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The Relationship Between Students' Perceptions of "Good Practices for Undergraduate Education" and the Paradigmatic Development of Disciplines in Course-Taking Behavior

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Abstract Our study uses data from the Wabash National Study of Liberal Arts Education to interrogate the affinity disciplines hypothesis through students' perceptions of faculty use of six of Chickering and Gamson's (AAHE Bull 39(7):3–7, 1987) principles of good practice for undergraduate education. We created a proportional scale based on Biglan's (J Appl Psychol 57(3):195–203, 1973) classification of paradigmatic development (with higher scores on the scale corresponding to students taking a higher proportion of courses in 'hard' fields compared to 'soft' fields), our study tests differences by the paradigmatic development of the disciplines or fields in which students take their courses within the first year of college. Our findings suggest that as paradigmatic development increases (toward a higher proportion of courses taken in hard disciplines), student perceptions of both faculty use of prompt feedback and faculty use of high expectations/academic challenge decrease, while student perceptions of cooperative learning increase. Further, no statistically significant differences were found between the paradigmatic development of fields in which students' take their courses and students' perceptions of faculty use of student-faculty contact, active and collaborative learning, or teaching clarity and organization. This study replicates the findings from Braxton et al. (Res High Educ 39(3):299–318, 1998) using student-level rather than faculty-level reports of faculty use of good teaching practices.

Keywords Good teaching practices · Paradigmatic development · Curriculum

Introduction

In the 29 years since Chickering and Gamson (1987) published "Seven Principles for Good Practice in Undergraduate Education," the criticisms of student outcomes in undergraduate education continue to mount. Upon graduation, student's growth in learning

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outcomes do not always reflect their effort and capability (McPherson and Shulenburger 2006). More specifically, many students who earn college degrees do not possess the expected levels of writing, reading, and critical thinking skills (see Arum and Roksa 2011). Even further, employers report that graduates do not have the necessary knowledge and problem-solving skills to succeed in the workplace (U.S. Department of Education 2006). As a result of these gaps, public confidence in the benefits of higher education has waned, leading to decreases in funding from state legislatures and increases in calls for accountability.

Despite these criticisms, the seven principles of good practice have been consistently vetted in the literature as leading to improved student outcomes, thereby sustaining their continued popularity as effective pedagogical tools for student learning in undergraduate education. These seven principles include behaviors both inside and outside the classroom: (a) encouraging student–faculty contact, (b) encouraging cooperation among students, (c) encouraging active learning, (d) giving prompt feedback to students, (e) emphasizing time on task, (f) communicating high expectations, and (g) respecting diverse talents and ways of learning (Chickering and Gamson 1987).

Literature Review

Overview of Good Teaching Practices

For the purpose of the current study, this section provides an overview of six of the seven of the principles of good teaching within undergraduate education first proposed by Chickering and Gamson (1987). The principle of respecting diverse talents and ways of knowing is not included within the overview here, due to methodological limitations with the instruments administered within the dataset for this study as described in further detail below.

Encouraging Student-Faculty Contact

Chickering and Gamson (1987) argued that, among the seven principles, frequency of student-faculty interactions both inside and outside the classroom has the most substantial effect on student involvement, motivation, and intellectual development. Research on classrooms focuses on accessibility and concern about students as two important qualities of good teachers (Sorincelli 1991). Outside of class, student-faculty interactions including research opportunities and informal discussions about course topics, values, and careers positively affect cognitive skills. In addition to cognitive effects, student-faculty interactions also influence students' career choice and preparation (Pascarella and Terenzini 2005). Faculty who treat students as adults and also provide support through critical feedback are especially influential to students (Goodman et al. 2011).

Encouraging Cooperative Learning

Using a problem-solving approach, cooperative learning engages students in pairs or small groups in structured ways (Millis 2009) such that every group member contributes and the group succeeds only if each member succeeds. Sorincelli (1991) added peer teaching to

small group work as a cooperative learning technique. Cooperative learning has repeatedly been shown to increase achievement of content knowledge, especially when related to complex critical thinking. Students also benefit from increased job-related skills as a result of cooperative learning experiences (Pascarella and Terenzini 2005). According to Johnson et al. (2007), cooperative learning has been adopted broadly and is often the preferred method of instruction. It is an effective practice in part because it balances individual accountability with positive interdependence.

Encouraging Active Learning

Active learning occurs when students participate in classroom activities and discussions. As opposed to a lecture-based course, active learning courses engage students through small group discussions, case study debates, and independent study. Sorincelli (1991) argued the importance of student involvement in the classroom, especially through peer interactions, for effective cognitive and affective learning. As a student-centered approach, active learning contextualizes content within its useful application. Prince and Felder (2006) explored the use of these inductive activities in STEM classrooms, and provided examples of specific active learning practices, including problem-based learning, case-based learning, and just-in-time teaching. Pascarella and Terenzini's (2005) synthesis of research shows that active learning techniques positively impacts students' acquisition of course content and persistence.

Giving Prompt Feedback to Students

Students require feedback on their essays, tests, and other performances to help them understand their mistakes. Prompt feedback, received when the logic behind specific decisions is still fresh in a student's mind, provides a strong tool for improvement. What often hinders prompt feedback is the faculty member's sense that thorough feedback is most important (LeClercq 1999). Sorincelli (1991) found that prompt feedback is positively related to student achievement and satisfaction.

Emphasizing Time on Task

According to Chickering and Gamson (1987), "Time plus energy equals learning" (p. 4). Walberg and Paik (2000) reviewed more than 130 studies showing that the more students study, the more they learn. Good classroom management includes directing students' time and energy to academically-oriented activities like studying and reading for class that will help them acquire knowledge and skills (Arum and Roksa 2011). Faculty provide this direction through lesson plans and organized delivery of content. Numerous studies have shown that organized instruction increases students' understanding and retention of ideas (Pascarella and Terenzini 2005). A learning-focused atmosphere also positively affects retention and students' sense of responsibility (Sorincelli 1991).

