Faculty Lend a Helping Hand to Student Success: Measuring Student-Faculty Interactions

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Abstract

Previous research indicates that student-faculty interactions can have several positive influences. Therefore, it is important for institutions to assess these interactions beyond just course evaluations. This study explores how to measure student interactions with faculty in a concise way as part of a larger survey. Exploratory and confirmatory factor analyses suggested two scales to measure student-faculty interactions – good faculty practices and teaching clarity. In addition, the paper explores the relationship between these scales and grade-point-average. The results from this study suggest that these items could serve as a good proxy for student interactions with faculty and are significant predictors of GPA and persistence.

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In the last few decades, numerous empirical studies have explored the effect of student-faculty interaction on students' college experience (Kuh & Hu, 2001). It is widely accepted that student-faculty interactions generally have a positive influence on the cognitive growth and development of college students (Astin, 1993; Pascarella & Terenzini, 2005). In particular, high level of interactions between student and faculty is beneficial to retention. For example, Pascarella and Terenzini (1977) found that various kinds of student-faculty interactions have significant predictive power of first year attrition after controlling for students' incoming background. Similarly, Lau (2003) argued that frequently interacting with faculty members could increase the chance of students' retention. In addition, student-faculty interaction is positively related to students' academic achievement. Terenzini and Pascarella (1980) showed that the frequency of contact between student and faculty is positively related to students' learning outcomes, even controlling for students' incoming differences. Other research suggests that student-faculty interaction in research universities can predict GPA for all racial and gender groups, although the magnitude of effects is not the same for different groups (Kim & Sax, 2009).

In spite of the generally positive relationship between student-faculty interaction and education outcomes in higher education, recent researchers have found that not all kinds of interaction have the same impact on student outcomes. In particular, interacting with faculty is beneficial when the interaction is intellectually or substantively focused, while pure social exchange only has limited effect (Pascarella & Terenzini, 1991). Pascarella and Terenzini (1977) also found that interacting with faculty about intellectual or course related matters, career plans, and academic programs is significantly related to first year attrition, while discussing personal problems, campus issues, or socializing informally does not have a significant effect on attrition.

In light of those research results, we chose to focus on in-class interactions when developing our measurement of student-faculty interaction as part of a larger survey. In particular, we tried to evaluate student-faculty interaction for two dimensions: teaching clarity and other in-class interaction that foster student learning (this will be referred to as *Good Faculty Practice* in this article).

Teaching Clarity

Teaching clarity is an important characteristic of effective teaching (Ginsberg, 2007; Hativa, Barak, & Simhi, 2001). As the name suggests, it refers to teaching methods where "faculty demonstrate a level of transparency in their approach to instruction and goal setting in an effort to help students better understand expectations and comprehend subject matter" (BrckaLorenz, Ribera, Kinzie, & Cole, p. 2). Simonds (1995) distinguished two specific kinds of teaching clarity. *Content clarity* relates to whether the teacher can help students understand or acquire substantive knowledge; while *process clarity* refers to behaviors such as communicating expectations and requirements to students. Both aspects of teaching clarity are essential to a successful student learning experience (Simonds, 1995). The items in our proposed teaching clarity scale were intended to cover both content and process clarity aspects of teaching clarity.

Studies have shown that teaching clarity has a positive relationship with various education outcomes such as student achievement and satisfaction (Hativa, 1998; Pascarella & Terenzini, 2005; Chesebro & McCroskey, 2001). Based on a comprehensive review of higher education research, Pascarella (2006) concluded that teaching clarity is moderately correlated with grades and final examination performance. Based on those research results, we expect that our measure of teaching clarity will be a significant predictor of GPA and persistence.

Good Faculty Practices

Apart from teaching clarity, other in-class student-faculty interactions also contribute to undergraduate education. Crisp (2009) discussed the relationship between student and faculty, moving beyond the formal instruction that takes place during class. He distinguished four dimensions of this mentoring relationship: (1) psychological and emotional support, (2) degree and career support, (3) academic subject knowledge support, and (4) the existence of a role model. Since we chose to focus on in-class student-faculty interaction, we confined our items to measure the first three dimensions above and named the scale *Good Faculty Practice*. In particular, our scale is intended to measure the extent to which the teacher could establish a supportive relationship with the student to encourage both mutual understanding and the acquisition of skills and knowledge. Research has shown that the amount of mentoring interaction between student and faculty is positively correlated with GPA and retention (Campbell, & Campbell, 1997). Thus, we expect that our measure of good faculty practice to have a significant relationship with GPA and retention.

