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Academic motivation among college students: variance and predictors

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ACADEMIC MOTIVATION AMONG COLLEGE STUDENTS: VARIANCE AND PREDICTORS

by

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CERTIFICATE OF APPROVAL

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PH.D. THESIS

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ABSTRACT

This three-paper dissertation addresses the manner in which students' intrinsic motivation to engage in academic tasks changes during the four years of college. The first paper examines the variance of students' academic motivation during college. The second paper analyzes whether good practices in undergraduate education promote academic motivation, and the third paper seeks to determine whether those good practices benefit certain students more than others. The papers find that academic motivation is a stable trait-like characteristic that is nonetheless susceptible to change across the four years of college. The good practices in higher education have significant positive effects on students' levels of academic motivation, net of other factors. However, student sub-groups differ in terms of how much they benefit from the good practices. The results indicate in particular the faculty challenge and high expectations, and clear and organized instruction are strong positive predictors of academic motivation. Implications are explored in each paper.

PUBLIC ABSTRACT

This three-paper dissertation addresses the manner in which students' intrinsic motivation to engage in academic tasks changes during the four years of college. The first paper examines the variance of students' academic motivation during college. The second paper analyzes whether good practices in undergraduate education promote academic motivation, and the third paper seeks to determine whether those good practices benefit certain students more than others. The papers indicate that academic motivation changes during college, the good practices are positive predictors of academic motivation, and that certain of the good practices are more beneficial to certain student sub-groups. Implications and directions for future research are explored in each paper.

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SUMMARY

This dissertation explores the contours of student motivation across the four years of college. In particular, it explores the ways in which students' intrinsic motivation to engage in and succeed at academic tasks ("academic motivation") changes between the first and second year of college, and between the first and fourth year of college. These inquiries are oriented around a single basic question: to what extent do college experiences shape students' academic motivation? The answer to that question has the potential to inform both theory and practice.

On the theoretical side, student's academic motivation has long been considered an important control variable in studies of college impact (see Pascarella & Terenzini, 2005). But there is no literature that empirically documents the extent to which college students' academic motivation changes over time. Is academic motivation stable over time, or is it susceptible to change? Answers to these theoretical questions also have practical implications. If academic motivation is susceptible to change, then it might also be susceptible to programmatic, curricular, and pedagogical intervention. The question then becomes: what programs, curriculum, and pedagogy work? A logical place to begin is the good practices in higher education, which an extensive body of work links with desirable college outcomes (see Pascarella et al., 2006). If these practices positively predict academic motivation, then next question is: for whom? The good practices, while generally predictive of desirable college outcomes, do not have the same effects for all students (Seifert, Gillig, Hanson, Pascarella, & Blaich, 2014). Accordingly, additional analysis is necessary to determine whether the effects of the good practices on academic motivation may be moderated by students' background characteristics.

Based on this framing of the inquiry, the purpose of this dissertation is threefold: (1) document the extent to which academic motivation varies during college, (2) determine whether

good practices in higher education predict changes in academic motivation, and (3) determine whether the good practices' predictive power differs based on students' background characteristics. Each purpose is addressed in a separate paper. All papers utilize data from the 2006–2010 cohort of the Wabash National Study of Liberal Arts Education ("WNS"). The analytic sample size is roughly 1700 students.

Paper 1 addresses the first purpose by documenting the extent to which academic motivation varies across the four years of college. After providing a review of the theoretical and empirical literature surrounding academic motivation of college students, Paper 1 tests the theoretical conception of academic motivation as a trait-like characteristic by computing the intra-class correlation for academic motivation across the four years of college. It finds that roughly half of variance in academic motivation rests within students, with the other half between students. This statistic supports the theoretical literature, which conceives of academic motivation as a trait-like characteristic that, though stable, is susceptible to programmatic, curricular, or pedagogical interventions. Paper 1 also includes basic descriptive analyses of the academic motivation measure.

Paper 2 addresses the second purpose by predicting the main effects of the good practices on academic motivation. Two models are estimated: one predicting change in academic motivation during the first year of college and one predicting change in academic motivation across the four years of college. The results of these models suggest that academic motivation can be positively influenced by the good practices, particularly faculty challenge and high expectations, and clear and organized instruction.

Paper 3 addresses the third purpose by evaluating whether the main effects from Paper 2 are conditioned on students' background characteristics. This paper follows the guidance of

previous work by expanding the inquiry beyond the general effects of the good practices to document the ways in which college experiences may have differential effects depending on the characteristics students bring with them to college. Results of regression models indicate that student groups do benefit from the good practices in differing ways, though faculty challenge and high expectations, and clear and organized instruction are positive predictors of academic motivation for all groups.