Communicating High Expectations

Holding students to high standards helps both motivated students and unmotivated students, as well as underprepared students. Faculty's high expectations can also affect the institutional environment, creating a scholarly climate (Chickering and Gamson 1987).

Faculty and institutions that emphasize high standards improve students' knowledge, academic skills, and critical thinking skills (Pascarella and Terenzini 2005). In addition, academically challenging experiences help students think critically and use multiple perspectives when evaluating and refining an interpretation (Goodman et al. 2011).

The Influence of Exposure to Good Teaching Practices

Sorcinelli's (1991) synthesis of the existing literature on each of the good teaching principles revealed two strands of research that clearly supported these principles: one strand focused on student development and college outcomes while the other strand focused on the effects of teachers on their students. More recently, research on good practices has turned to multi-institutional longitudinal studies to counteract the limitations of smaller-scale studies and provide consistent, but more generalizable, results (see Pascarella et al. 2006; Seifert et al. 2008).

As part of these multi-institutional studies, scholars examined the impact of good practices on specific populations. Recent research has provided empirical support for the benefit of good teaching practices in the overall engagement of African-American men in higher education (Strayhorn and DeVita 2010). Likewise, Nelson Laird et al. (2007) found that both African–American and Latinx students who experience good practices report greater gains in overall development. These gains depend especially on the practices of student-faculty contact, active and collaborative learning, and prompt feedback. For first-year students, experiencing good practices leads to improvements in cognitive development, educational aspirations, and learning orientations (Cruce et al. 2006). In a study of liberal arts colleges, the benefits of exposure to good practices was greater for first-year students who entered college with lower levels of parental education, tested precollege academic preparation, academic motivation, and high school involvement (Seifert et al. 2010). Likewise, the use of good practices in first-year seminars appears to mediate the benefit of these courses on students' life-long learning orientations (Padgett et al. 2013). In addition, for part-time students, greater contact with faculty increases their perceptions of general educational gains (Nelson Laird and Cruce 2009). Together, the results of these studies suggest that the seven principles benefit a diverse set of students in a wide variety of institutional settings.

Implicit in this research is the fact that the seven principles are not used ubiquitously across faculty, disciplines, or institutions in higher education. Chickering and Gamson's (1987) attention to pedagogy was only one part of a larger trend over the last 30 years to find ways to improve undergraduate education. This is reflected in the rise of faculty development centers on college campuses beginning in the early 1980s (Lounsbury and Pollack 2001). In 1998, the Boyer Commission recommended ways to improve higher education; one strand among those recommendations was to provide undergraduates with synthesis experiences, such as research opportunities (Boyer Commission on Educating Undergraduates in the Research University 1998). Mervis (2001) reported that the number of liberal arts undergraduates involved in research increased by 70 % during a 10 year period. Individual disciplines have also considered how to create effective educational experiences in more specific ways; for instance, the American Association for the Advancement of Science has been calling for more attention to scientific inquiry and high-quality science experiences in and out of the classroom for the past 20 years (Campbell et al. 2012).

In addition to the increased focus on educational practices, other institutional changes have also affected students' experiences. Foremost among these is the changing status of

faculty professionals. Ten years before Chickering and Gamson's (1987) publication on the seven good principles, only 34 % of faculty held adjunct (part-time) faculty appointments; by 2000, that number had risen to 43 % (Feldman and Turnley 2004). In 2013, the number of adjuncts had reached 50 % of all higher education faculty (Kezar 2013). While employing good practices is not limited to full-time, tenure-track faculty, adjuncts often lack support services, office space, and telephones, thereby raising concerns about reduced opportunities for faculty-student contact.

Paradigmatic Development and the Affinity Disciplines

While the effects of the good teaching practices on valued student outcomes have been well established, the level to which faculty enact these practices in the classroom varies widely. Faculty experience a great deal of autonomy in pedagogical decisions and make choices within the contexts of various relevant cultures at the level of their departments, institutions and disciplines (Umbach 2007). Examining faculty within a disciplinary content, Braxton (1995) and Braxton et al. (1998) studied how the use of the seven good principles in the classroom differed across academic disciplines. In particular, they examined the relationship between the paradigmatic development of a discipline and faculty's pedagogical choices. Introduced by Lodahl and Gordon (1972), the term "paradigmatic development" builds on Kuhn's (1962, 1970) notion of the scientific paradigm: "the essence of the paradigm concept is the degree of consensus or sharing of beliefs within a scientific field about theory, methodology, techniques, and problems" (Lodahl and Gordon 1972, p. 58). Braxton (1995) examined paradigmatic development using Biglan's (1973) classification of fields along a "hard-soft" dimension. Braxton (1995) argued that a discipline's paradigmatic development extends to the pedagogy used within each discipline, such that the practices used by faculty teaching courses in soft fields such as English and sociology differs from those used by faculty teaching in hard fields such as biology and engineering.

In particular, he suggested that "soft discipline faculty tend to value student character development, emphasize the development of critical thinking skills (analysis and synthesis), use discursive or student-centered teaching practices, and favor the use of program review and student assessment to improve teaching and learning" (Braxton 1995, p. 61). As such, he labeled low paradigmatic fields as "affinity disciplines" due to the greater tendency of faculty in these fields to adopt these effective teaching practices. Braxton et al. (1998) extended this argument, contending that pressures within high paradigmatic development fields restrict acceptable teaching practices, whereas these pressures are substantially less in low (or soft) paradigmatic development fields. The authors suggest that "strong, narrowly prescribed norms for appropriate teaching practices" (Braxton et al. 1998, p. 301) exist within high paradigmatic fields and faculty in these fields are therefore less willing to break with established pedagogical norms.

