

Faculty Perceptions of Their Disciplinary Cultures: Re-Evaluating Biglan's Dimensions

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Abstract

Disciplinary cultures are an important part of understanding the faculty experience. For fifty years, the Biglan dimensions have been frequently relied on by researchers interested in considering disciplinary differences as parts of their studies; however, applying a cultural lens draws attention to the possibility that over time, disciplinary cultures may have changed. Through exploring faculty perceptions of their disciplines using an item set derived from key cultural aspects of Biglan's dimensions, compared to the Biglan dimensions, this exploratory study offers insights into the evolution of disciplinary cultures, highlighting the variation and fluidity of disciplinary cultures that faculty experience in their disciplines today.

Keywords

Disciplinary cultures, Faculty experience, Biglan dimensions

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Study Purpose

The cultures of academic disciplines and how faculty relate to their disciplines have long been a fundamental framework for understanding faculty work (Clark, 1962; Umbach, 2007). Many scholars have even argued that academic disciplines are a more dominant influence on faculty life than institutions (Becher & Trowler, 2001; Clark, 1997; Hiller, 2023). As such, how researchers and practitioners understand disciplinary cultures and make distinctions between disciplines plays a critical role in shaping narratives around faculty work. Over the past fifty years, scholars have arguably drawn on Biglan's (1973a, b) dimensions – Hard-Soft, Pure-Applied, and Life-Nonlife – most frequently to understand disciplinary influences and differences in faculty work.

Yet, scholars acknowledge that disciplinary cultures are not necessarily static and can evolve, even if slowly, over time (Becher & Trowler, 2001; Manathunga & Brew, 2012). Disciplinary cultures are largely informed by how faculty engage with their disciplines and the narratives they form about their engagement (Becher & Trowler, 2001). Significant changes in the past fifty years in the composition of the faculty, such as the growth of contingent and non-tenure track faculty and increasing faculty diversity (American Association of University Professors, 2017, 2024), suggest the possibility that the disciplinary cultures that faculty perceive and work in today are not the same as they were fifty years ago, in part because who works in different disciplinary areas has changed.

Furthermore, past scholarship on disciplinary differences in faculty work has tended to apply the Biglan dimensions dichotomously by classifying, for example, a discipline as either Hard

or Soft, including Biglan's (1973b) own work (e.g., Braxton, 1993; Nelson Laird et al., 2008; Hiller, 2023). Scholars have even expanded on Biglan's original dichotomous classifications with additional disciplines (e.g., Malaney, 1986; Stoecker, 1993)¹. While this body of scholarship often identifies significant differences between disciplines using the dimensions dichotomously, Biglan's (1973a) original work makes clear that the dimensions are more continuous in nature. When using the Biglan dimensions as an interpretative lens, dichotomization of the dimensions can not only skew how researchers interpret their results but can also obscure nuance in faculty cultures including potential shifts in how faculty understand their disciplinary cultures. Take, for instance, an imaginary study's results that suggest faculty in Hard disciplines tend to eat pizza more than faculty in Soft disciplines. Do faculty in disciplines that are mostly Hard in nature, but with some aspects of Soft disciplinary cultures, eat pizza as much as faculty in harder disciplines? What about faculty's pizza eating frequency in a discipline that was Soft in nature in 1973 and therefore is classified as such for the imaginary study but has since shifted toward a harder disciplinary culture (as Becher and Trowler, 2001, suggest is possible as younger disciplines mature)? This example and these questions may seem trivial, but what if practitioners are putting considerable resources behind trying to increase the behavior a researcher studied? What if research suggests that student success or equity would improve by faculty engaging more in the behavior being studied? What if leaders are making decisions about the future funding of disciplinary programs based on the behavior being studied?

¹ Throughout this paper, references to the Biglan dimensions, and classifications/categorizations thereof, include these expanded disciplines as they are substantively based in Biglan's original conceptualizations of the dimensions.

Taken together, both the fact that disciplinary culture change is possible and the fact that dichotomous treatment of disciplines may obscure important nuances suggests a need to re-examine how the Biglan dimensions apply to current faculty perceptions of their disciplines. Past validation of the Biglan dimensions, even within the past decade (Simpson, 2017), does not preclude the possibility that disciplinary cultures have changed over time. Certainly, the ways that scholars apply the Biglan dimensions could still differentiate disciplines and disciplinary cultures even if there have been small changes in cultures, or changes among only a few disciplines. This exploratory study's purpose is to add to and deepen scholars' and practitioners' understandings of the Biglan dimensions and to extend the literature on how contemporary disciplines relate to how faculty organize their work through. The following questions guide this study:

- 1) How do faculty perceptions of the level of consensus about knowledge and inquiry in their disciplines, the level of application of knowledge and inquiry in their disciplines, and how their disciplines engage with living or social systems relate to one another?
- 2) How do faculty perceptions of these qualities of their disciplines compare to the Biglan dimensions?
- 3) How do disciplines cluster according to their aggregated faculty perceptions and how do those clusters compare to Biglan's categorization?

Framework

Biglan's (1973a, b) three dimensions are used as the primary framework for this study. Seeking to understand the nature of differences across disciplines, Biglan (1973a) identified three dimensions that differentiated amongst disciplines – Hard-Soft, Pure-Applied, and Life-Nonlife – which he further validated as differentiating amongst disciplinary characteristics regarding faculty

work (1973b) by applying them as eight categories based on the dichotomous classification of disciplines on each dimension (e.g., Chemistry was categorized as Hard-Pure-Nonlife vs. Special Education as Soft-Applied-Life). Biglan conceptualized the Hard-Soft dimension as aligning with the paradigmatic development of a discipline. He was inspired by Kuhn's (1976) approach to paradigms, noting that hard disciplines have one working body of theory and knowledge that all members subscribe to whereas soft disciplines have a more dispersed and varied approach to both content and methods of knowledge generation. In short, Hard disciplines have more consensus around the development of knowledge and are informed by a common paradigm. The Pure-Applied and Life-Nonlife dimensions were more practically identified by clear and common understandings of the disciplines at either end of the dimensions. Applied disciplines employ knowledge to address real-world problems in practical settings, while Life disciplines are concerned with living organisms and social systems. These three dimensions represent different elements of disciplinary culture; however, Biglan (1973a) – and a substantial amount of research utilizing Biglan's dimensions as the organizing scheme (e.g., Becher & Trowler, 2001) – note that the dimension with the strongest influence on disciplinary culture is the Hard-Soft dimension.