These three papers constitute an important initial step in understanding college students' motivation to engage in academic tasks. Each paper provides insight into questions that should be addressed by future research. In addition, implications for practitioners and college instructors are explored in each.

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THE VARIANCE OF STUDENTS' ACADEMIC MOTIVATION DURING COLLEGE: THEORETICAL AND EMPIRICAL IMPLICATIONS

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ABSTRACT

This paper uses data from the Wabash National Study to determine whether students' intrinsic motivation to engage in academic tasks—their "academic motivation"—changes during the four years of college. After summarizing relevant existing literature, descriptive analyses are conducted. Those analyses reveal that academic motivation dips during the first year of college and recovers during the subsequent three years of college, though never to pre-college levels. To determine whether this variance in academic motivation lies within or between students, an intraclass correlation coefficient is calculated. Approximately half of the variance in academic motivation lies within students. Accordingly, the measure of academic motivation utilized in this study comports with the theoretical conception of academic motivation as a stable, trait-like characteristic that is nonetheless susceptible to change over time. Practical and empirical implications of the descriptive findings are explored, and future directions for research are suggested.

INTRODUCTION

Learning does not occur by accident; it requires purposeful, directed effort. And sustaining that effort for the requisite duration is not always easy. It requires an internal drive. It requires motivation.

Motivation, that natural human capacity to direct energy in pursuit of a goal, is a hypothetical construct that cannot be observed directly (Wlodkowski, 1999). Thus, social scientists rely on theory to define motivation. Theory is frequently used to narrow both the object to which motivation is applied and the social context in which it is exercised. This paper is concerned with a specific motivational object, academic tasks, and a defined social context, postsecondary education at traditional four-year colleges.

Past research has linked academic motivation with a number of desirable outcomes such as academic achievement (Paulsen & Feldman, 1999), academic engagement (Panitz, 1999), greater success coping with stress (Struthers, Perry, & Menec, 2000), better study skills (Robbins et al., 2004), adoption of self-regulated learning strategies (Schunk & Zimmerman, 2012) and persistence (Porchea, Allen, Robbins, & Phelps, 2010). The literature has also identified a corollary to academic motivation: grit (Duckworth, Peterson, Matthews, & Kelly, 2007). Grit is an internal passion and persistence to accomplish long-term goals, and involves "working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress" (Duckworth, et. al, 2007, p. 1087–88). Grit scholars have found that people who pursue engagement in attention-absorbing activities, and eschew pursuit of immediate pleasure, showed greater perseverance of effort (Von Culin, Tsukayama, & Duckworth, 2014). Though the majority of the grit literature is focused on non-academic

settings, the links between engagement and perseverance provide a useful starting point for conceptualizing academic motivation as a possible precursor to the cognitive habits that lead towards long-term goal attainment.

Despite this importance, academic motivation is not well understood in the context of postsecondary education. Though a few empirical studies have explored the outcomes associated with academic motivation, none have documented how motivation changes over time. This study seeks to remedy that gap in the literature by documenting the contours of students' academic motivation during the four years of college using data from the Wabash National Study of Liberal Arts Education.

LITERATURE

Motivation consists of the "factors and processes that initiate and direct the magnitude, persistence, and quality of goal-directed behaviors" (Dweck & Elliott, 1983; Elliott & Dweck, 1988; Paulsen & Feldman, 1999, p. 18). Those factors and processes may pertain to a wide array of purposeful activities, ranging from a person's occupation to their hobbies and social endeavors. If directed effort is required, motivation is involved. This paper is principally concerned with the motivation of a particular population, traditional-aged college students, and in a particular context, four-year colleges and universities. Moreover, this paper is concerned only with the motivation students use to direct their academic pursuits. In short, this paper is concerned only with those "factors and processes" that comprise college students' *academic* motivation.

