Conservative
9. Attitude Toward Scholarship	Combined faculty response to statements A and B. A. The faculty in my department have fundamental differences about the nature of the discipline. Coded 1–4 Agree to Disagree B. In my field, most people agree on the standards of good scholarship. Recoded 1–4 Disagree to Agree
10. Attitude Toward Application	Combined faculty response to statements A and B. A. The goal of an academic scholar is to advance knowledge without regard for the possible implications for society. Coded 1–4 Agree to Disagree B. Government research funds should be allocated to universities on the basis of the need to solve significant social problems. Recoded 1–4 Disagree to Agree

Subjects

The subjects for this analysis were 5,057 respondents to the 1984 Carnegie Faculty Survey. Only those faculty in research and doctoral-granting institutions were selected in order to minimize possible institutionally based discipline misclassification problems as noted by Muffo and Langston (1981) as a potential error source. The final sample was 1,188 faculty.

The 1984 Carnegie Faculty Survey is a newer data base that reflects the substantial changes in the demographic profile of faculty that have occurred since Biglan's original study (Andersen, Carter, and Malizio, 1989). Trends toward increasing numbers of women and minorities, as well as toward the increasing age of faculty, have been well documented. Social psychology (Brown, 1986; Miller, 1982; Sears, Freedman, and Peplan, 1985) would suggest that changes in personal characteristics of faculty such as these could influence their attitudes, perceptions, and judgments related to work.

Analysis

The data analysis was done by discriminant analysis procedures. Discriminant analysis allows for both interpretation of group differences and the classification of previously ungrouped cases (Klecka, 1980). The first component of this analysis is the interpretive function. The purpose was to replicate the validity of the three Biglan dimensions using the selected "discriminating" predictor variables. Ten predictor variables were selected in four core areas: (1) faculty time (research time, teaching time, consulting time), (2) scholarly output format (number of monographs), (3) funding sources (federal, state, private), and (4) attitudes (conservative view, scholarship view, application view) (see Table 1). The ten predictor variables were assumed to maximize the differences among the mutually exclusive Biglan academic discipline clusters. The eight Biglan clusters were used as follows: soft-pure-life (SPL), soft-pure-nonlife (SPNL), soft-applied-life (SAL), soft-applied-nonlife (SANL), hard-pure-life (HPL), hard-pure-nonlife (HPNL), hard-applied-life (HAL), hard-applied-nonlife (HANL). The disciplines included in each cluster are shown in Table 2.

The second component of this analysis is the classification function of the discriminant analysis procedure. After the predictor variables were found to be capable of effectively distinguishing the Biglan groups, eight previously unclassified disciplines were selected. The eight professional disciplines were Art, Business, Dentistry, Law, Medicine, Music, Nursing, and Social Work. Each discipline had at least 100 in the overall sample in the Carnegie study. All eight disciplines were individually classified.

TABLE 2. Classification of Disciplines

	Hard		Soft	
	Life	Nonlife	Life	Nonlife
Pure	Anatomy Zoology Biology Physiology Biochemistry Virology	Mathematics Statistics Geology Chemistry Physics	Psychology Anthropology Political Science Sociology Theology	English Languages Literature History Philosophy
Applied	Agriculture Forestry	Engineering Chem Eng. Civil Eng. Elec. Eng. Mech. Eng.	Ed. Admin. Ed. Psych. Ed. Found.	Economics