The Biglan dimensions have largely been treated as truth since their publication as several studies have validated Biglan's findings (Simpson, 2017; Smart & Elton, 1982; Stoecker, 1993). Biglan's dimensions emerge as an organizing framework to understand disciplinary differences across a variety of topics, such as diverse course content (Millem, 2001; Umbach, 2006) and approaches to student learning or college teaching (Umbach, 2007; Nelson Laird et al., 2008). It is generally agreed that the dimensions are a useful tool to capture disciplinary values, norms, and beliefs in studies about the influences of discipline (Umbach, 2007).

Despite the fact that Biglan's dimensions have been widely used to study disciplinary cultures influence on a variety of topics, it is not without critique. Notably, Biglan's original study classified only thirty-five disciplines and occurred at only two institutions (Biglan 1973a). The dimensions also were not validated outside of the United States until relatively recently, despite the dimensions being widely used internationally for some time (Simpson, 2017). Biglan's tool has remained a frequently used and cited tool for researchers, but little attention has been given to the dichotomous nature of Biglan's dimensions. Despite Biglan developing these dimensions in a continuous manner, the dimensions almost universally situate disciplines as *either* Hard or Soft, Pure or Applied, and focusing on Life or Nonlife (Simpson, 2017). Given the nature of cultural change, as well as given the shifts in faculty characteristics and higher education more broadly, it is possible that approaching disciplinary characteristics dichotomously actually oversimplifies much of what makes each discipline unique.

Literature

Disciplinary Cultures

Biglan (1973a, b) utilized faculty perceptions of their disciplines when developing the dimensions. Faculty perceptions reflect how individuals enact their disciplinary culture (Umbach, 2007). Faculty perceptions also shape how faculty participate in processes of active culture (re)construction and how faculty socialize others into their disciplines. The Biglan dimensions are defined in a manner that clearly links to culture, which this study defines, following prominent scholarship on faculty cultures, as "the collective, mutually shaping patterns of norms, values, practices, beliefs, and assumptions that guide the behavior of individuals and groups" (Kuh & Whitt, 1988, p. 12). For example, the Hard-Soft dimension reflects the most knowledge-oriented

of dimensions, but its definition hinges on consensus among members around paradigms, agreement that socially develops over time. Biglan (1973a) considered the Hard-Soft dimension as empirically supporting the work of Kuhn (1996) who described how paradigms are developed and carried forward through socialization processes.

Over time, disciplinary cultures have been found to become harder and more applied (Becher & Trowler, 2001). Biglan (1973a) even contended that some disciplines, such as social sciences and business, may be striving for a singular paradigm, which would increase consensus and shift their Hard-Soft classification. While both Becher and Trowler, and Biglan conceded that disciplinary classifications may change as disciplinary cultures change, the possibility that disciplinary cultures have changed has received little attention by scholars attending to disciplines in their research. Capturing current faculty perceptions could highlight that discipline classifications within Biglan's dimensions need to change or affirm that Biglan's dimensions continue to be an accurate and valuable framework for studying faculty work.

Even though Biglan's tool has remained a frequently used and cited tool for researchers, little attention has been given to the dualistic nature of Biglan's dimensions. Biglan's classifications situate disciplines as *either* Hard or Soft, Pure or Applied, and dealing with Life or Nonlife. Given the nature of cultural change, as well as given the shifts in faculty characteristics and higher education more broadly, it is possible that approaching disciplinary characteristics dichotomously actually obscures much of what makes each discipline unique.

Influences of and on Disciplinary Cultures

Disciplinary cultures influence many aspects of faculty and student experiences. Substantial scholarship has been produced about the influence of disciplinary differences in

teaching and learning. At the most basic level, disciplinary cultures influence curricular decisions, shaping both method and content of instructional choices (Umbach, 2007). Disciplinary cultures have also been found to predict curriculum inclusion, as Soft-Pure disciplines are more likely to include diverse readings in their curriculum (Millem, 2001; Umbach, 2006). Disciplinary cultures also influence faculty emphasis on deep approaches to learning (Hiller & Nelson Laird, 2021; Nelson-Laird & Garver, 2010; Nelson Laird et al., 2011). Outside of the scholarship of teaching and learning, disciplinary cultures can and do influence other areas of faculty life. For example, different disciplines engage with service to their institutions at varying rates (Guarino and Borden, 2017).

The socially constructed nature of disciplines suggests that disciplinary cultures can evolve over time, even if slowly. Manathunga and Brew (2012) compare disciplines to oceans, with tides that alter disciplinary foundations over time. Despite faculty perceptions that disciplinary cultures are relatively permanent (Becher & Trowler, 2001) and despite academia's desire for stable disciplinary identities (Manathunga & Brew, 2012), the possibility of disciplinary cultural change suggests classifications may need reexamination. Moreover, higher education in the 21st century has shifted and disciplinary cultures are not immune to external influences on higher education. The growth of business mindsets and consumerism, internationalization, and the rise of accountability are all internal and external influences that may be shaping disciplinary cultures (Trowler, Saunders, & Bamber, 2012). Trowler and colleagues (2012) express some concern that the evolution of policy and economics external to higher education, as well as the distractions of the day-to-day administrative tasks of academia may "eclipse" the role that disciplinary cultures play, but that will not mean their influence will disappear. They articulate that

the presence of disciplinary cultures will not change; however, they worry the salience of disciplinary cultures may.

It is true that faculty demographics and the nature of faculty work have both changed substantively in the last fifty years, but when it comes to cultural change, we must also be attentive to the power dynamics. Institutional disciplinary leaders, like program and department chairs, as well as leaders in the development of scholarship within the discipline hold disproportionate control over the pace of change. It is the most dominant cultural group members that have the most influence on how practices, values, and beliefs are transferred to new students and faculty through socialization (Kuh & Whitt, 1988). This might suggest that cultural evolution occurs most when either newer practices, beliefs, etc., reach the dominant members of a discipline or when once non-dominant members take more dominant roles in their disciplines.

Methods

Data Source

We use data from the 2022 administration of the Faculty Survey of Student Engagement (FSSE) survey. To capture information about faculty perceptions of undergraduate student engagement, FSSE gathers information on student-faculty interactions, teaching practices, high-impact practice participation, and more. In addition to core FSSE survey items, exploratory survey item sets may be included to investigate research questions related to FSSE's mission. To investigate faculty members' perceptions of disciplinary norms and practices, we developed an exploratory item set which was given to faculty respondents at 16 random eligible participating institutions. The survey items relevant to this study are described below.

