DOCUMENT RESUME

ED 319 329 HE 023 522

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TITLE Disciplinary Differences in Faculty Conformity to the Norms of Science: Are Norms Compensatory Integrating Mechanisms for Professional Fragmentation?
PUB DATE 16 Apr 90
NOTE 16p.; Paper presented at the Annual Meeting of the American Education Research Association (Boston, MA, April 16-20, 1990).
PUB TYPE Viewpoints (120) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Behavior Standards; College Faculty; *Conformity; Higher Education; Intellectual Disciplines; *Norms; *Researchers; *Scientific Research; Standards

ABSTRACT

The norms of science define appropriate and inappropriate scholarly or research role performance. The four norms described in this study are (1) universalism: research is assessed on its merit, not particularistic criteria; (2) commonality: research must be made public and shared with the research community; (3) disinterestedness: research is conducted for the advancement of knowledge, not prestige or financial gain from the lay public; and (4) organized skepticism: research is subject to peer review and criticism. The Ladd and Lipset Survey measured the extent to which faculty in different disciplines reported how they act in accord with each of the four norms. Analysis of the survey's data show that, regardless of the disciplinary type, faculty generally agreed on the norm of disinterestedness in that it stems from the fundamental principle that the search for knowledge itself should direct scholarly activities. Faculty self-reports also indicated that they believe that adhering to the norm of communality is how they should behave regardless of disciplinary type. The norms of organized skepticism, however, were seen to not work well in disciplines characterized by weak or conflicting theoretical and methodological paradigms. Contains 33 references. (GLR)

Disciplinary Differences in Faculty Conformity to the Norms of Science: Are Norms Compensatory Integrating Mechanisms for Professional Fragmentation?

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Paper prepared for presentation at the Annual Meeting fo the American Educational Research Association
April 16-20, 1990, Boston

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Objectives

The structure of the academic profession is a fundamental topic in the study of the academic profession. Scholars such as Light (1974), Toombs (1975), Ruscio (1987) and Clark (1987, 1989) hold the view that the structure of the academic profession is fragmented rather than unitary. Differences among faculty in different types of colleges and universities and differences among faculty across academic disciplines are the forces of such fragmentation (Ruscio, 1987). Knowledge as to the characteristics of the profession can provide administrators, leaders, and individual faculty members with insight valuable to the maintenance of morale and community as well as the advancement of the higher education enterprise.

Scholars have sought integrating mechanisms to compensate for avowed fragmentation among faculty in different disciplines and in different types of colleges and universities (Clark, 1983; 1987; 1989; Ruscio, 1987). Clark (1983), however. has offered the norms of science as compensatory, integrating mechanisms for fragmentation derived from differences among academic disciplines.

If conformity to the norms of science is a valid indicator of integration among faculty in different academic disciplines, then invariability in adherence to the norms of science across different academic disciplines would suggest that the norms of science do function as mechanisms of integration. Although the basic natural and social sciences have been the object of such inqury (Braxton, 1986), a test of Clark's supposition requires that broad range of academic disciplines be used.

Studies of academic types and disciplinary differences have discovered characteristics related to the paradigmatic development of the discipline (Kuhn, 1970; Lodahl & Gordon, 1972). The Biglan Model (1973) for the classification of academic subject matter areas provides one framework for viewing conformity to the norms of

science across a broad range of different academic disciplines. Biglan's 1971 study (Biglan, Onclen, & Fiedler, 1971) of thirty-five academic departments resulted in a three-dimensional classification scheme for academic areas (Biglan, 1973a) that is frequently used in analyses characterizing the disciplinary nature of the profession. Biglan grouped the departments into eight groups based on their response to the task structure of their subject areas. Biglan used Kuhn's (1970) definition of paradigm to distinguish between hard-soft task structures, pure-applied orientation to application, and life-nonlife orientation to living organisms. The model's ability to differentiate among different academic disciplines has been validated by at least six other studies (Smart & Elton, 1975; 1976; Eison, 1976; Smart & McLaughlin, 1978; Muffo & Langston, 1979; Creswell, Seagren & Henry, 1979; Creswell & Bean, 1981). Orientations toward research, teaching, and publication patterns immerge as differences between hard and soft, pure and applied academic areas. However, little or no research has addressed the question of whether faculty conformity to the norms of science vary across the various dimensions of the Biglan Model (Braxton, 1986). Thus, the purposes of this research is to address this need.