RESULTS**Part 1**

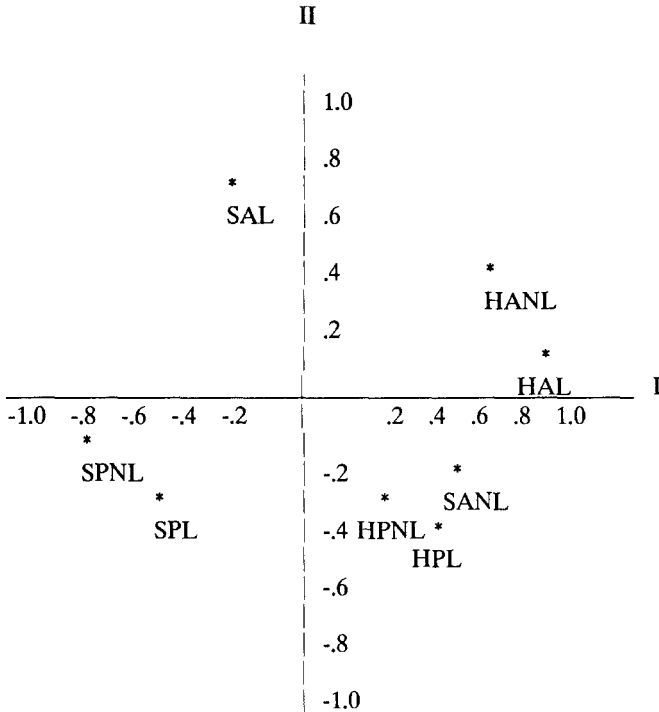
The discriminant analysis resulted in three significant discriminant functions. They accounted for 51.94, 28.87, and 10.51 percentages of the variance and were considered to be important. Table 3 presents the standardized discriminant function coefficients for the predictor variables on the three significant func-

TABLE 3. Standardized Discriminant Function Coefficients

Variable	Function I	Function II	Function III
<i>Time Use:</i>			
1. Research Time	.435	-.525	-.245
2. Teaching Time	-.228	.189	.513
3. Consulting Time	.249	.309	-.351
<i>Scholarly Output:</i>			
4. Monographs	-.353	.094	-.035
<i>Funding Source:</i>			
5. Private	-.012	.237	-.033
6. State	.096	.041	.347
7. Federal	.239	-.153	-.345
<i>Attitudes:</i>			
8. Conservative View	.711	.462	-.009
9. Attitude Toward Scholarship	.259	-.103	.636
10. Attitude Toward Application	-.175	.455	-.326

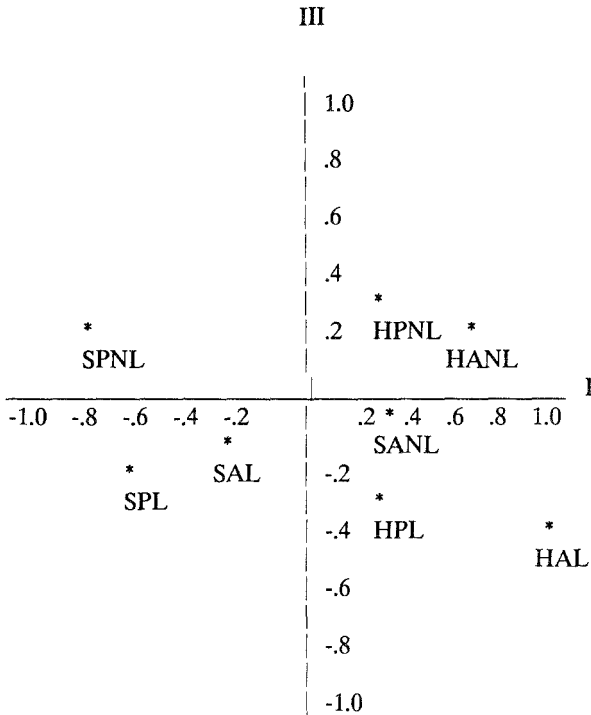
tions. Figures 1 and 2 illustrate the plotting of the group centroids for the three significant functions.

The first function appears to discriminate between the hard disciplinary groups and the soft groups. The function is dominated by the large coefficient for faculty attitudes, which are conservative in nature. Also important in this function are the large positive coefficients for the amount of time spent in research, the attitude toward scholarship, and the federal funding source. The location of all four group centroids for the hard disciplinary cluster is on the positive side of this function (Figure 1, horizontal axis). This distribution would suggest that the faculty in the hard disciplines are a politically conserva-



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|-----------------------------|-----------------------------|
| HPL = hard-pure-life | SPL = soft-pure-life |
| HPNL = hard-pure-nonlife | SPNL = soft-pure-nonlife |
| HAL = hard-applied-life | SAL = soft-applied-life |
| HANL = hard-applied-nonlife | SANL = soft-applied-nonlife |

FIG. 1. Centroids of the eight Biglan discipline clusters on discriminant function I and II.