Sample

The data set included 691 faculty who responded to at least one of the items in the additional item set. Faculty represented 100 unique disciplines, with the highest proportion of faculty respondents in Arts and Humanities disciplines (19.4%) and the smallest proportion of faculty respondents in Engineering disciplines (1.0%). Most faculty identified as Women (50.9%), with a slightly smaller proportion identifying as Men (42.8%). The largest proportion of faculty identified as White (74.3%) with smaller proportions of faculty identifying as Hispanic or Latino (2.28%), Multiracial (3.36), Asian (4.7%), or Black or African American (7.26%). Most faculty reported their sexual orientation as Straight (83.1%), with LGBTQ+ faculty making up a smaller proportion of respondents (6.1). About a quarter of faculty were Full Professors (25.0%), Associate Professors (27.1%), Assistant Professors (26.5%). Slightly more than three quarters of faculty respondents held an administrative position (76.0%). See Table 1 for sample characteristics.

Table 1
Faculty Characteristics

	N	%
Disciplinary Area		
Arts & Humanities	163	19.4
Biological Sciences, Agriculture, & Natural Resources	52	6.2
Business	91	10.8
Communications, Media, & Public Relations	41	4.9
Education	74	8.8
Engineering	8	1.0
Health Professions	111	13.2
Physical sciences, Mathematics, & Computer Science	109	13.0
Social Sciences	111	13.2
Academic Rank		
Full Professor	169	25.0
Associate Professor	183	27.1
Assistant Professor	179	26.5
Full-time Lecturer/Instructor	72	10.7
Part-time Lecturer/Instructor	72	10.7
Gender Identity		
Man	316	42.8

Woman	376	50.9
Another gender identity	8	1.1
I prefer not to respond	39	5.3
Race and Ethnicity		
Asian	35	4.7
Black or African American	54	7.3
Hispanic or Latino	17	2.3
White	553	74.3
Another race or ethnicity	14	1.9
Multiracial	25	3.4
I prefer not to respond	46	6.2
Sexual Orientation		
Straight (heterosexual)	616	83.1
LGBQ+	44	6.1
I prefer not to respond	81	10.9
Administrative Position		
Yes	574	76.0
No	181	24.0

Measures

This study focuses on eight items in the additional FSSE item set that were informed by literature on Biglan's dimensions and disciplinary cultures (e.g., Becher & Trowler, 2001; Biglan, 1973a, b). These items asked faculty about their perceptions of how key cultural aspects of Hard, Soft, Pure, Applied, Life, and Nonlife disciplines applied to their own disciplines. The items did not focus on asking faculty whether they perceived their disciplines are Hard or Soft. Instead, the item set focused on descriptive qualities of each dimension, asking faculty to rate these qualities on a scale from 0 (Does not describe my discipline at all) to 10 (Perfectly describes my discipline). For instance, as an indicator of whether a faculty member perceives their discipline to be Hard or Soft, we inquired about whether there was substantial agreement about the core content knowledge and theories in the field/discipline and whether there were common methods or approaches to answering questions or solving problems in their field/discipline. If Biglan's (1973a, b) dimensions still apply to disciplines as originally conceived by Biglan, we would expect faculty in Hard disciplines on average to rate these two items at the high end of the scale.

Our sets of items pertaining to each dimension can be interpreted as measuring a disciplinary's culture's levels of consensus about knowledge and inquiry, application of knowledge and inquiry, and engagement with living or social systems. Three items were reversed coded for analysis. As analyzed, a score of 0 was designed to correspond to Soft, Applied, and Nonlife and a score of 10 to Hard, Pure, Life. See Table 2 for items, coding, and response frequencies.

Table 2

Relative Frequencies for Items Related to Biglan Dimensions

For the following items, please think about what you perceive as the norms, practices, and beliefs of your primary discipline/field with regard to faculty work (research, teaching, etc.).

On a scale of 0 to 10, how well do the following statements describe your primary discipline or field?

Response options: 0= Does not describe my discipline at all through 10=Perfectly describes my discipline

	Not at										Perfectly	
	all	0	1	2	3	4	5	6	7	8		9
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
There is substantial agreement about the core content knowledge and theories in my field/discipline (<i>rbbd01a</i>)	.3	1.0	.9	1.6	1.6	7.9	9.4	19.7	26.4	18.1	12.9	
There are common methods or approaches to answering questions or solving problems in my field/discipline (<i>rbbd01b</i>)	.6	.6	.4	2.2	1.6	6.6	7.2	20.5	27.2	20.3	12.7	
Scholars in my field/discipline generally agree on which problems or questions are important to pursue (<i>rbbd01c</i>)	.6	.9	1.5	2.9	2.1	12.7	14.0	19.1	24.3	15.5	6.5	
Scholars in my field/discipline focus on the practical application of theory and content to professional practice (<i>rbbd01f</i>) (reverse coded)	16.9	23.8	21.9	14.8	5.4	8.2	2.5	2.2	1.6	1.5	1.2	
Scholars in my field/discipline focus on the application of theory and content to real-life issues (<i>rbbd01g</i>) (reverse coded)	19.3	21.8	21.1	16.3	6.2	6.5	2.9	1.8	2.4	1.0	.7	
Scholars in my field/discipline draw on non-academic sources of knowledge or expertise (e.g., government agencies, non-profit organizations, professional organizations) (<i>rbbd01h</i>) (reverse coded)	9.5	13.5	22.6	16.9	9.9	9.9	3.6	5.5	3.7	2.2	2.7	

Knowledge and inquiry in my field/discipline is primarily concerned with biological or living things (<i>rbbd01i</i>)	22.0	7.0	5.8	4.6	3.3	8.0	3.7	7.0	7.0	10.7	21.1
Knowledge and inquiry in my field/discipline is primarily concerned with social systems (<i>rbbd01j</i>)	11.8	4.9	5.4	4.5	3.6	11.0	8.0	11.8	13.4	12.2	13.5

Analysis

To answer Research Question 1, exploratory factor analysis (EFA) was utilized to develop and examine scales that reflect disciplinary consensus, application, and life or social systems, including reliability analysis of each scale, descriptive statistics, and correlations between scales.

Research Question 2 is addressed in two ways. First, to better understand the nuance of perceptions expressed by faculty, we look at the descriptives of faculty members' scores on the scales developed in the first research question as well as how individual faculty scale scores compare to the overall scale means and how they compare across Biglan's dimensions. Second, we examine the mean scale scores by discipline as an indicator of each discipline's predominant culture with regard to the scales, with comparison to Biglan's dimensions. For these discipline-level comparisons, as scholars have traditionally applied Biglan's dimensions dichotomously, we examine two methods of applying our scales dichotomously: by using the scale midpoints and by using the overall scale means as the dividing point.