Academic motivation is not susceptible to a single definition. There are four broad theories of academic motivation. The first is the "drive" theory, which defines motivation as a

drive to achieve success (see Atkinson, 1964; Paunonen & Ashton, 2001). This theory defines success broadly and focuses primarily on the aspirational and affective nature of success generally, rather than on more particularized goals like getting a good grade or graduating with honors. Second is the "goal" theory, which defines motivation as the effort a student expends to achieve a particularized goal (see Eccles & Wigfield, 2002). The linchpin in this theoretical framework is the difference between goals that are external to the learner—like GPA or graduate school admission—and mastery of a particular topic, with the latter associated with more positive outcomes. Third is the "expectancy" motivation theory, where motivation is derived from students' belief, or expectancy, that they will perform well on an academic task (see Bandura, 1982, 1986; Eccles & Wigfield, 2002). In short, if a student expects she will perform well on a particular learning task based on past performance, she will be motivated to direct energy to accomplish her present task. If she performs well on the present task, the resulting feedback loop is self-reinforcing and leads to greater motivation in the future. Fourth, is the "self-worth" theory of motivation, wherein students with a generally positive self-concept about their academic work will be more motivated to expend the requisite energy to learn new material (see Covington, 1998, 2000).

Though empirical work has linked each of the four theories of academic motivation with positive educational outcomes, few studies have done so with regard to postsecondary education. Existing studies of the effects of academic motivation focus primarily on the goal theory of motivation. That theory seeks to differentiate goals which are external to the learner, such as receiving a good grade in a course or graduating with honors, with goals that are internal to the learner, such as personal mastery of a give course subject (Eccles & Wigfield, 2002; Robbins et al., 2004). This distinction is known more widely as the difference between extrinsic and

intrinsic motivation. Theorists have defined intrinsic motivation as "(a) preference for hard and challenging tasks, (b) learning that is driven by curiosity or interest, and (c) striving for competence or mastery" (Eccles & Wigfield, 2002, p. 114). Under this definition, motivation is a trait-like characteristic, which is more stable than transient affect or emotion, but still susceptible to change. Accordingly, individual differences exist in intrinsic motivation; some people have more of it than others.

Several empirical studies link intrinsic academic motivation with positive outcomes: including achievement, as measured by GPA (Chemers, Hu, & Garcia, 2001; Struthers et al., 2000), persistence (Allen, 1999; Allen, Robbins, Casillas, & Oh, 2008; Lotkowski, Robbins, & Noeth, 2004) and cognitive gains (Garcia & Pintrich, 1992). Robbins and colleagues provide the most comprehensive review of the existing empirical work (2004). Using meta-analytic techniques, Robbins and colleagues documented small to moderate positive correlations between intrinsic academic motivation and retention and moderate to strong positive correlations between intrinsic motivation and GPA across 109 studies of collegiate academic success. The authors concluded that academic motivation, as measured by intrinsic achievement goals, is generally a predictor of retention and GPA. Moreover, some of the existing research indicates that student demographic characteristics such as race and gender may moderate the effects of academic motivation. In particular, academic motivation appears to play a more important role for students of color in terms of persistence and performance. Similarly, women appear to benefit more from academic motivation compared to male students. Accordingly, research and programmatic efforts should be directed at improving students' intrinsic academic motivation.

Despite these findings, no studies have examined the extent to which academic motivation changes across the four years of college. The dearth of research may owe to the lack of longitudinal data on students' motivation. Indeed, even studies that follow student outcomes over time only sample student motivation once (e.g., Porchea et al., 2010). As a result, little is known about the extent to which academic motivation changes during the four years of college. The theoretical literature summarized above suggests that academic motivation is a trait-like characteristic: stable but susceptible to change. However, this has not yet been tested using longitudinal data. Accordingly, it is unknown whether postsecondary educators can undertake programmatic efforts to improve students' academic motivation. This paper seeks to remedy this gap in the literature using longitudinal data from the Wabash National Study of Liberal Arts Education.

RESEARCH QUESTIONS

Based on the foregoing, this paper addresses the following research questions:

1. How does academic motivation change across the four years of college? This research question will be addressed using descriptive analyses.
2. How stable are students' academic motivation scores across the four years of college? This research question will be addressed by computing an intraclass correlation coefficient.

DATA AND METHODS

Data

Sample and data collection. Data for this study came from the Wabash National Study of Liberal Arts Education ("WNS"), a multi-institutional study of college experiences and outcomes. The WNS study utilizes a longitudinal pre-test, post-test design to isolate the unique effects of various college experiences on measured outcomes including critical thinking skills and moral reasoning. WNS collected data from 19 institutions of higher education; these institutions were selected from more than 60 American colleges and universities that responded to a national invitation to participate. This study utilizes data from only 17 of the 19 participating institutions—data from two community colleges was excluded.

Initial data collection occurred in fall 2006 (time 1), before students began their first semester of college. Two follow up collections occurred in spring 2007 (time 2) and spring 2010 (time 3), respectively. These follow-up collections took place at the end of students' first year of college, and at the end of students' fourth year of college.