The Braxton et al. (1998) Affinity Disciplines Hypothesis

The Braxton et al. (1998) study was the first to empirically test Braxton's (1995) "affinity disciplines hypothesis," the notion that due to differences in the paradigmatic development of their fields, faculty in low paradigmatic development fields are more likely than those in high paradigmatic development fields to employ Chickering and Gamson's (1987) seven principles of good practice in their teaching. To do so, the researchers employed a survey

of 114 randomly sampled faculty in the School of Business and the College of Arts and Sciences at a large, public Research I University. The data collection consisted of a semi-structured interview and a 70-item questionnaire about faculty's undergraduate teaching, which was then synthesized into seven indices, one for each of the seven good practices.

Braxton et al.'s (1998) study yielded mixed results regarding their affinity disciplines hypothesis. For the practices of providing prompt feedback, encouraging cooperation among students, and emphasizing time on task, the affinity disciplines hypothesis was not supported. Faculty engaged in these practices similarly across disciplines. For the remaining good practices, however, the affinity disciplines hypothesis was supported. Faculty in low paradigmatic development fields were significantly more likely than peers in high paradigmatic development fields to apply the principles of faculty-student contact ($b = 0.23$, $p < 0.05$), active learning ($b = 0.32$, $p < 0.05$), high expectations ($b = 0.19$, $p < 0.05$), and respect for diversity ($b = 0.23$, $p < 0.05$; this last good practice is not included in our study).

The authors identified four primary limitations to their study: (1) faculty may have given socially desirable responses on the survey, (2) the data was from a single institution, (3) there was no control for typical class size, and (4) data on the use of good teaching practices was self-reported by faculty. In addition, Braxton et al. (1998) pointed out that "[s]tudents' perceptions of the extent to which faculty enact the seven principles…might have provided more objective and independently derived measures of faculty performance of these principles" (p. 311).

Purpose and Research Questions

In our current study, we replicate and extend the Braxton et al. (1998) study by using student-level data to examine the relationship between paradigmatic development and the use of good teaching practices, while also attempting to address all four of the above-mentioned limitations. First, by using student perceptions of faculty's use of good practices in their classes, we provide a more objective measure of faculty's use of these principles in their teaching. Because students are describing their professor's behaviors rather than using faculty self-report, the data is less vulnerable to error due to socially desirable responses. Second, our data is from the Wabash National Study of Liberal Arts Education and includes 50 institutions, instead of the single institution included in the Braxton et al. study. Third, we control for institutions' student-faculty ratio as a proxy for class size. Finally, while we use student -reported data, our study analyzes students' perceptions about faculty teaching practices holistically across courses, rather than examining perceptions on a course-by-course basis (as student ratings of instruction would do). The use of holistic responses minimizes bias common in individual evaluations where things like expected course grade and student-faculty relationships may bias ratings. Like Braxton et al. (1998), we hypothesize that the paradigmatic development of the disciplines in which faculty teach affects their pedagogical choices. By examining students' perceptions of the presence of Chickering and Gamson's (1987) principles of good practice in conjunction with the disciplinary patterns of students' coursework on the hard-soft spectrum, we interrogate the affinity disciplines hypothesis. The following research question guides our study: Does the paradigmatic development of the fields in which students take courses during their first-year of college predict students' perceptions of instructors' use of six of the seven principles of good practice for undergraduate education?

Methods

For our study's analyses, we use data from the Wabash National Study of Liberal Arts Education (WNS). The WNS is a longitudinal, pretest/posttest study that examines the effects of liberal arts college experiences on a variety of both cognitive and affective student learning outcomes. The WNS includes three cohorts of students (2006–2010; 2007–2011; and 2008–2012) at institutions that vary by size, control, type, selectivity, and geographic location within the United States. Our study includes students from 46 institutions, including liberal arts colleges (purposefully oversampled), research universities, regional universities, and community/2-year colleges. The institutional sample also includes minority-serving institutions and same-gender colleges.

Data collection for each cohort of the WNS occurred in three intervals. The first interval occurred during the students' fall semester of their first year of college. This initial data collection attained background information, high school experiences, and precollege levels of WNS student learning outcomes (both cognitive and affective). The first follow-up data collection occurred at the end of the students' first year of college, obtaining information on the students' experiences during the first year of college and end-of-first-year levels of WNS student learning outcomes. The final data collection occurred during the end of the students' fourth year of college. This data interval collected information on the students' experiences over 4 years of college, along with the same WNS student learning outcomes attained during the first two data collection intervals. Our study only utilizes data from the students' first year of college, specifically analyzing data from the initial and first follow-up data collections.

Dependent Measures

We include six dependent measures to assess students' perceptions of faculty use of Chickering and Gamson's (1987) vetted good practices: quality of student nonclassroom interactions with faculty (5-item scale, $\alpha = 0.856$), cooperative learning (4-item scale, $\alpha = 0.701$), active and collaborative learning (11-item scale, $\alpha = 0.612$), prompt feedback (3-item scale, $\alpha = 0.672$), teaching clarity and organization (10-item scale, $\alpha = 0.904$), and challenging classes and high faculty expectations (6-item scale, $\alpha = 0.834$). Each of these dependent variables measures students' perceptions of the use of good practices in their classes throughout the first year of college. Appendix A provides a detailed description of all measures and variables within our study.