To explore Research Question 3, we employ cluster analysis, using the disciplinary means of the three scales to classify disciplines into groups. After identifying three clusters with fair cluster quality (Rousseeuw, 1987), we examined discipline level means within these clusters.

Limitations

This sample may not reflect all colleges and universities as institutions self-select to participate in FSSE and the item set examined was randomly distributed to only a subset of those participating institutions. That said, disciplinary cultures have been found to be more influential to faculty life than individual institutional cultures (Clark, 1997; Hiller, 2023). Additionally, faculty representation across disciplines was uneven, ranging from one to 55 (mean=8). Furthermore, faculty characteristics such as stage of career or institutional characteristics were not a part of analysis; however, as scholars know that institutional cultures, disciplinary cultures, and faculty characteristics interact (Umbach, 2007), further exploration of these interactions with disciplinary cultures and the Biglan dimensions would be an interesting line of further research. While not necessarily problematic for an exploratory study, these limitations indicate a possibility of bias when aggregating to the discipline level and could lead to results that do not apply to all faculty or subdisciplines within each broader discipline. Given these limitations, caution should be taken in generalizing results.

Results

Faculty Perceptions and their Relationships with One Another

EFA analysis indicated the items form three scales. See Table 3 for item descriptives and factor loadings and Tables 4 and 5 for scale descriptives. The scales related to consensus and application of knowledge have acceptable Cronbach's alphas ($>.7$), suggesting the items are correlated and the scales can be considered narrow constructs. Cronbach's alpha for the living and social systems scale is low (.54), however, strong face validity of the constituent items suggests it is reasonable to use this scale for further exploratory analysis.

The intraclass coefficients suggest that reasonable proportions of variance in the scale scores are attributable to faculty disciplines, especially the living and social systems scale (.34). Scales ranged in their correlation with one another from very low (Consensus–Life Systems, $r=.092$) to medium (Life Systems–Application, $r= -.328$; Consensus–Application, $r= -.499$). On average, faculty perceived their disciplines as having high levels of consensus (mean=7.38) and application (mean=2.72).

Table 3
Item Descriptives and Factor Loadings

For the following items, please think about what you perceive as the norms, practices, and beliefs of your primary discipline/field with regard to faculty work (research, teaching, etc.).
On a scale of 0 to 10, how well do the following statements describe your primary discipline or field?
Response options: 0= Does not describe my discipline at all through 10=Perfectly describes my discipline,

	N	Mean	Std. Dev.	Factor Loadings
There is substantial agreement about the core content knowledge and theories in my field/discipline (<i>rbbd01a</i>)	680	7.52	1.85	.881 ^a
There are common methods or approaches to answering questions or solving problems in my field/discipline (<i>rbbd01b</i>)	679	7.62	1.82	.892 ^a
Scholars in my field/discipline generally agree on which problems or questions are important to pursue (<i>rbbd01c</i>)	679	7.01	1.93	.832 ^a
Scholars in my field/discipline focus on the practical application of theory and content to professional practice (<i>rbbd01f</i>) (reverse coded)	681	2.43	2.20	.803 ^b
Scholars in my field/discipline focus on the application of theory and content to real-life issues (<i>rbbd01g</i>) (reverse coded)	679	2.36	2.15	.834 ^b
Scholars in my field/discipline draw on non-academic sources of knowledge or expertise (e.g., government agencies, non-profit organizations, professional organizations) (<i>rbbd01h</i>) (reverse coded)	674	3.35	2.50	.793 ^b
Knowledge and inquiry in my field/discipline is primarily concerned with biological or living things (<i>rbbd01i</i>)	674	5.19	3.90	-.885 ^c
Knowledge and inquiry in my field/discipline is primarily concerned with social systems (<i>rbbd01j</i>)	672	5.81	3.30	-.751 ^c

Key: a = factor loadings for BBD - Consensus, b = factor loadings for BBD - Application, c = factor loadings for BBD - Life

Table 4
Scale Descriptives

	Count	Mean	SD	α	ICC by Institution	ICC by Discipline
BBD - Consensus	678	7.38	1.66	.86	.01	.13
BBD - Application	673	2.72	1.89	.77	.04	.11
BBD - Life Systems	669	5.48	2.99	.54	.04	.34

Table 5*Significant Correlations between Biglan Scales*

	BBD – Consensus	BBD – Application	BBD – Life Systems
BBD – Consensus	1		
BBD – Application	-.499**	1	
BBD – Life Systems	.092*	-.328**	1

Note: * $p < .05$, ** $p < .01$

Comparing Faculty Perceptions of their Disciplines' Qualities

Examining faculty members' perceptions of their disciplines' level of consensus about knowledge and inquiry in their disciplines, level of application of knowledge and inquiry in their disciplines, and engagement with living or social systems, revealed both unsurprising and surprising results. Using Biglan's original and literature-based classifications to interpret faculty members' scale scores, these results suggest the Biglan dimensions continue to differentiate important disciplinary qualities. Faculty in Hard disciplines tend to view their disciplines as having greater levels of consensus (70.4%) than faculty in Soft disciplines (47.5%). Faculty in Pure disciplines more often view their discipline as having less application (53.3%) compared to faculty in Applied disciplines (28.6%). Lastly, faculty in Life disciplines more often viewed their disciplines as having more focus on living and social systems (78.7%) compared to faculty in Nonlife disciplines (28.4%).

Yet, these results also suggest considerable nuance to how faculty view their disciplines, that does not necessarily align with common understandings of what the dimensions mean. Considering the level of consensus and level of application, nearly one-third of faculty in Hard and Applied disciplines viewed their disciplines as having less consensus (29.6%) and less application (28.6%), respectively, compared to the overall scale means. Also, surprisingly, faculty in Soft and Pure disciplines showed more mixed perceptions of their disciplines, with nearly half

of faculty viewing their disciplines as having more consensus (47.5%) and more application (46.7%), respectively, compared to the overall scale means. Underscoring this nuance, the mean score for level of consensus for faculty in Soft disciplines was 7.22, well above the midpoint of the 0-10 scale range, suggesting these faculty viewed their disciplines as Harder than previously understood. Similarly, the mean score for level of application for faculty in Pure disciplines was 3.36, well below the midpoint of the scale range, suggesting these faculty viewed their disciplines as more Applied than previously understood. See Tables 6-8 for descriptives of each of our scales compared to original Biglan classifications.