WNS collected extensive student background and demographic data at time 1. These data include information pertaining to students' demographic characteristics, parents' educational attainment, and pre-college activities such as high school co-curricular involvement. In addition, WNS collected data from students' institutional files, notably their ACT (or equivalent SAT) score. Finally, time 1 data collection included a pre-college measure of multiple of outcome variables, including students' academic motivation. At time 2 and time 3, in addition to again collecting students' outcome measures, WNS administered extensive questionnaires concerning students' in-college experiences, including measures that are part of

the National Study of Student Engagement ("NSSE"). (For a more in-depth discussion of the WNS data collection regime, see WNS Research Methods, 2008.) Roughly 1600 students have complete data at times 1, 2, and 3. Only these students' data were analyzed in this study.

Variables. This paper uses only one WNS variable: the WNS measure of academic motivation. The WNS measure of academic motivation is an operationalization of intrinsic academic motivation. The measure consists of eight Likert-scale items relating to students' intrinsic drive to complete academic tasks; for instance: "I enjoy the challenge of learning complicated new material." (See Appendix 1 for a copy of the scale.) WNS measured academic motivation during each wave of data collection: before the start of college, after the first year of college and after the fourth year of college. The scale, which was vetted and pilot tested before administration to WNS participants, has an internal consistency reliability (Cronbach's α) of .69. Higher scores indicate higher levels of academic motivation.

Analysis. Analysis took place in two steps, one for each research question.

Question 1: How Does Academic Motivation Change Across the Four Years of College?

Basic descriptive and statistical analyses were conducted to answer this research question. The mean academic motivation score was computed for the analytic sample for each wave of data collection: time 1, time 2, time 3. Weights were used for time 2 and time 3 measures to compensation for attrition and ensure each wave's data approximated the sampling unit. Then, the mean score was disaggregated based on the following student characteristics: (1) race, (2) gender, (3) pre-college academic ability (ACT score), and (4) parental education. Additionally, the means for each sub-sample was plotted across the four years of college. To

determine the extent of the statistical reliability of the change between time points, a simple repeated measures t-test was run on the sample mean academic motivation score.

Question 2: How Stable Are Students' Academic Motivation Scores Across the Four Years of College?

This question seeks to address the extent to which individual students, rather than the groups of students addressed using the descriptive analyses described above, undergo change in academic motivation across the four years of college. To answer that question, an intraclass correlation coefficient was computed for academic motivation.

Because the WNS sampled students' academic motivation using the same measure at three different time points, those three measures can be nested within each student (Raudenbush & Bryk, 2002; Singer & Willett, 2003). Doing so allows the total variance of academic motivation to be partitioned into two parts. The first part is the "within student" variance. This is the proportion of the total variance in academic motivation that is attributable to an individual student's changing level of academic motivation during college. The second part is the "between student" variance, which represents the difference between the academic motivation scores of an individual student and other students in the WNS sample. Partitioning the variance in this way will allow examination of the extent to which individual students' academic motivation changes during college. This information will help in determining the extent to which the WNS academic motivation measure conforms to theoretical conceptions of academic motivation as a "trait-like" characteristic. More practically, the extent of within student variance will help to evaluate the extent to which postsecondary educators may be able to improve students' academic motivation through programmatic intervention.

To partition the variance, the WNS data were transformed into long form using the Stata statistical analysis software program. An "empty model" was then estimated using Stata's multilevel modelling program (see Raudenbush & Bryk, 2002; Singer & Willett, 2003). The intraclass correlation is reported in the next section.

RESULTS

The results are described in two parts.

Question 1: How Does Academic Motivation Change Across the Four Years of College?

Descriptive analyses of the academic motivation scale scores reveal that students' academic motivation deceases during their first year of college and then recovers by the end of the fourth year of college, but to pre-college levels. This finding is consistent across the entire analytic sample as well as for each of the groups for which data were disaggregated. See Figure 1 below for a graphical depiction of the overall trends in academic motivation.

The descriptive analyses also reveal group differences in mean academic motivation scores (see Table 1, below). For instance, at the end of the first year of college, students of color have higher mean academic motivation scores than their white counterparts. At the same time point, women have higher scores than men. Interestingly, students in the bottom quartile of pre-college academic ability have mean academic motivation scores similar to students in the top quartile of pre-college academic ability.