Independent Measure of Interest

Our study's independent variable of interest is the paradigmatic development of disciplines or fields in which students take courses—operationalized by a scale we created from data on courses taken during the first year of college. Following Braxton et al. (1998) affinity disciplines hypothesis, we examine how the disciplinary contexts in which faculty teach affect student's perceptions of the use of good teaching practices. Using Braxton's (1995) schema, we categorize courses as within either hard or soft disciplines, based on the paradigmatic development of the field (Biglan 1973; Braxton and Hargens 1996; Kuhn 1970). According to Biglan's widely-used classification, courses taken in high-paradigmatic-consensus disciplines are in *hard* fields and courses taken in low-paradigmatic-consensus disciplines are in *soft* fields. Courses we code as in high paradigmatic fields

include math, natural sciences (including biological sciences and physical sciences), health, and engineering; those coded as in low paradigmatic fields include humanities, social sciences, business, and education. At the first follow-up data collection interval, students were asked to report the number of courses they took within each discipline (i.e., natural sciences, business, etc.) during the first year of college. Each disciplinary-course variable had options ranging from zero (no courses taken in this discipline) to five (five or more courses taken in this discipline). We used these variables and Biglan's hard-soft classification scheme to construct our study's independent variable of interest: the paradigmatic development of disciplines or fields in which students take courses. We operationalized this variable using the equation that appears below.

$$Paradigmatic\ development = \frac{Courses\ taken\ in\ hard\ disciplines}{Total\ courses\ taken}$$

In brief, this equation provides the proportion of courses that students took in hard disciplines out of the total number of courses taken in the first year of college. The mean for this variable was 0.35 (with a standard deviation of 0.24, minimum value = 0, maximum value = 1). As illustrated by the mean of our paradigmatic development variable (0.35), there is a skew towards students taking more courses in soft disciplines. More specifically, the mean number of courses taken in each discipline illustrates this: hard disciplines included math (1.12), natural sciences (1.30), health (0.17), and engineering (0.12), while soft disciplines included humanities (2.60), social sciences (1.46), business (0.23), education (0.20), and other (0.34). This is not surprising, however, given that the majority of institutions in the sample for our study were liberal arts colleges. Further, it is important to note that in creating this variable, we dropped students from our sample that reported taking zero or one course during their first year of college, along with students from our sample that reported taking more than 20 courses in their first year of college. While we acknowledge this as a limitation, the total number of cases we dropped was 71. We made this decision on the premise that without these 71 cases, we have a more realistic and generalizable sample for analysis.

Covariates

We include the following precollege covariates: sex (male vs. female as the reference group), race (Black, Asian, and Latinx, all with White serving as the omitted reference category), first-generation college student (1,0), precollege academic motivation (scale reliability alpha = 0.69), ACT Composite Score (or SAT equivalent), and frequency of high school interactions with teachers outside class (ranged from 1 to 4, with 1 being strongly agree that they frequently interacted with teachers outside class and 4 being strongly disagree). We also include in-college covariates for hours worked per week, grades, and academic honors program membership (1, 0). Because students' perceptions of these "good practices" may vary at the institution level, we include several institutional covariates: percent part-time faculty (2006–2011, derived from IPEDS), student-faculty ratio (derived from IPEDS for year of each cohort), special-mission-serving institutional classification (Historically-Black College, Hispanic-Serving Institution, with predominantly white institution as the omitted reference category), same-gender college (1,0), and institution type (regional university, research university, and community college, all with liberal arts college as the omitted reference category). We included the precollege covariates to control for students' potential predispositions regarding course-taking choices

and/or perceptions of good teaching practices; the in-college covariates to control for in-college experiences that might potentially prohibit, inhibit, or modify students' perceptions of good teaching practices; and the institutional covariates to control for institution-level factors that might potentially relate to students' course-taking behavior or faculty pedagogical choices due to variation in institutional mission, size and resource allocation.

Analyses

We ran six series of ordinary least squares (OLS) regressions. Each model regressed one of the six good-practice variables (measured at the end of the first year of college) on all pre-college, in-college, and institutional covariates. We used listwise deletion, which yielded an analytical student sample of 6116. The original sample size at the first data collection (fall of the students' first year of college) was 17,330. Approximately 55 % of the original sample did not complete the follow-up assessments at the second data collection. Further, approximately 20 % of the sample who persisted to the second data collection were removed within the listwise deletion. We also standardized all continuous variables. We controlled for the nested nature of our data using STATA's "svy" command.

To check for multicollinearity issues, we computed a correlation matrix of all independent variables and variance inflation factors (VIFs) for each model. The correlation matrix showed only four correlations over $r = 0.40$: HBCU and Black ($r = 0.70$), student-faculty ratio and ACT Composite Score ($r = -0.44$), regional university and HBCU ($r = 0.43$), and college grades and ACT Composite Score ($r = 0.42$). However, the highest VIF for the models was only 2.94, which was between HBCU and Black in all six models. While this VIF is higher than Allison's (1999) most conservative threshold of 2.50, it is well below Steven's (2002) liberal threshold of 10.0. Further, all other VIFs within our models were below Allison's (1999) threshold of 2.50.

Figure 1 illustrates the variation in paradigmatic scale values for students' course-taking patterns across institutional types (categorized by liberal arts college, research university, regional university, and community college) in a box plot format. As this figure illustrates, and as expected, there are differences in first-year course-taking patterns by institutional type.