Theoretical Perspective

The norms of science are the ethos of science which provide guides for professional behavior (Merton, 1942; 1973). As the norms of science are derived from the goals and methods of science, conformity to the norms of science is functional to the advancement of knowledge. Thus, the norms of science define appropriate and inappropriate scholarly or research role performance. Although academics in different disciplines may endorse these norms, research has indicated that faculty conformity to them is influenced by level of paradigmatic development of the discipline (Ruscio, 1987).

The four norms described by Merton (1942;1973) are: 1. *universalism*, the presecription that the findings of research are assessed on the basis of merit and not on particularistic criteria; 2. *commonality*, the preseciption that the findings of research must be made public and shared with the research community in exchange

for individual recognition and esteem for their contribution; 3. *disiniterestedness*, the prescription that research should not be conducted for the pfrimary purpose of receiving prestige and financial gain from the lay public, but rather should be undertaken for the advancement of knowledge; and 4. *organized skepticism*, the prescription that knowledge claims should not be accepted without an assessment based on empirical or logical criteria by peers.

These norms are transmitted through expressions of preferred and prohibited behavior and through example by members of the professional community (Merton, 1942;1973; Goode, 1957). Moreover, the professional community not only allocates rewards to individuals who adhere to the norms of science, but also metes out sanctions to individuals who violate these norms (Merton,1942; 1973). Individual academics also vary in the extent to which these norms are internalized. Thus, pressures for normative conformity emanate from one's colleagues and from the individual self.

Because the Biglan Hard and Soft as well as the Biglan Pure and Applied subject matter areas ahve been found to differ on their preferences for research (Creswell and Roskens, 1981), it might be expected that faculty conformity to the norms of science will also differe along these lines.

Methodology

The Ladd and Lipset Survey of the American Professoriate (1978) was used as the data source for this study. A subset composed of 3362 observations from the sample of 4,383 was defined. The subset was made up of: all faculty engaged in research holding an appointment at either a research university, doctoral granting, comprehensive college or university, or liberal college, and who designated their primary field of research, scholarship, or creative work to be in one of the thirty-five subject areas catagorized in the Biglan model.

Four dependent variables, one independent variable, and one control variable comprised the research design for this study. Each of the four dependent variables correspond to one of the four norms of science described by Merton (1942; 1973). These four variables

were composites or sums of specific items on the Ladd and Lipset Survey which measured the extent to which faculty in different disciplines reported they act in accord with each of the normative statements. The following response scale was used: almost always act in accord (1), sometimes (2) and rarely (3). The items measured in the survey are shown in Table 1.

Disciplinary subject matter, comprised of four categories of the Biglan model, was the independent variable of this study. Primary areas of research claimed by respondents on the Ladd and Lipset (1978) survey were matched to subject areas described in the Biglan model and catagorized according to that model. As research has indicated that the life-nonlife model dimensions adds little to the differentiating ability of the model (Smart and Elton, 1982), this combination was not used, condensing this variable into four levels rather than eight. Hard-Pure, Hard-Applied, Soft-Pure, and Soft-Applied were these four levels of this variable. Institutional type was the variable controlled in this study because research has indicated that faculty conformity to some norms vary across different types of colleges and universities (Braxton, 1989). This variable used Ladd and Lipset's (1978) catagorization based on the 1976 Carnegie Classification of Institutions and comprised four levels: Research Universities I & II; Doctoral Granting Universities I & II; Comprehensive Colleges & Universities I & II; and Liberal Arts Colleges. This variable was collapsed into two levels, combining research and doctoral granting universities as level one and the comprehensive and liberal arts colleges as the second level.