HPL = hard-pure-life
 HPNL = hard-pure-nonlife
 HAL = hard-applied-life
 HANL = hard-applied-nonlife
 SPL = soft-pure-life
 SPNL = soft-pure-nonlife
 SAL = soft-applied-life
 SANL = soft-applied-nonlife

FIG. 2. Centroids of the eight Biglan discipline clusters on discriminant function I and III.

tive group who share similar views on parameters for good scholarship in their field. Their academic life is spent largely in research activities for which they depend heavily on the federal government as a source of funding. Three of the four group centroids for the soft disciplines are located on the negative side of this function, indicating a reversed pattern of scores.

The second function appears to discriminate between the pure and applied disciplinary groups. The nature of this function is defined by the large coefficients for attitudes that are conservative and attitudes that are positive toward knowledge application. The function also exhibits large positive coefficients for

private funding sources and spending time in consultative roles. The location of the group centroids of three of the four applied disciplinary groups on the positive side of this function (Figure 1, vertical axis) indicates that these disciplines exhibit high levels of these predictor variables. The applied disciplines are largely conservative, seeing the need for the application of their scholarly work, spending their time promoting that application through their consultative role, and being supported by their private benefactors. This picture of the applied disciplines is highly consistent with our current knowledge. The group centroids for the pure disciplines were all on the negative end of the function, indicating low scores on the predictor variables.

The third function appears to discriminate between the life and nonlife disciplinary clusters. The nature of this function is defined by large positive coefficients for a unified paradigmatic view of good scholarship, large amounts of time spent in teaching, and the state as the source of research funding. The location of the group centroids for three of the four nonlife disciplines is on the positive side of this function (Figure 2, vertical axis). All four nonlife disciplines are more positive than all the life disciplines. This distribution suggests that members of the nonlife disciplines have a uniform view of good scholarship, spend most of their work time in the teaching function, and receive most of their research funding from state-level sources. The life disciplines were all on the negative end of this function, indicating low scores on the predictor variables.

Part 2

The classification of the professional disciplines did not result in a clear pattern of distribution. Table 4 shows the percent of each discipline categorized in one Biglan cluster. The analysis was able to classify two disciplines with at least 50 percent of the predicted group membership in one Biglan cluster. Of the Nursing group, 54.21 percent ($N = 48$) was classified as in the soft-ap-

TABLE 4. New Classification of Disciplines

Art	32.0%	HPNL
Business	27.5%	SAL
Dentistry	50.0%	HANL
Law	27.8%	SANL
Medicine	21.7%	HAL
Music	28.5%	SAL
	28.5%	SPNL
Nursing	54.21%	SAL
Social Work	25.0%	SPNL

plied-life disciplinary cluster. Fifty percent of the Dentistry group ($N = 10$) was classified as in the hard-applied-nonlife group. The remaining professional groups had no more than 32 percent classified in any single disciplinary group but did have majorities in the following combinations. Thirty-two percent of the Art group ($N = 25$) was classified as hard-pure-nonlife. The Business/management group ($N = 80$) had 56.4 percent classified in the soft categories, with the largest single group, 27.5 percent, in the soft-applied-life cluster. Eighty-three percent of the Law group ($N = 18$) was in the soft categories. The soft-applied-nonlife disciplinary cluster contained the largest single percentage group, 27.8 percent of the Law group. Fifty-seven percent of the Music group ($N = 57$) was split between the soft-applied-life cluster and the soft-pure-nonlife cluster. Fifty percent of the Medicine group ($N = 92$) was distributed in the hard categories. Of the 50 percent, the largest single group, 21.7 percent, was in the hard-applied-life category. Seventy-five percent of the Social Work group ($N = 12$) was distributed in the soft categories, with the largest single group, 25 percent, in the soft-pure-nonlife group.