Table 6
Descriptives of BBD – Consensus by Biglan’s Hard-Soft Dimension

Original Biglan Category	Min	Median	Max	Mean	Percentage of Faculty Perceiving Their Discipline with... (Relative to Overall Mean)	
					More Consensus	Less Consensus
Hard	4.00	8.00	10.00	8.03	70.4%	29.6%
Soft	0.00	7.33	10.00	7.22	47.5%	52.5%
Overall	0.00	7.67	10.00	7.38	53.4%	46.6%

Table 7
Descriptives of BBD – Application by Biglan’s Pure-Applied Dimension

Original Biglan Category	Min	Median	Max	Mean	Percentage of Faculty Perceiving Their Discipline with... (Relative to Overall Mean)	
					Less Application	More Application
Pure	0.00	3.00	9.00	3.36	53.3%	46.7%
Applied	0.00	2.00	10.00	2.21	28.6%	71.4%
Overall	0.00	2.33	10.00	2.72	40.2%	59.4%

Table 8*Descriptives of BBD – Life Systems by Biglan’s Life-Nonlife Dimension*

Original Biglan Category	Min	Median	Max	Mean	Percentage of Faculty Perceiving Their Discipline with... (Relative to Overall Mean)	
					More Life Systems Focus	Less Life Systems Focus
Life	0.00	7.25	10.00	7.06	78.7%	21.3%
Nonlife	0.00	3.50	10.00	3.96	28.4%	71.6%
Overall	0.00	5.50	10.00	5.48	52.1%	47.9%

Examining the discipline-level mean scale scores, we found considerable variation across disciplines within Biglan’s dimensions. For example, within Hard disciplines, Kinesiology faculty had a mean consensus score of 6.81, while Biology and Computer science faculty had means of 7.53 and 8.29, respectively. In soft disciplines, means spanned a similarly wide range, with faculty in Philosophy averaging 5.79 on the consensus scale while faculty in Psychology averaged 7.49. At this level, some hard disciplines (e.g., Kinesiology) scored lower than some soft disciplines (e.g., Psychology) on the consensus scale. Similar patterns were observed for applied and pure disciplines on the application scale and for life and non-life disciplines on the life systems scale. See Table 9 for full scale means by discipline.

Table 9*Mean Scale Scores by Discipline with Original Biglan Categories*

Faculty Discipline	Original Biglan Categories			Mean Scale Scores		
	Hard-Soft	Pure-Applied	Life-Nonlife	BBD-Consensus	BBD-Application	BBD-Life Systems
Overall (All Disciplines)	--	--	--	7.38	2.72	5.48
Social sciences (general)	--	--	--	6.44	2.82	4.15
Other social sciences	--	--	--	6.45	7.33	3.00
Supply chain and operations management	--	--	--	8.50	3.88	4.05
Public relations and advertising	--	--	--	6.87	4.44	6.50
Health technology (medical, dental, laboratory)	--	--	--	9.00	2.67	7.33
General studies	--	--	--	6.17	3.00	3.90
Liberal arts and sciences	--	--	--	7.67	4.29	5.54
Multi, Interdisciplinary studies	--	--	--	8.00	3.33	5.30

Professional studies (general)	--	--	--	8.33	4.17	2.93
Other, not listed	--	--	--	6.92	5.10	4.50
Biology (general)	H	P	L	7.53	2.92	6.23
Biochemistry or biophysics	H	P	L	8.00	1.67	4.50
Biomedical science	H	P	L	7.33	1.89	7.00
Botany	H	P	L	8.00	3.54	6.32
Cell and molecular biology	H	P	L	8.56	1.33	6.00
Environmental science/studies	H	P	L	6.33	4.00	4.00
Marine science	H	P	L	8.33	2.67	6.00
Microbiology or bacteriology	H	P	L	8.67	2.67	5.00
Natural science	H	P	L	6.50	1.89	6.00
Physiology and developmental biology	H	P	L	8.07	1.33	5.00
Other biological sciences	H	P	L	10.00	1.67	5.50
Kinesiology	H	P	L	6.81	3.00	6.00
Physical sciences (general)	H	P	N	9.33	1.67	6.50
Chemistry	H	P	N	8.02	2.87	5.40
Earth science (including geology)	H	P	N	8.11	4.00	6.50
Mathematics	H	P	N	8.19	3.67	1.00
Physics	H	P	N	8.42	3.49	2.58
Statistics	H	P	N	9.00	2.07	2.28
Other physical sciences	H	P	N	8.33	2.22	1.33
Agriculture	H	A	L	8.33	2.08	5.50
Other agriculture and natural resources	H	A	L	6.33	2.67	5.50
Speech	H	A	L	8.67	3.85	2.04
Dentistry	H	A	L	6.67	2.61	7.75
Nutrition and dietetics	H	A	L	9.50	4.67	5.50
Computer science	H	A	N	8.29	3.00	6.50
Chemical engineering	H	A	N	8.67	3.13	1.28
Civil engineering	H	A	N	10.00	1.00	9.00
Computer engineering and technology	H	A	N	8.67	2.00	3.00
Electrical or electronic engineering	H	A	N	8.67	1.96	6.89
Computer information systems	H	A	N	9.17	0.33	6.00
Information technology	H	A	N	7.00	4.60	7.13
Anthropology	S	P	L	6.72	2.59	4.33
Ethnic studies	S	P	L	5.67	2.11	3.33
Political science	S	P	L	6.80	2.27	4.50
Psychology	S	P	L	7.49	2.47	6.80
Sociology	S	P	L	5.95	1.50	8.00
Arts, fine and applied	S	P	N	7.15	2.48	8.39
Art history	S	P	N	6.00	3.52	7.64
English (language and literature)	S	P	N	5.94	2.81	7.79
French (language and literature)	S	P	N	5.22	1.48	2.83
Spanish (language and literature)	S	P	N	6.56	1.29	3.92
Other language and literature	S	P	N	7.00	4.00	2.50