Data Analysis

In order to determine whether statistically significant interactions were present between institutional type and disciplinary type were present, preliminary analyses of variance (ANOVA) were conducted for each dependent variable. None were found, and these interactions were subsequently deleted from subsequent ANOVA's. A 4x2 analyses of variance was then conducted for each of the four dependent variables of this study. Four levels of disciplinary type and two levels of institutional type were the factors in these analyses

of variance. Because of large sample size and the fact that frequency tables revealed unequal cell sizes, increasing the probability of committing Type I errors, all statistical tests were made at the .01 level of significance.

Findings

Summary statistics from the four analyses of variance are shown in Table 2 and results of post-hoc group mean comparisons are shown in Table 3. Results indicate that there is considerable difference in faculty reports of conformity to the norms of universalism and organized skepticism, but little variation in reports of conformity to disinterestedness ($F = 1.08$, $p.<.38$) and communality ($F=3.59$, $p<.013$) Although a general difference was indicated with faculty agreement with the norms of *communality* , post-hoc gruop mean comparisons (Bonferroni Method) failed to identify an statistically significant differences.

Conformity to the norms of *universalism* ($F = 5.87$, $p<.0006$) differed primarily along hard-soft pure catagories of Biglan classification. Post-hoc mean comparison (t-method) showed statistically significant differences between hard-pure subject areas such as science and biological sciences ($x = 2.2$) and the soft-pure subject areas such as humanities and social sciences ($x = 2.34$).

Post-hoc mean comparisons demonstrated that faculty agreement on the norms of *organized skepticism* ($F = 10.21$, $p<.0001$) varied significantly between the sciences (hard-pure) ($x = 6.32$) and the both soft-pure ($x = 6.32$) and soft applied ($x = 6.85$) subject areas. In the responses to the norms of universalism and organized skepticism, faculty in the sciences professed more of an agreement with the norms of science then did faculty in the soft disciplinary types.

Limitations

The principle limitation to this study is that the four measures of individual conformity to the norms of science are self-reports, not independently derived measures of conformity. In general, self-reports yield higher rates of deviance than offical reports (Reiss,

1973). These questions, however, pertain to behaviors less extreme than fraud or plagiarism, and faculty may be more inclined to report variations from the types of noramtive statements used in the survey then they would admit to fraud or plagiarism (Zuckerman, 1977). At best, they may be assumed to be liberal estimates of individual faculty conformity to the norms of science or as expressions of an ideology concerning the practice of research and scholarship (Braxton, 1989).

Discussion

It is not surprising that faculty, regardless of disciplinary type, generally agreed on the norm of disinterestedness, as it stems from the fundamental principle that the search for knowledge itself should direct scholarly activities(Anderson & Louis, forthcoming). In the Ladd and Lipset survey, the variable of disinterestedness is measured by a statement offering critical evaluation by competent peers over public acclaim. Likewise, the norm of communality makes knowledge public property, discourages secrecy, encourages sharing of research in progress, and obligates researchers to acknowledge intellectual property by citations and references. Although intellectual property with commercial value can be "owned" rather then become a public good (Samuelson, 1987), faculty surveyed in the Ladd and Lipset survey professed to believe in the intrinsic worth of knowledge. If sharing is somewhat of a "cultural myth", as Rosenzweig(1985) professes, faculty self-reports indicate that they believe that is how they should behave, regardless of disciplinary type.

The norms of organized skepticism, on the other hand, do not work well in disciplines characterized by weak or conflicting theoretical and methodological paradigms (Anderson & Lewis, forcoming). These norms are directly tied to science, which is based on replication and sequential knowledge. Knowledge in subject fields such as the humanities, social sciences, and education is more descriptive, interpretive, and not as easily replicated. The results of this investigation show that there is a significant variation between agreement on these norms between the hard-pure sciences and soft

disciplinary fields, which can be attributed to the types of knowledge held by the different disciplines.

Results showed that faculty in soft-pure disciplinary fields conformed less to the norms of universalism then did faculty in the hard-pure disciplinary fields. This norm, which is based on merit over particularism, may carry more conceptual meaning to the clear, abstract, objective nature of science then it does to more qualitative, subjective types of knowledge which are often supportive of social equality and the acknowledgment of individual circumstances.