Our two measures are intended to help institutions assess these interactions beyond just course evaluations. We also included these measures as part of a larger survey, so as not to overburden students with countless surveys. Thus, this study explores how to measure student interactions with faculty in a concise way as part of a larger survey. In particular, we are interested in (1) whether the student-faculty interaction items load onto two distinct components, (2) if these two components have good measurement properties, and (3) whether these components are good predictors of GPA and persistence into the second year.

Methodology

Participants

This research used data from the 2011 NSSE 2.0 pilot study that surveyed 1,006 first-year and 2,578 senior students at 19 institutions about academic programs and other various activities at their institutions. Participating institutions varied across region, Carnegie classification, and size. The average institutional response rate was 35%. Approximately, 66% of the students in the sample were female and 79% were full-time students. About, 7% classified themselves as African-American, 6% as Asian, 73% as White, 10% as Hispanic and the rest as multiracial or another racial/ethnic group. In addition, a variable was created using a random number generator that put each student into one of two groups. The first group consisting of half of the sample was used to conduct the exploratory factor analyses and the second half was used in the confirmatory factor analysis. The entire sample was used for the predictive validity analyses.

Materials

The NSSE 2.0 pilot survey had measures for quantitative reasoning, higher order learning, reflective and integrative learning, collaborative learning, teaching clarity, good faculty practices, quality of interactions, supportive environment, serious conversations with different people, student-reported gains, and high impact practices. For the teaching clarity and good faculty practice items, the question stem of "During the current school year, to what extent have your instructors done the following" preceded each individual item, with response options of "Very little," "Some," "Quite a bit", and "Very Much." All relevant survey items from the 2011 NSSE 2.0 pilot administration were included in the EFA. CFA analyses were done for those items that fell into the student-faculty interactions components.

For the predicative validity analyses, survey responses were also merged with institution-provided grade-point-average (GPA) and persistence. An academic year GPA was calculated using an average of the fall and spring GPA, weighted by credit hours attempted each semester. If fall GPA was missing, then spring GPA was used as the year GPA. Persistence was measured using information from spring 2011 to fall 2011 for first-year students. The controls that were used in these analyses were background characteristics (gender, ethnicity, and parents' education level) and prior academic ability, as measured by composite SAT and ACT scores.

Analyses

The analyses for the study were conducted in three steps. For all three stages, separate analyses were completed for first-year students and then again for seniors. The first step was an exploratory factor analysis (EFA). Second, confirmatory factor analyses (CFA) were conducted using the results from the EFA. Finally, regression models were run to examine the effects of the created scales on grade-point-average and persistence.

EFA. Two different exploratory factor analyses were run for first-year and senior students separately. Each of the analyses included all relevant interval level items from the pilot survey. The exploratory factor analysis used the Kaiser-Myer-Olkin (KMO) measure of adequacy and to allow for the detection of multicollinarity. Direct oblimin rotation (oblique) was used to allow for correlation between factors. Once the EFA analyses were run, all components with eigenvalues of 1.0 or greater were kept as valid components. All factor loading and cross-loadings at .40 or higher were reported. For this study, only those components related to experiences with faculty are referenced.

CFA. Confirmatory factor analyses were conducted using the preliminary scale recommendations from the EFAs. Again, separate analyses were completed for first-years and

then again for seniors. These analyses used the other randomly selected half of the cases that were not used in the exploratory factor analyses. Because the senior data sets had the largest sample sizes, these were used to initially develop the models. After building the models, modification indices were used to determine which error terms should be correlated to increase the model fit. The highest conceptually appropriate modification indices were added first. After a correlation path was added, the model was re-calculated and fit indices re-examined before adding another correlation path. Error term correlations were added continually until either a) adequate model fit was achieved or b) standardized regression weights began decreasing to an unacceptably low level. Once the complete models (with the greatest number of paths) were created using the senior data sets, they were then run with the first-year students, and model fit indices and standardized regression weights were recorded for the models using these data sets as well.

To determine model fit, five different indices were considered: CMIN/DF (chi-square divided by degrees of freedom), GFI (goodness of fit index), CFI (comparative fit index), RMSEA (root mean square error of approximation), and PCLOSE (p-value for test of close fit). Good model fit criteria for CMIN/DF is a value of 5 or less; however, this statistic is very sensitive to sample size and likely to be inflated with large samples. For the other indices, strong model fit is reflected by GFI greater than .85, CFI greater than .90, RMSEA less than .06, and PCLOSE greater than .05 (Hu & Bentler, 1999).