DISCUSSION

The findings of this study support the continued use of the Biglan classification system as a valid conceptual framework for studying the academic disciplines. The ten selected discriminating variables when used to differentiate the faculty groups resulted in three significant dimensions consistent with the previously reported Biglan dimensions. The manner in which faculty spend time, the type of scholarly output generated, the type of funding sources used, and the attitudes of the individuals themselves were found to discriminate faculty groups such that three significant functions resulted. The first function, defined by conservative political views, a unified view of scholarly research, academic activity dominated by research, and funding from the federal government, differentiated the hard and soft disciplinary clusters. The second function, defined by conservative views, concern with knowledge application, activity largely related to consulting, and funding from private sources, clearly split the pure and applied academic disciplines. The third function, defined by uniform views of good scholarship, activity dominated by teaching, and funding sources at the state level, differentiated the life and nonlife disciplinary groups. This clear replication of the three dimensions with a current nationally representative faculty sample is consistent with the findings of the previous research on the dimensions of the Biglan classification system (Biglan, 1973*b*; Creswell and Bean, 1981; Smart and Elton, 1982).

The new classification of previously unclassified disciplines in which a majority of the members were classified in one academic disciplinary cluster was achieved in only two disciplines. Nursing was classified in the soft-applied-life

cluster, which is in agreement with the Malaney classification. A study of professional faculty roles (Stark, Lowther, and Hagerty, 1986) in which Nursing faculty were found to spend large amounts of time in the teaching role and minimal time in the research function supports this classification. Dentistry was found to be hard-applied-nonlife in contrast to the hard-applied-life categorization by Malaney. For the other six disciplines also classified by Malaney, this study shows only a few similarities in classification. Both studies found Medicine to be a hard discipline and Social Work to be distributed in the soft categories. The classification of Art in the nonlife group, Music in the soft-nonlife group, and Business in the soft-applied group was consistent in both studies.

Although the Biglan classification has been rigorously investigated, the lack of clear results in classifying new disciplines suggests that its underlying constructs are not yet fully understood. Biglan (1973*a*) originally suggested that the subject matter characteristics reflected the underlying cognitive processes of the discipline. The concept of a disciplinary way of knowing and viewing the world has been addressed by others studying the academic disciplines. Becher (1987) outlines the multiplicity of intellectual tasks and contexts that derive from the characteristics of the disciplinary knowledge. His review briefly alludes to the professional disciplines as users of the knowledge bases of the more fundamental sciences and humanities disciplines. As such, cognitive processes in professional fields might then be considered derivatives of other fields and might lead to unclear disciplinary distinctions and difficulties in classification, as occurred in this study. Business, for example, is characterized by wide ranges of subject matter and intellectual tasks, from computers to public relations, both of which are drawn from other disciplines. As more of the newer fields develop with overlapping and interdisciplinary characteristics, subject matter variability may make classification increasingly difficult.

In addition to the nature of the newer disciplines, the length of time that the field has been in existence may be important. Paradigmatic development of the traditional disciplines (chemistry, physics, etc.) has occurred over very long periods of time. Newer fields, particularly professional fields, may have not had sufficient time to crystallize their intellectual domain and develop their scholarly tradition.

Classification, at least within the Biglan model, may be limited by these disciplinary developments. Becher (1989) has expanded on Biglan's concepts to add the social dimensions of convergent/divergent and rural/urban. New conceptualizations that move away from a single subject matter emphasis may better capture the diversity of interdisciplinary fields such as the health professions and business fields.

The lack of clear results in classifying new fields may also be due in part to the very small numbers in certain disciplines within this study. Although a major national data base was used, individual disciplines often had very small

numbers of respondents. Further study with larger disciplinary groups is desirable. A further limitation may be the use of secondary analysis. The data used in this study were collected for purposes other than this study. Certain preferred variables were either not available or not usable due to high levels of missing data as was the case with the use of monographs rather than articles as the measure of scholarly output.

CONCLUSION

The Biglan classification scheme provides a valid framework for studying academic diversity within the higher education system. It continues to be a strong construct for classifying faculty as evidenced by its power to discriminate current faculty on a recent faculty data set. Previously unclassified professional disciplines of Dentistry and Nursing were classified as hard-applied-non-life and soft-applied-life respectively. Difficulty classifying other fields may be the result of diverse, interdisciplinary subject matter, and the stage of academic development of the discipline. An expanded classification system such as the one by Becher may be more inclusive and deserves further study.

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