Importance

These findings suggest that while the norms of disinterestedness and communality may function as integrating mechanisms across the Biglan catagories of subject areas, the norms of universalism and organized skepticism do not. In fact, the latter may act as a further force of fragmentation as Clark (1983) expected the norms to act as a set. These results support the view that concensus within the academic profession on Merton's norms of science is related more to the extent of similarity of paradigmatic development of different disciplines than to a consensus on shared norms.

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TABLE I

Measures For the Norms of Science

Norm	Measure
1. Universalism	A composite of the following two items:* (1) "The acceptance or non-acceptance of scientific and scholarly contributions should be judged on the evidence and not on the social characteristics (such as race or sex) of the authors;" and (2) "The standing accorded scientists and scholars in their fields should depend on the quality and extent of their contributions, not on their personal or social characteristics."
2. Communality	A composite of the following three survey items:* (1) "In general, scientists and scholars are unjustified in keeping their research findings secret;" (2) "Scientists and scholars have the obligation to acknowledge intellectual property by pertinent citations and references;" and (3) "Scientists and scholars should be willing to inform others investigating similar problems about their work in progress."
3. Disinterestedness	This variable is measured through the following survey item:* "Scientists and scholars should prefer critical evaluation by competent peers to public acclaim."
4. Organized Skepticism	A composite of the following five survey items:* (1) "Scientists and scholars should critically examine others' contributions which they are using in their own work;" (2) "Scientists and scholars should be skeptical even about their own research findings until competent peers have evaluated them;"

Table I Continued

(3) "Scientists and scholars have an obligation to present available evidence that contradicts their hypotheses;"

(4) "No matter how deeply persuaded scientists and scholars may be that their ideas are sound, they must take account of critical appraisals of these ideas by competent peers;" and

(5) "Scientists and scholars ought to question their findings if these cannot be independently reproduced by any others in the field."

* For each survey item listed above, respondents were asked to indicate the extent to which they act in accord with the stated behavior using the following scale: 1-Almost Always, 2-Sometimes, 3-Rarely.

TABLE 2

Summary to Analysis of Variance

Source	df	SS	F	Pr F
A. Universalism				
institutional type	1	0.03742054	0.11	.7442
disciplinary type	3	6.18683706	5.87	.0006
B. Communality				
institutional type	1	0.02235193	0.03	.8634
disciplinary type	3	8.12058317	3.59	.0133
C. Disinterestedness				
institutional type	1	1.49691649	1.96	.1612
disciplinary type	3	2.46043492	1.08	.3580
D. Organized Skepticism				
institutional type	1	0.30657142	0.12	.7317
disciplinary type	3	79.82136756	10.21	.0001

TABLE 3

Post-hoc Group Mean Comparisons and Corresponding Confidence Intervals by Bonferroni Method

Disciplinary Type	Mean Difference	Confidence Interval	
A. Disinterestedness			
SA-SP	.01998	.169-.209	
SA-HA	.2579	.241-.293	
SA-HP	.10514	.994-.310	
SP-HA	.00582	.228-.240	
SP-HP	.08516	.074-.244	
HA-HP	.07935	.167-.325	
B. Organized Skepticism			
SP-SP	.1125	.2408-.4658	
SP-HA	.2442	.1929-.6813	
SP-HP	.5301	.2282-.8320	***
SA-HA	.1317	.3651-.6285	
SA-HP	.4176	.0343-.8009	***
HA-HP	.2859	.1758-.7476	
C. Universalism			
SP-SA	.0254	.1009-.1516	
SP-HA	.07410	.0829-.2311	
SP-HP	.14067	.0343-.2479	***
SA-HO	.0488	.1303-.2278	
SA-HP	.1153	.0216-.2521	
HA-HP	.0666	.0991-.2323	
D. Communality			
SA-HA	.1108	.1550-.3766	
SA-SP	.1774	.0092-.3641	
SA-HP	.1891	.0133-.3916	
HA-SP	.0667	.1672-.3006	
HA-HP	.0784	.1683-.3251	
SP-HP	.0117	.1465-.1699	