The results of the repeated-measures t-test reveals that the sample mean academic motivation scores are different between time 1 and time 2 ($t=21.01$; $p<.0001$), between time 2 and time 3 ($t=-4.78$; $p<.0001$), and between time 1 and time 3 ($t=13.72$; $p<.0001$). The results of

the repeated measure t-tests indicate that the observed changes in academic motivation between the beginning of college (time 1), and the end of the first (time 2) and fourth (time 3) years of college is not due to chance.

Overall, these results appear to support some of the existing theory that suggests that academic motivation is a stable, yet malleable trait-like characteristic. However, additional analysis is necessary to explore just how susceptible academic motivation is to change. The results of that further analysis is described in the next section.

Question 2: How Stable Are Students' Academic Motivation Scores Across the Four Years of College?

The intraclass correlation coefficient for academic motivation was 0.48. Accordingly, the total variance in academic motivation scores was apportioned roughly evenly between students and within students. In other words, about half of the variance lay within each student when measured across time, while the other half lay between students.

An alternate analysis was run to discount the possibility that the observed variance in academic motivation was an artifact of secular change in students' responses to the academic motivation scale. In this analysis, academic motivation was regressed on dummy variables indicating time 2 (end of first year) and time 3 (end of fourth year) measurement using Stata's longitudinal regression function. After controlling for time, the results are essentially the same (*rho* = 0.51), with about half of variance in academic motivation found within students, and half between students.

IMPLICATIONS & LIMITATIONS

Implications. The results have both theoretical and practical implications. As a matter of theory, the results of the descriptive analyses and intraclass correlation analysis suggest that academic motivation, as measured by the WNS scale, is a stable, trait-like characteristic. This finding is consistent with the existing literature, which suggests that academic motivation is not transient or ephemeral, but is also susceptible to change over time (see Eccles & Wigfield, 2002). In other words, academic motivation is something more stable than affect or emotion, but more malleable than personality or some other trait. This finding would seem to suggest that the WNS measure of academic motivation is consonant with the existing academic motivation literature. Accordingly, analyses of the WNS academic motivation data has the potential to contribute to academic motivation's scholarly canon.

Practically, the results of this study indicate that academic motivation is susceptible to change. This is an important finding because it undermines conventional wisdom that students' poor performance is attributable to an immutable lack of motivation. To the contrary, these results suggest that students' motivation changes over time, including during college. Of particular interest is the decline in academic motivation during the first year of college. During the first nine months of college, students appear to lose an appreciable amount of their motivation to engage in academic tasks. And while they make up some of those losses before the end of the fourth year of college, they do not recover to pre-college levels.

These results also require further inquiry. First, the results indicate that academic motivation changes during college. The natural follow-up question is: what predicts the observed change in academic motivation? Second, the results suggest that academic motivation

may be subject to educational interventions. Because academic motivation changes during college, and because about half of the variance in academic motivation lies within students, it is possible that educational practices could affect students' level of motivation. Additional analysis is necessary to determine which educational practices, if any, are related to growth in academic motivation. Finally, the results show a degree of difference in academic motivation mean scores based on students' background characteristics. Though these differences were not examined for statistical significance in this paper, their existence prompts additional inquiry. In particular, future analyses should determine if different educational experiences have differential effects on students' academic motivation based on those students' background characteristics.

All of the questions posed by the descriptive results are answerable, at least in part, by analyzing the WNS data. The WNS dataset has robust measures of students' educational experiences during college, including empirically vetted measures of good practices in undergraduate education. Moreover, the WNS data will permit analysis of whether the predictors of academic motivation vary based on students' background characteristics. In so doing, the WNS dataset provides a unique opportunity to expand the existing literature on academic motivation to include analysis of the changes in students' academic motivation across the four years of college.

Limitations. This study suffers from several limitations, including attrition between initial and follow-up data collection. Although WNS employs weights based on sex, race, pre-college academic ability, and institutional type, this procedure cannot guarantee that respondents that remained in the study after initial collection responded in substantially similar ways as their counterparts who did not persist in the study. This is particularly concerning in a study such as

this one, which seeks to explore the dynamics of academic motivation. It is reasonable to believe that students that possess enhanced academic motivation are more likely to complete all three WNS data collections. Accordingly, by removing students whose data was not complete across all three collection time-points, this study's generalizability may be limited. Though no analytic steps can cure this methodological shortcoming, it must be noted as a limitation on the manner in which the above-reported results are interpreted and utilized.