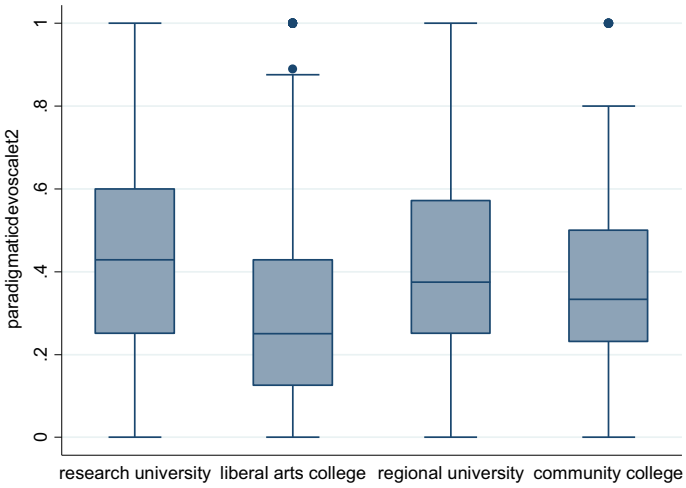

Fig. 1 Box plot of variance in paradigmatic development scale by institution type

Students at liberal arts colleges took fewer courses in high-paradigmatic development fields than students at research universities, regional universities, and community colleges. Students at research universities had the highest minimum value among the four ranges on the paradigmatic development scale, signifying that students at these institutions took the most courses in high-paradigmatic development fields. These differences were somewhat anticipated, however, given variance in mission and curricular emphases by institution type.

Limitations

Our analyses and study is not without limitations. First, we must address the reliabilities of our dependent measures. Two reliabilities were below $\alpha = 0.70$: active and collaborative learning with an alpha of 0.612 and prompt feedback with an alpha of 0.672. It is important to note that these two scales were derived from different survey instruments. The active and collaborative learning scale was a measure within the National Survey of Student Engagement (NSSE), while the prompt feedback scale was created as part of the good practices scales for the WNS. Despite the low reliability, prompt feedback as a dependent measure was significantly predicted by paradigmatic development. This finding may, in fact, highlight that a larger effect is present. In other words, if the reliability for prompt feedback were higher, it is possible that the effect size would also be larger for paradigmatic development.

Second, self-reported data is always a concern with survey data. Scholars have argued that the credibility of self-reported data varies significantly (see Porter 2011). With our study, a major limitation is that the data is self-reported. We do not have school-reported data for students' course-taking behaviors, which would be a more reliable source than students' report of their course-taking behaviors.

Finally, we must also acknowledge that our data—particularly our paradigmatic development scale—measures the number of courses taken rather than the credit hours taken. This limitation is noteworthy as two students may each report taking two courses in biological sciences, and these students—given our operationalization of paradigmatic development—would be rated similarly. It is possible, however, that one of these students may have taken six credit hours and another two credit hours of biological science courses. This limitation is important because, in some instances, credit hours earned, compared to number of courses taken, would more precisely measure the extent of a student's exposure to and experience with courses taken in hard versus soft fields. Therefore, one should interpret our findings with this limitation—and the others noted above—in mind.

Results

Table 1 illustrates the means for all variables within our analytic sample.

Paradigmatic Development

Table 2 presents the regression results from our study. Paradigmatic development significantly predicted use of three of the six good practices. For each one-unit increase in the paradigmatic score of a student's course taking (i.e., taking a higher proportion of hard discipline courses), students perceived a 0.19 standard deviation increase in faculty use of cooperative learning ($p < 0.001$) in their classes, holding all else constant. However, for each one-unit increase in the paradigmatic score of a student's course taking, students

Table 1 Descriptive statistics for all independent variables and measures

Variable	Mean	SD	Min	Max
Male	0.37	0.48	0.00	1.00
Black (White = ref)	0.09	0.28	0.00	1.00
Asian (White = ref)	0.06	0.24	0.00	1.00
Latinx (White = ref)	0.05	0.22	0.00	1.00
First-generation student status	0.29	0.45	0.00	1.00
Precollege academic motivation	3.61	0.56	1.13	5.00
ACT Composite Score	25.50	4.65	8.00	36.00
High school interactions with teachers	0.81	0.39	0.00	1.00
Hours worked per week in college	4.99	7.39	0.00	65.00
College grades	6.06	1.57	1.00	8.00
Academic honors program participation	0.16	0.37	0.00	1.00
Paradigmatic development	0.35	0.24	0.00	1.00
Percent part-time faculty	0.28	0.14	0.02	0.67
Student faculty ratio	13.39	3.73	6.00	24.00
Historically Black College	0.05	0.21	0.00	1.00
Hispanic Serving Institution	0.01	0.11	0.00	1.00
Same gender college	0.09	0.29	0.00	1.00
Regional University (Liberal Arts College = ref)	0.21	0.41	0.00	1.00
Research University (Liberal Arts College = ref)	0.26	0.44	0.00	1.00
Community College (Liberal Arts College = ref)	0.02	0.13	0.00	1.00

Table 2 The estimated effects of academic discipline on students' perceptions of end-of-fourth-year good practices for undergraduate education using the Wabash National Study of Liberal Arts Education ($N = 6116$)

	Student-faculty contact Coef. (SE)	Cooperative learning Coef. (SE)	Active and collaborative learning Coef. (SE)	Prompt feedback Coef. (SE)	Teaching clarity and organization Coef. (SE)	High expectations Coef. (SE)
Male	0.07** (0.02)	−0.01 (0.03)	0.07** (0.03)	0.05 (0.03)	0.00 (0.03)	0.07** (0.02)
Black (White = ref)	−0.13 (0.07)	−0.13 (0.08)	0.12 (0.06)	−0.02 (0.05)	−0.05 (0.10)	0.05 (0.08)
Asian (White = ref)	−0.11* (0.05)	−0.06 (0.07)	−0.14* (0.06)	−0.25*** (0.06)	−0.06 (0.05)	−0.07 (0.06)
Latinx (White = ref)	0.05 (0.06)	−0.02 (0.07)	0.05 (0.06)	0.04 (0.05)	0.19*** (0.05)	0.07 (0.05)
First-generation student status	−0.04 (0.03)	−0.02 (0.03)	−0.05 (0.03)	−0.04 (0.02)	−0.05 (0.03)	−0.05 (0.03)
Precollege academic motivation	0.20*** (0.01)	0.15*** (0.01)	0.20*** (0.02)	0.16*** (0.01)	0.16*** (0.01)	0.15*** (0.01)
ACT Composite Score	−0.06*** (0.02)	−0.09*** (0.02)	−0.10*** (0.02)	0.02 (0.02)	0.07*** (0.02)	0.02 (0.02)