History	S	P	N	7.11	1.56	3.08
Humanities (general)	S	P	N	5.91	2.00	6.00
Music	S	P	N	6.86	2.17	7.00
Philosophy	S	P	N	5.79	2.76	6.07
Theater or drama	S	P	N	7.08	2.00	5.08
Other fine and performing arts	S	P	N	8.00	2.33	5.50
Other humanities	S	P	N	7.44	1.67	2.50
Geography	S	P	N	9.00	4.33	4.63
Religion	S	A	L	6.92	2.00	3.00
Hospitality and tourism	S	A	L	8.00	4.00	2.25
Education (general)	S	A	L	6.95	3.03	6.08
Early childhood education	S	A	L	7.17	1.90	8.18
Elementary, middle school education	S	A	L	8.20	1.50	8.25
Mathematics education	S	A	L	6.00	2.93	7.90
Physical education	S	A	L	8.00	1.67	5.00
Secondary education	S	A	L	7.00	2.00	8.00
Special education	S	A	L	7.50	2.42	8.50
Other education	S	A	L	7.29	2.29	7.44
Health science	S	A	L	7.67	2.05	7.93
Healthcare administration and policy	S	A	L	7.33	0.33	8.00
Nursing	S	A	L	8.09	1.26	8.31
Occupational therapy	S	A	L	7.33	1.00	5.75
Physical therapy	S	A	L	8.33	4.00	10.00
Rehabilitation sciences	S	A	L	8.00	3.58	3.75
Speech therapy	S	A	L	7.92	3.00	4.50
Other health professions	S	A	L	7.17	1.93	5.40
Criminal justice	S	A	L	7.33	2.00	6.50
Social work	S	A	L	8.22	2.38	5.57
Family and consumer studies	S	A	L	5.33	2.55	4.83
Theological studies, ministry	S	A	L	6.71		
Economics	S	A	N	7.42	1.64	7.41
Accounting	S	A	N	7.93	1.67	5.50
Business administration	S	A	N	8.86	2.92	5.98
Entrepreneurial studies	S	A	N	3.33	2.67	8.25
Finance	S	A	N	7.50	2.43	5.75
International business	S	A	N	8.17	1.44	7.67
Management	S	A	N	7.91	2.70	5.50
Management information systems	S	A	N	7.87	2.13	7.00
Marketing	S	A	N	8.28	2.25	5.31
Organizational leadership or behavior	S	A	N	7.00	2.00	1.50
Other business	S	A	N	7.22	0.67	2.50
Communications (general)	S	A	N	7.73	2.33	2.00
Broadcast communications	S	A	N	7.22	2.00	5.00
Journalism	S	A	N	5.00	1.94	7.92

Mass communications and media studies	S	A	N	7.93	1.67	8.50
Other communications	S	A	N	6.17	0.50	8.00
Public administration, policy	S	A	N	8.00	1.33	9.00

Using the discipline mean scale scores, we examined how they could be dichotomized using the Biglan classifications, first by using the scale midpoint (5) and second by using the overall scale mean as the break point. As would be expected given the faculty-level results explored earlier, discipline mean perceptions of their disciplinary qualities differ from Biglan’s original classifications, with more disciplines identified as Hard and Applied. Table 10 provides a summary of how disciplines would be classified under Biglan’s dimensions and each of our dichotomizations.

Since our scales were developed by situating the common definitions or understandings of Biglan’s dimensions as the low and high points, dichotomizing by the scale midpoint would conceptually divide discipline mean perceptions into the conceptual Hard, Soft, Pure, Applied, Life, and Nonlife categories. A “neutral” category was added as some disciplines had mean scale scores exactly at the midpoint. Our results show that nearly all disciplines would be classified as Hard (98%) and Applied (98%), compared to 35% and 57% of disciplines, respectively, using Biglan’s classifications. Life and Nonlife disciplines shift from an even 50% split to 63% and 33% of disciplines identified as Life and Nonlife, respectively.

Making the dichotomization break point relative to the overall scale means also suggests that discipline mean faculty perceptions of their disciplinary qualities do not cleanly align with Biglan’s dimensions. While 65% of disciplines were classified as Soft using Biglan’s dimensions, only 45% were relative to the overall scale mean. Similarly, fewer disciplines were identified as Pure, only 36% compared to 43% using Biglan’s dimensions.

Table 10*Percentage of Disciplines Classified by Three Classification Schemes*

	Biglan Classifications	Dichotomized by Scale Midpoint	Dichotomized by Scale Mean
Hard	35%	98%	55%
Soft	65%	1%	45%
H-S Neutral	0%	1%	0%
Pure	43%	2%	36%
Applied	57%	98%	64%
P-A Neutral	0%	0%	0%
Life	50%	63%	58%
Nonlife	50%	33%	42%
L-N Neutral	0%	5%	0%

Disciplinary Clusters

Results of a two-step cluster analysis using discipline level means suggest that three groups of disciplines form based on the aggregated faculty perceptions of the level of consensus around knowledge and application and engagement with living or social systems. To measure cluster quality, we measure cohesion and separation using the silhouette measure, an indication of how well clustered the groups are, with 0.2 through 0.5 indicating fair cluster quality. Our disciplinary means clustered into groups with a silhouette measure of 0.44, indicating fair cluster quality (Rousseeuw, 1987).

The discipline level means clustered into differently sized groups. Approximately one-third (34.7%) of discipline level means clustered into Cluster 1, 50% fell into Cluster 2, and 15.3% of discipline level means fell into Cluster 3. The most powerful input (predictor) for cluster development was the consensus scale score, followed by the application scale score, and finally the life systems scale score; however, the difference between predictor power of the consensus

scale and the life systems scale (a measure between 0 and 1) was 0.4, which indicates there may not be substantial differences in predictor power between each of the three scales.

Comparing the group centroids to the overall discipline scale means shows that the three clusters roughly align with three of Biglan’s categories: Hard-Applied-Nonlife, Hard-Applied-Life, and Soft-Pure-Nonlife. Cluster 1 disciplines have a high mean on the Consensus scale (8.30), a relatively low mean on the Application scale (2.25), and relatively low mean score the Life Systems scale (3.85). While Cluster 2 also has a Consensus scale mean (7.42) slightly higher than the overall scale mean (7.38), suggesting a lean toward Hard disciplines, disciplines in this cluster are moderately softer than the disciplines in Cluster 1. Similarly, disciplines in Cluster 2 are generally more Applied, but slightly less so than those in Cluster 1. Cluster 2 appears to differentiate itself from Cluster 1 in the Life Systems scale, with disciplines in Cluster 2 being focused more on Life Systems (centroid mean of 6.90). Cluster 3 distinguishes itself from the other clusters more clearly in the Consensus and Application scales, with a Consensus centroid mean (5.81) lower than the overall scale mean and an Application centroid mean (4.35) greater than the overall scale mean. See Table 11 for cluster group centroid descriptives.