CONCLUSION

Descriptive and simple statistical analysis of the WNS academic motivation measure indicates that academic motivation changes during college. In particular, about half of the variance in academic motivation lies between students, while half lies within students. This finding comports with the existing literature, which conceives of academic motivation as a trait-like characteristic that, although stable, is susceptible to change over time, including during the four years of college. But merely documenting the existence of change is not sufficient to aid educators and policymakers in altering instructional and co-curricular experiences to improve academic motivation. Additional research is needed to isolate those educational programs and practices that are associated with increased academic motivation.

Moreover, researchers should consider ways to begin developing a narrative that explains the changes in academic motivation that are observed in this paper. For instance, what is it about the first year of college that causes motivation to fall? Is the decline merely an artifact of adjusting to college life? Or do students suffer from a lack of opportunity to engage in motivation-enhancing tasks during the first year of college? Correspondingly, what is it that

causes recovery in academic motivation between the end of the first year and the end of the fourth year?

Some initial answers to these questions are available through analysis of the WNS data, particularly with regards to the types of educational practices that are positively associated with academic motivation. But others of these questions will require more granular data that tracks individual students' experiences through particular classes and co-curricular activities. Indeed qualitative of mix-methods studies may be best suited to this task. Because, in all events, this study suggests strongly that academic motivation changes during college. The question left to institutions of higher education is what opportunities that change presents.

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Figure 1. **Trends in Academic Motivation Scores across the Four Years of College**

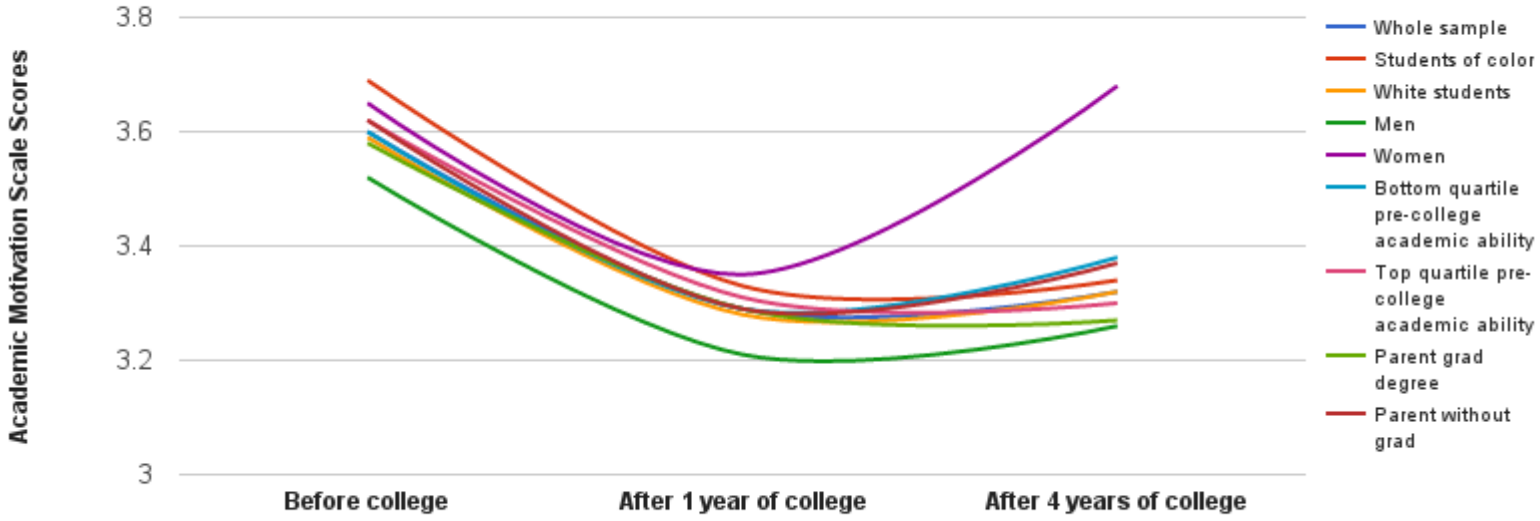

Table 1. **Mean Academic Motivation Scale Scores* by Student Group across Four Years of College**

	Pre-college	**End of first year of college**	**End of fourth year of college**
Whole sample	3.60	3.29	3.32
Students of color	3.69	3.33	3.34
White students	3.59	3.28	3.32
Men	3.52	3.21	3.26
Women	3.65	3.35	3.68
Bottom quartile pre-college academic ability	3.60	3.29	3.38
Top quartile pre-college academic ability	3.62	3.31	3.30
Parent grad degree	3.58	3.29	3.27
Parent without grad	3.62	3.29	3.37

* Note that means were computed using weighted samples.