Table 2 continued

	Student-faculty contact Coef. (SE)	Cooperative learning Coef. (SE)	Active and collaborative learning Coef. (SE)	Prompt feedback Coef. (SE)	Teaching clarity and organization Coef. (SE)	High expectations Coef. (SE)
High school interaction with teachers	0.26*** (0.03)	0.22*** (0.04)	0.23*** (0.03)	0.06 (0.04)	0.03 (0.03)	0.15*** (0.03)
Hours worked per week in college	0.02 (0.02)	0.00 (0.02)	0.06** (0.02)	−0.00 (0.01)	−0.03 (0.02)	−0.00 (0.01)
College grades	0.15*** (0.02)	0.05*** (0.02)	0.16*** (0.02)	0.18*** (0.01)	0.15*** (0.01)	0.08*** (0.02)
Academic honors program membership	0.13*** (0.04)	0.14*** (0.04)	0.17*** (0.03)	0.05 (0.04)	−0.01 (0.03)	0.08 (0.04)
Paradigmatic Development Scale	0.01 (0.01)	0.19*** (0.02)	0.01 (0.01)	−0.04* (0.01)	−0.01 (0.02)	−0.13*** (0.02)
Percent part-time faculty (2006–2008)	−0.40** (0.12)	−0.57** (0.19)	−0.16 (0.17)	0.15 (0.20)	−0.12 (0.15)	−0.43* (0.19)
Student faculty ratio (2006–2008)	−0.01 (0.01)	−0.03** (0.01)	−0.00 (0.01)	−0.02* (0.01)	−0.01 (0.01)	−0.03* (0.01)
Historically Black College (PWI = ref)	−0.06 (0.13)	0.47** (0.17)	0.36*** (0.09)	−0.07 (0.12)	−0.17 (0.16)	0.23 (0.19)
Hispanic Serving Institution (PWI = ref)	0.19*** (0.03)	0.02 (0.05)	−0.16*** (0.04)	−0.00 (0.04)	−0.09** (0.03)	−0.01 (0.06)
Same Gender College	0.16* (0.06)	0.10 (0.07)	0.16* (0.07)	0.27* (0.12)	0.31*** (0.08)	0.26*** (0.07)
Regional University (Liberal Arts College = ref)	−0.22*** (0.05)	−0.15 (0.08)	−0.11 (0.07)	−0.05 (0.08)	−0.16* (0.07)	−0.12 (0.07)
Research University (Liberal Arts College = ref)	−0.40*** (0.08)	−0.04 (0.08)	−0.17* (0.07)	−0.25* (0.11)	−0.22*** (0.05)	−0.33*** (0.09)
Community College (Liberal Arts College = ref)	0.06 (0.12)	−0.15 (0.17)	−0.43** (0.13)	0.13 (0.18)	0.64*** (0.12)	0.29 (0.22)
R-squared	0.16	0.12	0.14	0.13	0.14	0.15

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

perceived a 0.04 standard deviation decrease in faculty use of prompt feedback ($p < 0.05$) and a 0.13 standard deviation decrease in their use of high expectations and challenge ($p < 0.001$) in their classes, holding all else constant. Differences in the paradigmatic development of academic disciplines did not have a significant effect on students'

perceptions of faculty use of the good practices of student-faculty contact, active and collaborative learning, and teaching clarity and organization.

Covariates

In addition, several interesting and significant findings emerged from the covariates in our regression models. Most notably, precollege academic motivation and college grades were both positive, significant predictors of student perceptions of faculty use of all six good teaching practices. Frequency of interactions with teachers outside of class during high school, and participation in an academic honors program during the first year of college, were both positive, significant predictors of students' perceptions of three or four of the six good teaching practices. Hours worked per week in college were positively related to faculty use of active and collaborative learning.

A few personal characteristics also predicted students' perceptions of faculty use of good teaching practices. Students with higher ACT scores perceived greater faculty use of teaching clarity and organization practices, but less faculty use of student-faculty interactions, cooperative learning, and active and collaborative learning. Sex predicted three of the six good teaching practices, with males perceiving higher faculty use of student-faculty contact, active and collaborative learning, and high expectations/academic challenge than their female peers. Race also predicted students' perceptions of faculty use of good teaching practices, with Asian students perceiving less faculty use of student-faculty contact, active and collaborative learning, and prompt feedback. Further, Latinx students perceived higher levels of faculty use of teaching clarity and organization than their white peers.

Finally, institutional covariates also had significant effects on students' perceptions of faculty use of good teaching practices. Students at same-gender colleges perceived higher use of five of the six good teaching practices when compared to their peers at coeducational institutions. At research universities, students perceived significantly less use of five of the six good teaching practices than their peers at liberal arts colleges. At regional universities, students perceived significantly less use of two of the six good teaching practices compared to their peers at liberal arts colleges. While students at community colleges perceived less use of active and collaborative learning, they perceived greater use of teaching clarity and organization than peers at liberal arts colleges. Students at HBCUs perceived greater faculty use of cooperative learning and active and collaborative learning than their peers at predominantly white institutions. Likewise, students at HSIs perceived greater use of student-faculty contact than peers at predominantly white institutions, but less use of active and collaborative learning and teaching clarity and organization. Finally, the student-faculty ratio was negatively related to students' perceptions of faculty use of cooperative learning, prompt feedback, and high expectations/academic challenge, which supports the notion that faculty more often use the good practices in smaller classes, while percentage of part-time faculty was negatively related to students' perceptions of faculty use of student-faculty contact, cooperative learning, and high expectations/academic challenge.