Standardized regression weights were used to determine the strength of the factor loadings. These values can fall between 0 and 1, with higher values being more desirable. Values under .40 were considered unacceptably low. There are also significance tests for all of the paths that correspond with the standardized regression weights, and non-significant paths would suggest

that the item does not load with the factor. A final consideration for the model was the correlation between the various sub-scales. Moderate correlations were expected, but extremely high correlations could be indicative of multicollinearity and mean that the items should all be loading on a single latent variable rather than two correlated latent variables. Correlations between factors of .80 or above were considered undesirably high.

Predictive validity. Ordinary least squares (OLS) regression models for academic year GPA and logistic regression models for persistence were tested. To explore the effects of engagement on academic year GPA for full-time, first-year and senior students, individual OLS regression models were run to examine the unique effect each engagement measure had on GPA after controlling for background characteristics (gender, ethnicity, and parents' education level) and prior academic ability, as measured by composite SAT and ACT scores. Background and ability were entered into the model in the first step, and then individual NSSE 2.0 engagement measures were entered into the model to examine the effect the measure had on GPA after controlling for background and ability. Change in R-square and standardized beta coefficients (β) for the engagement measures are reported. Logistic regression models were run to examine the unique effect each engagement measure had on first-year student persistence controlling for prior academic ability. Two dummy variables were created and entered into the logistic model to represent the middle 50% and upper quartile of each engagement scale. Thus, the lowest quartile of each engagement scale was the reference group.

Results

Determining Scales

The EFA using Principal Components Analysis with oblique rotation suggested two distinct components from the six items about student-faculty interaction. The Kasier-Meyer-

Olkin statistic was .837 for first-years and .898 for seniors, indicating good factorability of the item set (Kaiser, 1974). The two student-faculty interaction factors accounted for 4.0% of the variance for first-years and 8.4% of the variance for seniors (note that because all items on the survey were included in the EFA, there were more than 20 components to share the variance explained). Factor loadings ranged from .525 to .756 for first-years and .567 to .825 for seniors. The CFA for these two factors revealed a good fit (Table 1) without any modifications to the model needed (model shown in Figure 1). The factors were correlated at .60 for first-years and .58 for seniors, suggesting that they are related but not at risk for multicollinearity. The factor loadings for the items showed good strength, ranging from .57 to .99 (see Table 2). Overall, the fit indices, factor correlations, and factor loadings suggest two good subscales for student-faculty interactions.

Insert Tables 1 and 2 about here

Based on these results, two scales were then created. The first scale, Teaching Clarity (TC), included three items about classroom interactions (i.e. instructors using examples or illustrations to explain difficult points). The second scale, Good Faculty Practices (GFP), focused on student relationships with faculty (i.e. faculty got to know the student and their background). Cronbach's alphas ranged from .817 to .862, suggesting acceptably high levels of internal consistency (McMillan & Schumacher, 2001).

Insert Figure 1 about here

Predicting GPA

For the predictive validity analyses, year GPA was negatively skewed, which should be expected, and the mean year GPA of NSSE 2.0 respondents was fairly high, around 3.2. Normal probability plots and residual analyses indicated no sever departure from the assumptions of independence, normality, heteroschedasticity, and linearity. Variance inflation factors were checked for multicollinearity, which was not present in any of the analyses. All assumptions seemed to be upheld, so the regression models were built and run.

After controlling for background characteristics and prior ability, which explained 24.7% for first-year students and 16.4% for seniors of the variability in GPA, TC and GFP had statistically significant unique contributions to the regression model, explaining an additional 1.6% and 3.3% of the variation in grade-point-average, respectively, for first-year students. The same pattern was seen in seniors as well with TC and GFP explaining 1.3% and 4.6% of the variance in GPA. Table 3 displays the unique variance explained by the scales after controlling for background characteristics and prior ability.

Compared to the other NSSE 2.0 scales used in other models, TC and GFP had by far the most predictive power. For first-year students, the unique variance explained in GPA by TC is twice that of any of the other scales, excluding GFP, which is twice that of TC. For seniors TC and GFP are two of the strongest predictors, with the percentage of variance explained in GPA being more than three times that of any of the other scales.