Table 11
Cluster Group Centroid Descriptives

	BBD-Consensus		BBD-Application		BBD-Life Systems	
	Mean	SD	Mean	SD	Mean	SD
Cluster 1	8.30	0.69	2.25	0.91	3.85	1.61
Cluster 2	7.42	0.75	2.15	0.67	6.90	1.22
Cluster 3	5.81	0.90	4.35	0.95	5.01	2.14

Though the clusters arguably align with three of Biglan’s eight interacted dimension categories, as suggested by the cluster centroids, there is far more fluidity in our clusters. This is more clearly depicted in Figure 1 which shows the relative frequencies of disciplines by scale

means and Figure 2 which depicts the three clusters in a scatterplot by disciplines' three scale means. These figures help to highlight how Cluster 1 and 2 are most distinguished by differences in Life Systems means, while Cluster 3 is most differentiated by its Application and Consensus means compared to the other clusters.

Figure 1

Relative Frequency of Discipline Membership in Each Cluster by Scale Means

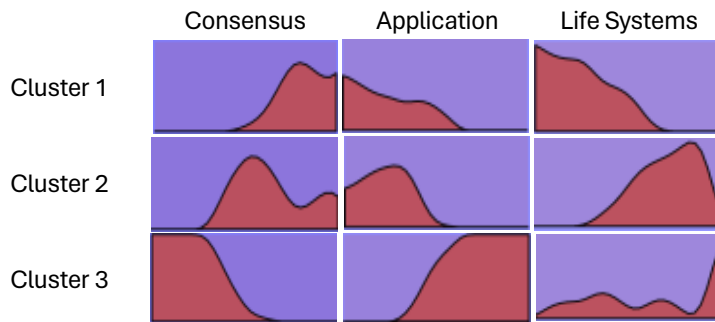
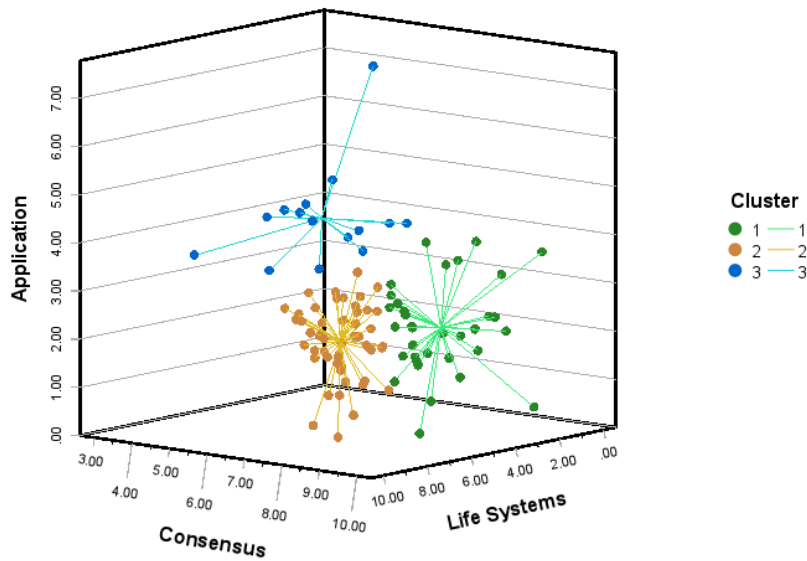


Figure 2

Discipline Scale Means by Cluster



Note: Scales of Application and Consensus are truncated for visibility. Lines converge on cluster group centroid.

Discussion

Biglan's framework for understanding disciplinary cultures has been a core perspective for decades. Examining the framework at our current point helps advance knowledge and understanding of disciplines, which continue to be central to how faculty organize their work. By seeking to understand faculty members' perceptions of the qualities of their disciplines and questioning whether those perceptions align with the Biglan dimensions, these findings help scholars more deeply understand current faculty narratives about their disciplinary engagement, a core feature of disciplinary cultures (Becher & Trowler, 2001).

To better examine current faculty perceptions of their disciplinary cultures we designed survey items around the most prominent conceptualizations of the Biglan dimensions. While this approach arguably may not capture all important cultural aspects that relate to being a Hard or Applied discipline (let alone other important disciplinary qualities that impact faculty work), it allowed for a focused examination of how the ways that scholars conceptualize and discuss the Biglan dimensions relate to actual faculty perceptions of their disciplines.

Our Consensus and Application items, designed to align with the Hard-Soft and Pure-Applied Biglan dimensions, respectively, formed narrow constructs as judged by their face validity and Cronbach's alphas, and those scales intra-class correlation coefficients (ICCs) suggest that a moderate amount of variation in the scale scores (13% for Consensus and 11% for Application) is due to disciplines. While higher ICCs might have been expected, considering the intention that these scales differentiate prominent disciplinary qualities, an intriguing possibility is that other factors are becoming greater influences on how faculty view these qualities in their disciplines, such as institutional cultures or professional cultures.

Notably, the Life Systems items formed a weak construct, though appropriate for exploratory analysis given its strong face validity. It is simply possible that Biglan's Life-Nonlife dimensions is conceptualized so simplistically and binarily that it would be difficult to create a stronger construct. Possibly because it is typically conceptualized so binarily, the Life Systems scale had a large ICC suggesting that approximately 34% of variation in the scale scores is due to disciplines. Much more so than the Consensus and Application scales, scholars can be confident that disciplinary cultures are strongly influencing how disciplines focus on living and social systems or not.

Further analysis of faculty perceptions showed that though survey items were designed to align with the most common aspects attributed to Biglan's Hard-Soft, Pure-Applied, and Life-Nonlife dimensions, faculty on average viewed their disciplines as having greater levels of consensus and application than scholars would have assumed based on prior scholarship. One possibility, as noted by Becher and Trowler (2001), is that the cultures of once-Soft disciplines shifted toward greater levels of consensus. An additional possibility is that external influences influenced once-Pure disciplines into greater levels of application of their disciplinary knowledge and inquiry on real life issues. Further study that seeks to examine why faculty perceive their disciplines as holding certain qualities could help identify the influences at the root of apparent cultural shifts like these.

Our results further examined how two different dichotomous classifications of disciplines using our scales compared to classifications using the Biglan dimensions. Dichotomizing disciplines on the scales by the scale midpoint, or what we would conceptually understand as half-way between Hard and Soft, for example, showed that exceedingly few disciplines would be

classified as Soft or Pure. Given our analysis of faculty members' scale scores, this is natural conclusion. Examining a second method of classification, it is true that if classifications are assigned relative to the overall scale means, many faculty and disciplines align better with how prior scholarship would categorize those disciplines (e.g., Biglan, 1973b), however this is not the case for all disciplines. Researchers must carefully consider whether some faculty within their disciplines really perceive their disciplines as Pure and as Soft as we have traditionally expected.