Discussion

As highlighted in the results section, student perceptions of faculty use of three of the six principles of good teaching were significantly related to the paradigmatic score of a student's course taking. As scores increase on our paradigmatic scale (toward a higher

proportion of courses taken in hard disciplines), students' perceptions of faculty use of prompt feedback and their perceptions of faculty use of high expectations/academic challenge decrease, while students' perceptions of faculty use of cooperative learning increase. Further, paradigmatic development did not significantly predict the use of the good principles of student-faculty contact, active and collaborative learning, and teaching clarity and organization.

Student-Faculty Contact

Our study suggests that there is no significant difference in students' perceptions of the use of student-faculty contact due to students taking more courses in soft (low paradigmatic) versus hard (high paradigmatic) disciplines. This is inconsistent with the Braxton et al. (1998) finding of higher use of student-faculty contact by faculty in soft fields ($b = 0.23$, $p < 0.05$). Braxton et al. did not go into great detail about the relationship between faculty in low paradigmatic fields and the higher level of student-faculty contact, other than stating that it supported the affinity disciplines hypothesis.

This finding could be the result of measurement differences and/or important differences between the potentially more objective perceptions of students in our study and the potentially more subjective perceptions of faculty regarding their own use of good teaching practices in the Braxton et al. study. Alternately, the different findings may be due to the change in the makeup of the professoriate over time. The dramatic shift in the numbers of adjunct and part-time faculty, who now account for more than 50 % of all instructional faculty, could have a major impact on the level of student-faculty contact that occurs on today's campuses (Feldman and Turnley 2004; Kezar 2013). This is not to suggest that adjunct faculty are incapable of employing good practices. Instead, adjunct and part-time faculty often lack resources—such as offices, time on campus, and professional development funds—that are afforded to their full-time tenure-track coworkers (Feldman and Turnley 2004; Smith 2003). These changes in the professoriate, which limit faculty and potentially restrict opportunities for faculty-student contact, could partially explain the change from a significant finding in support of the affinity disciplines hypothesis in Braxton et al.'s (1998) study and our finding of no significant differences between soft and hard paradigmatic fields.

Cooperative Learning

Braxton et al. (1998) found no significant differences by discipline in faculty use of cooperative learning. However, our study suggests that as students reported a higher proportion of hard discipline courses taken, they perceive that their professors make more use of cooperative learning ($b = 0.19$, $p < 0.001$) compared to their peers who take more courses in soft (low paradigmatic) disciplines. This shift represents a major departure from the affinity disciplines hypothesis, a distinctive finding, especially given the pedagogical nature of this good practice.

Johnson et al. (2007) asserted that cooperative learning has become widely accepted as a pedagogical practice. Students in the hard disciplines, however, may perceive greater use of cooperative learning due to an emphasis on these activities among many emerging pedagogical approaches within the STEM fields (see Prince and Felder 2006). For example, the use of partner-based laboratory and clinical experiences, as well as design groups, are now more common in STEM fields, which may have increased the overall use of small group learning experiences in courses in hard fields. The economic pressure to

produce graduates in STEM fields is a tangible force in higher education today (Donovan et al. 2014; Roschelle et al. 2011). Cooperative learning is by no means a new innovation, but as more and more focus is placed on student outcomes and higher quality teaching, a larger onus to incorporate these practices is being felt across higher education (Johnson et al. 2007; Mills 2010). It is therefore unsurprising that in the 18 years since the Braxton et al. (1998) study, increasing pressure on hard paradigmatic fields to produce a higher number of better-prepared graduates has caused a reversal of the affinity disciplines hypothesis—at least in terms of faculty use of cooperative learning groups.

Active and Collaborative Learning

Our findings indicate that there is no significant difference in students' perceptions of faculty use of active learning due to students taking a higher proportion of courses in hard (high paradigmatic) versus soft (low paradigmatic) disciplines. Braxton et al.'s (1998) findings indicated that faculty reported greater use of active learning in soft fields. Like with cooperative learning, our findings suggest a leveling out between soft and hard disciplines in use of good teaching practices. This could be the result of increased opportunities for undergraduate research in STEM fields (Mervis 2001). It could also show more widespread faculty engagement with campus teaching centers that provide support for faculty to utilize active learning techniques. Finally, the proliferation of technology use, both in the classroom and as an extension of the classroom through learning management systems, provides virtual spaces for active and collaborative learning that were much less prevalent 18 years ago when Braxton et al. conducted their original study.

Prompt Feedback

Braxton et al. (1998) found no difference between soft and hard disciplines in faculty reports of their use of prompt feedback and asserted that a pervasive normative culture was present amongst faculty. However, our results indicate that students with high scores on our paradigmatic scale perceive less faculty use of prompt feedback ($b = -0.04$, $p < 0.05$). LeClercq (1999) asserted that faculty prioritize thoroughness in feedback. However, faculty in soft disciplines, who spend much of their time providing feedback on essays and similar student work, may be more likely to be trained in commenting techniques that emphasize quality over quantity of feedback. Given equal types of assignments, then, faculty in soft fields may be more prompt than their counterparts in hard fields. This result may also reflect a greater likelihood that first-year courses in hard disciplines are large, lecture classes where faculty must provide feedback on a greater number of assignments before returning them to students. Overall, this finding upholds the affinity disciplines hypothesis.