Insert Table 3 about here

Predicting Persistence

Logistic regression results indicate that those in the middle 50% on teaching clarity are statistically significantly more likely to persist than those in the bottom quartile of TC. As shown in Table 4, those in the middle 50% for TC have 79% greater odds of being retained than those in the bottom quartile and those in the top quartile for TC have 53% greater odds of being retained than those in the bottom quartile for teaching clarity. The percentage rate difference between those in the bottom and top quartile on teaching clarity was three percent.

While the logistic regression results for good faculty practice show no statistically significant differences between the bottom quartile and the middle 50% or the top quartile (Table 5), in general, persistence rates increase as good faculty practices increase. The average persistence rate difference between those in the bottom and top quartiles was seven percent. This general positive relationship tends to hold across ability groups with the exception of the top quartile of ability, which showed a 4% decrease in persistence between the middle 50% and top quartile groups.

Insert Tables 4 and 5 about here

Limitations

As with most studies this one has strengths, but also some limitations that should be noted. The participation in NSSE is limited to those institutions that choose to participate, so neither the participants nor the institutions used in this study were selected at random to create a nationally representative sample. Nevertheless, efforts were made to ensure that the participating institutions did vary in terms of geographic region, Carnegie classification, and size. Another

limitation of this study was that not all of the possible predictors of GPA and persistence were available to us. As this is a study done at an independent research center, all the information available to institutions was not known to us, but we did make multiple efforts to get as many predictors of GPA and persistence from institutions to include in our models. Furthermore, as most survey research does, this study relied on self-reported perceptions of student experiences, which may not be completely objective. However, most studies looking at student self-reports in higher education suggest that self-reports and actual abilities are positively related (Anaya, 1999; Pike, 1995). Taking all of these limitations into account, the findings from this study suggest worthwhile insights that should be valuable to higher education administrators when looking at faculty teaching and practices.

Discussion

Results from this study suggest that these items included in a larger survey serve as a good proxy for student-faculty interactions. Both the EFA and CFA suggest that these items make two strong scales for teaching clarity and good faculty practices that are also related to one another. As theorized from the literature, these measures for teaching clarity and good faculty practices also influence students' GPA and persistence. The more involved faculty members, who put effort not only into their methods of instruction through focus on teaching clarity, but who also incorporate good faculty practices such as a concern for active participation and positive atmosphere are related to student successes like higher GPA and persistence from the first into the second year.

In fact, these results would suggest that the more personal interactions found in the good faculty practices scale, such as got to know you and your background, that are much less likely to be found on course evaluations might be a more important predictor of student success. While

course evaluations are the considered by most to be the primary source for information about student perceptions of faculty, as many universities move to online course evaluation administration for the obvious reasons of cost and efficiency they have encountered the undesirable side effect of lower response rates (Anderson, Cain, & Bird, 2005; Donmeyer, Baum, Hanna, & Chapman, 2004). In-class administration of evaluations, while not without its complications, at least has the major advantage of a captive audience. Furthermore, the increase in the use of adjunct and non-tenure track instructors at many universities can result in a lower emphasis on the importance of course evaluations, which are no longer viewed as essential for the process of promotion and tenure (Ehrenberg, 2010; Pannapacker, 2000). Other types of evidence concerning interaction between students and faculty, such as classroom observations, can also be costly in terms of time and effort (Webb & McEnerney, 1995), and potentially only capture a small portion of the overall interactions and may not provide information on more subtle but effective practices such as atmosphere and getting to know students. Measures like the short sets of items described above could provide additional information on some aspects of classroom practices that are not being measured by course evaluations, especially in light of the problems with course evaluations and other assessments of instructor quality.

As institutions try to understand student engagement, interactions with faculty emerge as arguably one of the most influential for success and development in college. Course evaluations may not provide the most complete picture of what is happening in the classroom, but an efficient way to supplement this type of information could be through student self-report surveys. Thus, a measure such as the one developed here could be instrumental in finding students who are not getting the types of interactions can impact their success and furthermore informing

various faculty members about the importance of incorporating these various behaviors and practices into their classrooms.

References

Anderson, H.M., Cain, J., & Bird, E. (2005). Online student course evaluations: Review of literature and a pilot study. *American Journal of Pharmaceutical Education, 69*(1), 34-43.

Astin, A. (1993). *What matters in college? Four critical years revisited.* San Francisco: Jossey-Bass.