APPENDIX

Academic Motivation Scale

General Instructions: Circle the number that indicates the extent to which you agree/disagree with each of the following statements about your views or perspectives in general.

There is neither a right nor wrong answer to any question. Please do your best to provide complete information. However, if you do not want to respond to an item, feel free to leave the response blank. Your identity and responses will be held in strict confidence.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A. I am willing to work hard in a course to learn the material even if it won't lead to a higher grade.	1	2	3	4	5
B. When I do well on a test, it is usually because I am well-prepared, not because the test is easy.	1	2	3	4	5
C. I frequently do more reading in a class than is required simply because it interests me.	1	2	3	4	5
D. I frequently talk to faculty outside of class about ideas presented during class.	1	2	3	4	5
E. Getting the best grades I can is very important to me.	1	2	3	4	5
F. I enjoy the challenge of learning complicated new material.	1	2	3	4	5
G. My academic experiences (i.e., courses, labs, studying, discussions with faculty) will be the most <u>important</u> part of college.	1	2	3	4	5
H. My academic experiences (i.e., courses, labs, studying, discussions with faculty) will be the most <u>enjoyable</u> part of college.	1	2	3	4	5

PREDICTING CHANGE IN ACADEMIC MOTIVATION: MAIN EFFECTS

Paper #2

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ABSTRACT

This paper explores the effects of the good practices in higher education on students' academic motivation using data from the Wabash National Study of Liberal Arts Education. Academic motivation was measured pre-college, at the end of the first year of college, and at the end of the fourth year of college. Models were run to predict academic motivation at the end of the first year, and end of the fourth year of college. Net of background characteristics, results indicate that many of the very same good practices that have been linked with gains in desirable college outcomes like growth in critical thinking are related with increased levels of academic motivation. In particular, faculty challenge and high expectations, and clear and organized instruction were positive predictors of academic motivation at both time points.

INTRODUCTION

College students' intrinsic motivation to engage in academic tasks—their academic motivation—is a key predictor of desirable outcomes like academic performance and persistence to graduation. Moreover, research indicates that academic motivation changes during college (see Gillig, Dissertation Paper #1). Students enter college with high academic motivation, which dips during the first year of college before recovering somewhat during the remaining three years of before graduation. In total, about half of the overall variance in academic motivation lies within students, meaning that college students' academic motivation is stable, yet susceptible to change over time.

The question of what predicts change in college students' academic motivation is as yet unanswered. Though a few studies have highlighted the efficacy of certain programmatic interventions such as attributional retraining, none have documented the effect of general educational practices on students' academic motivation. Can postsecondary educators teach in a way that improves students' academic motivation? Can they use co-curricular educational experiences to improve academic motivation? And do their interactions with students improve those students' motivation to engage in academic tasks? This paper seeks to begin to answer these questions.

LITERATURE

This paper draws on two distinct bodies of literature. The first is the motivational literature, which provides theoretical grounding for the concept of academic motivation. The second is the college impact literature, which is the broad field of theoretical and empirical work that documents the instructional and co-curricular practices that have come to be known as "good practices" in higher education.

Academic Motivation

In broad terms, motivation is made up of the "factors and processes that initiate and direct the magnitude, persistence, and quality of goal-directed behaviors" (Dweck & Elliott, 1983; Elliott & Dweck, 1988; Paulsen & Feldman, 1999, p. 18). When applied to students' academic pursuits, motivation has no single definition. A common definition adopted in empirical work is the "goal" theory, where motivation is defined as the amount of effort a student makes to achieve a particular goal (see Eccles & Wigfield, 2002). The linchpin of the goal theory of motivation is the difference between intrinsic and extrinsic goals. Intrinsic goals are internal to the learner, such as mastery of a topic, or success at creating something new. By contrast, extrinsic goals involve goals external to the learner, like getting a good grade or getting into graduate school. This distinction is known more widely as the difference between extrinsic and intrinsic motivation. More precisely, theorists have defined intrinsic motivation as "(a) preference for hard and challenging tasks, (b) learning that is driven by curiosity or interest, and (c) striving for competence or mastery" (Eccles & Wigfield, 2002, p. 114).