Teaching Clarity and Organization

Braxton et al. (1998) found no significant differences for "time on task" as we found no significant differences for "teaching clarity and organization." This finding may be explained by an overall push for teaching clarity and organization in higher education. This would be consistent with the persistent finding that students' ratings of their instructors' effectiveness at teaching clarity and organization behaviors have been found to be highly correlated with measures of student achievement (Feldman 2007). It may also reflect that

faculty and students are both aware that paradigms differ across disciplines, and therefore, find different approaches to teaching clarity and organization effective. Another potential explanation could be the increase in campus teaching centers nationwide, which are accessible for faculty across all disciplines (Lounsbury and Pollack 2001) to learn how to improve the clarity of their teaching.

High Expectations

The Braxton et al. (1998) finding that faculty reported greater use of high expectations in soft fields than in hard fields parallels our finding that students who take more courses in high paradigmatic development (hard) fields perceive less faculty use of academic challenge (for our study, $b = -0.13$, $p < 0.001$). This finding affirms the affinity disciplines hypothesis and highlights the tendency of soft disciplines to more frequently employ student-centric teaching practices. However, we also want to point out that this finding may be due, in part, to students' perceptions of the cognitive load they are carrying, particularly in their first year of college. Specifically, students may stereotypically expect the content of courses in hard disciplines to be more challenging than courses in the humanities or social sciences, so that they then perceive high expectations and academic challenge in soft disciplines to be faculty-driven rather than content-driven.

Concluding Thoughts

In this study, we found that students who had higher scores on our paradigmatic scale (took a high proportion of courses in the hard disciplines) perceived less faculty use of the good practices of prompt feedback and high expectations/academic challenge than their peers with lower paradigmatic scores (proportionally took more courses in the soft disciplines). However, students with higher scores on our paradigmatic scale perceived increased faculty use of cooperative learning compared to their peers with lower scores on the paradigmatic scale. We found no significant differences by academic discipline for student-faculty contact, active and collaborative learning, or teaching clarity and organization. Our study makes an important contribution by introducing the student's perspective into research on disciplinary differences in faculty use of the seven principles of good practice. Given the expansive literature on these good practices as vetted tools for student learning (Chickering and Gamson 1987; Chickering and Reisser 1993; Pascarella and Terenzini 2005; Sorincelli 1991), institutions should strive to implement these pedagogical principles across all disciplines.

It is helpful to place disciplinary differences in faculty use of good teaching practices in the larger context of modern American higher education. We posit that the differences in students' perceptions of faculty use of good teaching practices between the courses they take in soft (low-paradigmatic) fields versus hard (high-paradigmatic) fields in our study, compared to the disciplinary differences in faculty self-reported use of such practices in Braxton et al.'s (1998) study, could be partially explained by a 'leveling of the playing field' for faculty in hard (high-paradigmatic) fields. And one noteworthy reason for this change may be the rapidly-growing emphasis on pedagogical innovation and greater quality of education in STEM fields in recent years. Colleges and universities across the country are facing greater scrutiny regarding the impact they have on their students. To meet these challenges, campuses have turned to faculty development centers that serve all instructors (Lounsbury and Pollack 2001). The use of course management systems, online

components, and other pedagogical technologies have greatly expanded, along with numerous other changes in the modern classroom and lecture hall. In this dynamic context, it should not be surprising that all faculty are making strides to improve undergraduate education. Moving forward, faculty development professionals engaged in instructional improvement activities should consider the paradigmatic development of the fields in which faculty are teaching, along with more common factors such as teaching load, academic rank, and satisfaction from teaching, all the while considering the broader changes in disciplinary-level forces in American higher education today.

Our findings from the covariates included in our model also suggest that students' perceptions of faculty use of good teaching practices vary based on a variety of factors beyond just the paradigmatic development of the courses students take. We found noteworthy institutional differences in students' perceptions of faculty use of good teaching practices. For example, students attending research or regional universities perceived less use of good teaching practices compared to their peers at liberal arts colleges, while students attending same-gender or HBCUs perceived greater use of good teaching practices compared to their peers at coeducational or predominantly-white institutions, respectively. Future research should explore these institutional differences in more depth. For example, why do students who attend larger institutions perceive less faculty use of good teaching practices? And why do students who attend institutions with students who are more homogeneous in terms of gender or race/ethnicity perceive greater faculty use of good teaching practices?

We also found that students' perceptions of faculty use of good teaching practices consistently vary according to students' individual characteristics. For example, students with greater academic motivation and higher college grades, as well as those who participate in college academic honors programs and who interacted more with their high school teachers consistently perceive greater faculty use of good teaching practices. Future research should examine these and other student-level differences in greater depth. In particular, future research should examine if these factors—such as students' academic motivation—moderate the effects of course-taking by paradigmatic development on students' perceptions of good practices. For example, why do students with greater academic advantages perceive more faculty use of good teaching practices compared to their peers who are less academically advantaged? Are there moderating effects present in the relationships between student course-taking experiences and their perceptions of good teaching practices? Do the potential moderating effects of student characteristics further vary by institutional factors, such as institution type? Finally, why do male students perceive greater faculty use of multiple good teaching practices than female students, and why do Asian students perceive less faculty use of several good teaching practices than White students?

Ultimately, the vetted good teaching practices play a significant role in student learning. It is important for both faculty and faculty development professionals in campus teaching centers to work toward incorporating these practices not only across disciplines, but also across student and institutional characteristics. It is also imperative that scholars continue to interrogate the influences—both student and institutional characteristics—have on students' perceptions of and attainment of these influential practices on college campuses.

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