BrckaLorenz, A., Ribera, A., Kinzie, J., & Cole, E. (in press). Examining effective faculty practice: Teaching clarity and student engagement. *To Improve the Academy, 31*.

Campbell, T. A. & Campbell, D. E. (1997). Faculty/student mentor program: effects in academic performance and retention. *Research in Higher Education, 38*(6), 727-742.

Chesebro, J. L., & McCroskey, J. C. (2001). The relationship of teacher clarity and immediacy with student state receiver apprehension, affect and cognitive learning. *Communication Education, 50*(1), 59-68.

Crisp, G. (2009). Conceptualization and initial validation of the college student mentoring scale. *Journal of College Student Development, 50*(2), 177-191.

Donmeyer, C.J., Baum, P., Hanna, R.W., & Chapman, K.S. (2004). Gathering faculty teaching evaluations by in-class and online surveys: Their effects on response rates and evaluations. *Assessment & Evaluation in Higher Education, 29*(5), 611-623.

Ehrenberg, R.G. (2010, June). Rethinking the professoriate. Paper presented at the American Enterprise Institute Conference on Innovation and Entrepreneurship in Higher Education, Washington, D.C.

Ginsberg, S. M. (2007). Teacher transparency: What students can see from faculty communication. *Journal of Cognitive Affective Learning, 4*(1), 13-24.

Hativa, N. (1998). Lack of clarity in university teaching: A case study. *Higher Education, 36*(3), 353-381.

Hativa, N., Barak, R., & Simhi, E. (2001). Exemplary university teachers: Knowledge and beliefs regarding effective teaching dimensions and strategies. *The Journal of Higher Education, 72*(6), 699-729.

Hu, L.T., & Bentler, P.M. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional versus new alternatives. *Structural Equation Modeling, 6,* 1-55.

Kaiser, H.F. (1974). An index of factorial simplicity. *Psychometrika, 39,* 31-36.

Kim, Y. K. & Sam, L. J. (2009) Student-faculty interaction in research universities: differences by student gender, race, social class, and first-generation status. *Research in Higher Education, 50,* 437-459.

Lau, L. K. (2003). Institutional factors affecting student retention. *Education, 124*(1), 126–136.

McMillan, J.H., & Schumacher, S. (2001). *Research in education: A conceptual introduction*. New York: Longman.

Pannapacker, W. (2000, December 1). The adjunct rip-off: 10 reasons why the use of adjuncts hurts students. *The Chronicle of Higher Education,* retrieved from http://chronicle.com/article/The-Adjunct-Rip-off-10/46365/.

Pascarella, E. T., Terenzini, P. T. (1977). Patterns of student-faculty informal interaction beyond the classroom and voluntary freshman attrition. *Journal of Higher Education, 48*(5), 540-552.

Pascarella, E. T., & Terenzini, P. T. (1991). *How college affects students: Findings and insights from twenty years of research.* San Francisco: Jossey-Bass.

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students(Vol. 2): A third decade*

of research. San Francisco: Jossey-Bass.

Pascarella, E. T. (2006). How college affects students: Ten directions for future research. *Journal of College Student Development*, 2006, *47*, 508–520.

Simonds, C. J. (1995). Classroom understanding: an expanded notion of teacher clarity. *Communication Research Reports*, *14*(3), 279-290.

Terenzini, P. and Pascarella, E. T. (1980). Student/faculty relationships and freshman year educational outcomes: A further investigation. *Journal of College Student Personnel*, *21*, 521-528.

Webb, J., & McEnerney, K. (1995). The view from the back of the classroom: A faculty-based peer observation program. *Journal on Excellence in College Teaching, 6*(3), 145-60.

Table 1

Confirmatory Factor Analysis: Model-fit Results

Model statistics	N	GFI	CFI	RMSEA	PCLOSE
First-year	306	.999	.999	.0003	.90
Seniors	631	.999	.999	.0140	.93

Note: Strong model fit is reflected by GFI greater than .85, CFI greater than .90, RMSEA less than .06, and PCLOSE greater than .05.