Finally, we considered how disciplines would cluster based on their mean scale scores. Traditionally in the literature, disciplines were assigned to eight categories that were simply interactions of the dichotomous classifications of the Biglan dimensions (or four categories if researchers only used the Hard-Soft and Pure-Applied dimensions). So, for instance, a discipline identified as Hard, Applied, and Life would be in the Hard-Applied-Life category. However, our findings clearly indicate greater fluidity in disciplinary cultures across our three scales.

Interestingly, cluster analysis suggested that only three groupings of disciplines arise from our scales. Clusters 1 and 2 overlapped to an extent in the Consensus and Application scales (with Cluster 1 being slightly more oriented toward higher levels of consensus and application), but were more strongly differentiated by the Life Systems scale. Since so many faculty viewed their disciplines as having higher levels of consensus and application, it is perhaps unsurprising that clusters would capture disciplines with higher levels on these scales that are then differentiated by the Life Systems scale. It then follows that Cluster 3 includes disciplines across the Life Systems scale but captures the fewer disciplines with lower levels of consensus and application.

While the Biglan dimensions offer a relatively simple framework that has helped to differentiate faculty practices and behaviors, our findings raise questions about what the

dimensions mean to faculty today. Our findings suggest greater levels of variation in faculty perceptions of their disciplinary cultures within disciplines and within traditional Biglan dimension categories than previously found in the literature.

Significance and Implications

Biglan's original dimensions remain popular, but the dimension's continued relevance has remained unquestioned, and perhaps taken for granted. Despite the assumed stability of the dimensions over time, higher education context has changed quite a bit. It is not difficult to imagine the possibility that change within disciplinary cultures has occurred. Our results highlight the possibility that disciplinary cultures are changing. Faculty characteristics and the nature of faculty work have changed a lot in the last fifty years. As faculty in their disciplines all participate in socialization processes as they prepare to learn and work within their discipline (Umbach, 2007), it should not be surprising to scholars that disciplinary cultures may have changed even if only in small ways. While it might be tempting, based on our findings, to highlight large significant changes to disciplinary cultures, we more modestly conclude that our findings strongly suggest only that the ways faculty perceive their disciplinary cultures today are not the same as what was originally conceptualized fifty years ago by Biglan's (1973a, b) work.

Given that socialization processes often reinforce and perpetuate elements of disciplinary cultures, it is likely that some disciplines have evolved their cultures in only modest ways, if at all. Furthermore, the composition and diversity of faculty in the past fifty years has changed but not likely evenly across all disciplines. Given that dominant members of a culture are often the ones socializing and reinforcing elements of disciplinary cultures, disciplines that have seen less change in their faculty may be slower in cultural change.

Broadly, these findings suggest *evolution* in how faculty view important components of their disciplinary cultures compared to Biglan's original dimensions, possibly with some disciplines evolving to a greater degree than others, but our findings should not be interpreted so far as to suggest there has been broad-based major change in disciplinary cultures. We view these findings as reinforcing Manathunga & Brew's (2012) metaphor that tides may alter disciplinary foundations but these changes take time. Our findings clearly suggest disciplinary cultures are not perceived by faculty the same way they were fifty years ago, even if the three Biglan dimensions continue to identify central aspects of disciplinary cultures. Our study highlights the need for further research on disciplinary cultures.

Implications for practice

The practical implications of our findings may be somewhat subtle and reliant on the extent to which practitioners work within or across disciplinary cultures. Arguably, practitioners who engage with faculty work should necessarily take into account disciplinary cultures as these cultures so strongly shape, even if implicitly, the ways that faculty approach their work. The fluidity in faculty perceptions of disciplinary cultures calls for practitioners to be more attentive to nuance in disciplines' levels of consensus, application, and engagement with living or social systems. One important group of practitioners whose work could be affected by our findings are faculty and educational developers, who generally agree on the importance of accounting for disciplinary differences when educating faculty on teaching and learning (Hutchings et al., 2011). Our results highlight that variation exists not just across disciplines but even within disciplines. Individual faculty may not perceive their discipline's culture the same way that other faculty in

their discipline do, meaning that some faculty may not approach their teaching and research in the same way as other faculty in their discipline.

Faculty and educational developers may consider seeking to understand more about levels of consensus, application, and engagement with living or social systems *across* and *within* disciplines when designing meaningful professional development. Practitioners who have followed the literature on disciplinary cultures and the Biglan dimensions may find that the disciplinary cultures of faculty they work with, or how the faculty they work with perceive their own disciplinary cultures, is not what they would expect. More innovative or personalized approaches to educational development may be necessary to maximize the impact of this important work. Do faculty developers need more expertise in specific disciplines to aid in understanding a discipline's culture? Should institutions embed faculty developers within academic departments to provide more targeted and customized support to one discipline at a time? Should professional development for educational developers be more prominently situated within particular disciplinary approaches to teaching and learning?

Implications for future research

Our findings highlight the nuances and variation across and within disciplinary cultures and that faculty perceptions around Consensus, Application, and Life System do not necessarily align with long-standing conceptualizations using Biglan's dimensions. When scholars classify disciplines into categories based on Biglan's dichotomous dimensions, many of these nuances may be obscured or off base. Our findings, being based on direct faculty perceptions of cultural qualities of their disciplines, strongly suggest that the traditional application of the Biglan dimensions may not identify the disciplinary differences we think it will. Additionally, while

classifying disciplines, dichotomously or into multiple categories, may be expeditious in research and aid in identifying broad differences, researchers should further consider the nuance and value that can be added by conceptualizing disciplinary cultures as more fluid and continuous.

Dichotomous thinking, in how Biglan's dimensions are applied and discussed, may push researchers and decision-makers, by extension, into extremes when making decisions. It might seem like common sense to articulate that nuance matters, but our findings indeed highlight that is the case. And yet, researchers who study disciplinary differences in faculty experiences or teaching and learning hardly ever handle questions of disciplinary differences with the type of nuance our scales, or even Biglan's dimensions, could allow for.

Future research should seek to validate these findings and to better understand the extent to which these findings impact the conclusions and implications drawn from research on disciplinary differences in faculty work. Do the use of these scales, dichotomously or continuously, in research on faculty work produce findings that align with what has been or would be found using Biglan's dimensions? As this study did not examine how faculty identities relate to their perceptions of their disciplinary cultures, future studies could explore these relationships. This study's methodology also raises questions about the relationships that divergent perceptions of disciplinary cultures have with faculty work. Do faculty whose perceptions of their disciplinary cultures differ from other faculty within their discipline approach their work in substantively different ways? As disciplinary cultures influence so many aspects of faculty work, the directions for future research are countless.

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