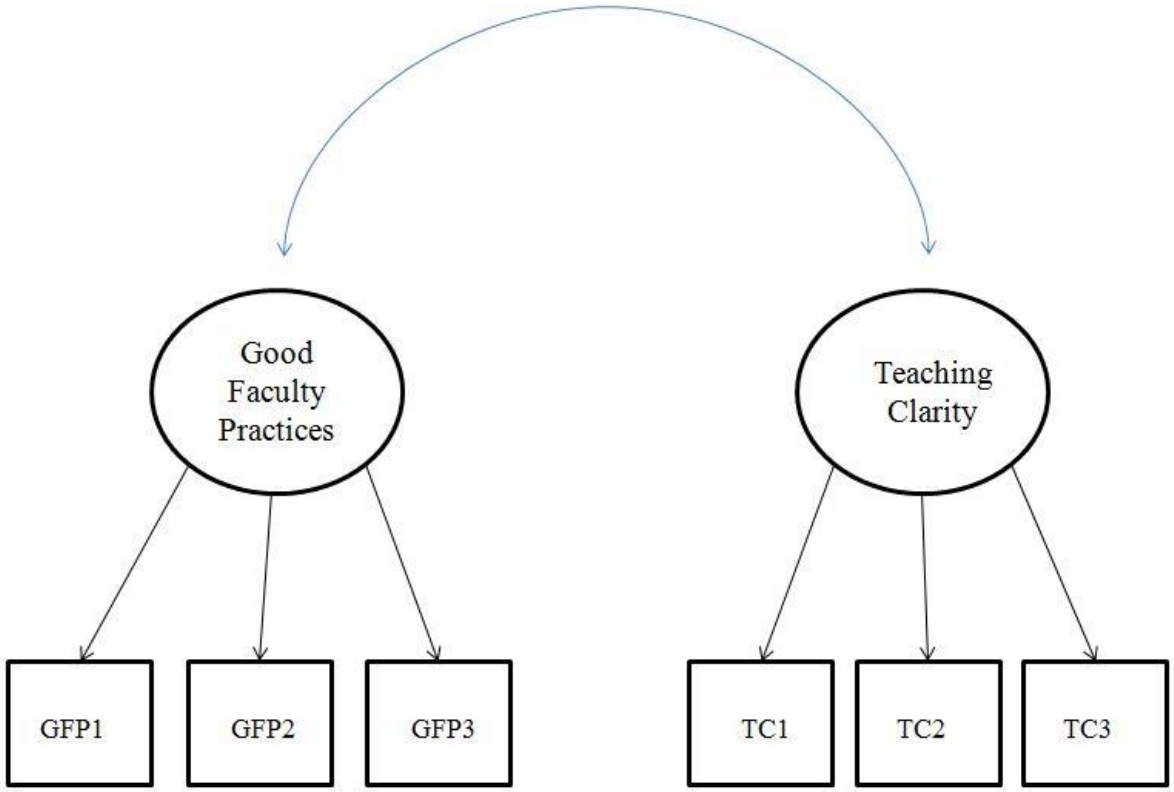

Figure 1. Path model for Good Faculty Practices and Teaching Clarity subscales

Table 2

Items, CFA Factor Loadings, and Cronbach's Alphas for First-Year and Senior Students

	Item	FY Factor Loading	SR Factor Loading
GFP1	Got to know you and your background	.57	.66
GFP2	Taught in ways that encouraged your active participation	.71	.86
GFP3	Created an atmosphere conducive to you learning	.99	.93
	Cronbach's α	*.817*	*.857*
TC1	Clearly explained course goals and requirements	.66	.78
TC2	Taught course sessions in an organized way	.79	.84
TC3	Used examples or illustrations to explain difficult points	.76	.83
	Cronbach's α	*.832*	*.862*

Table 3

Results of OLS regression models: Controlling for precollege characteristics and abilities and entering each scale separately

	ΔR2	β	Sig	n
First-year				
Teaching Clarity	.016	.127	.000	4030
Good Faculty Practices	.033	.184	.000	550
Senior				
Teaching Clarity	.013	.114	.000	4817
Good Faculty Practices	.046	.217	.000	667

Table 4

Logistic regression model results for Teaching Clarity

		Parameter Estimates	
Model		**Odds Ratio**	**Sig.**
1	Intercept only		
2	Ability	1.42	.000
	Mid 50% TC	1.79	.000
	Top 25% TC	1.53	.003

Table 5

Logistic regression model results for Good Faculty Practices

		Parameter Estimates	
Model		**Odds Ratio**	**Sig.**
1	Intercept only		
2	Ability	1.20	.252
	Mid 50% GFP	1.77	.165
	Top 25% GFP	2.47	.101