Intrinsic motivation is conceived as being a trait-like characteristic (Eccles & Wigfield, 2002). It is less changeable than affect or emotion, which might vary constantly across the span of a single day. Yet, it is more malleable than a trait, which is highly resistant to change even across long periods of time. Instead, academic motivation is stable, yet still susceptible to change. Indeed, analysis of longitudinal data from the Wabash National Study of Liberal Arts Education ("WNS") revealed that roughly half of the overall variance in students' academic motivation scores lies within students, meaning that academic motivation is both stable and susceptible to change over time (Gillig Dissertation, Paper #1). Moreover, because half of the

total variance in academic motivation lies between students, individual differences exist in intrinsic motivation; some people have more academic motivation than others.

Past empirical studies have linked intrinsic academic motivation with positive college outcomes, including: achievement (Chemers, Hu, & Garcia, 2001; Struthers, Perry, & Menec, 2000); persistence (Allen, 1999; Allen, Robbins, Casillas, & Oh, 2008; Lotkowski, Robbins, & Noeth, 2004); and cognitive gains (Garcia & Pintrich, 1992). But the latest summative empirical work, by Robbins and colleagues is now over a decade old (2004). Robbins and colleagues used meta-analytic techniques to document positive correlations between intrinsic academic motivation and retention and moderate to strong positive correlations between intrinsic motivation and academic success across 109 studies of collegiate academic success. (All but of a few of the studies included in the meta-analysis used GPA as the measure of academic success.) As a result, Robbins and colleagues concluded that intrinsic academic motivation is a predictor of retention and academic performance. Moreover, some of the existing research indicates that students' demographic characteristics such as race and gender may moderate the effects of academic motivation. In particular, academic motivation appears to play a more important role for students of color in terms of persistence and performance. Similarly, women appear to benefit more from academic motivation compared to their male counterparts.

Good Practices in Higher Education

An extensive body of scholarly work has considered the efficacy of postsecondary programs and initiatives. Chickering and Gamson (1987, 1991) were among the first to synthesize a list of principles of good practice in undergraduate education. The principles—(a) student-faculty contact; (b) cooperation among students; (c) active learning; (d) prompt feedback to students; (e) time on task; (f) high expectations; and (g) respect for diverse students and

diverse ways of knowing—have become influential in research on the effects of college on students (the so-called "college impact" research). Indeed, the items that comprise the National Survey of Student Engagement and other frequently-used surveys of student learning are, in large part, operationalized versions of Chickering and Gamson's list of good practices (Kuh, 2001).

Since their introduction, the seven principles of good practice in higher education (or just "the good practices") have been subjected to rigorous empirical analysis. By and large, these studies have demonstrated that "various measures of the good practice dimensions are significantly and positively linked to desired aspects of cognitive and non-cognitive growth during college" (Pascarella et al., 2006, p. 254). Extensive research has documented the positive effects of the good practices on desirable college outcomes (Kuh & Hu, 2001). These studies included examinations of diversity experiences (Gurin, Dey, Hurtado, & Gurin, 2002; Gurin, Nagda, & Lopez, 2004; Pascarella, Martin, Hanson, & Trolian, 2014; Pascarella, Palmer, Moye, & Pierson, 2001); student faculty interactions (Kuh & Hu, 2001; Terenzini, Springer, Pascarella, & Nora, 1995); and cooperative student learning experiences (Cabrera et al., 2002). (For an exhaustive list of good practices studies, see Pascarella et al., 2006.)

However, most of studies of the good practices assessed only one good practice and failed to account for the confounding influence of exposure to other good practices. Furthermore, good practice studies were often conducted within a single institutional sample, greatly limiting researchers' ability to generalize findings across diverse institution types. To remedy these limitations, recent studies of good practices have used multi-institutional, longitudinal datasets to assess the impact of good practice across different institutional types (Cruce, Wolniak, Seifert, & Pascarella, 2006; Mayhew, Seifert, Pascarella, Nelson Laird, &

Blaich, 2012; Pascarella, Seifert, & Blaich, 2009; Pascarella, Seifert, & Whitt, 2008; Pascarella, Wolniak, Cruce, & Blaich, 2004; Seifert, Pascarella, Goodman, Salisbury, & Blaich, 2010). The Wabash National Study of Liberal Arts Education is one such study.

Many of these multi-institution studies largely employ Pascarella and Terenzini's (2005) college impact model to isolate the effects of educational programs and practices on college outcomes. The model is centered on the recognition that students come to college with a host of background characteristics including their academic preparedness, sociocultural characteristics and orientations toward learning that may affect both in-college processes and end-of-college outcomes (Astin, 1993; Pascarella, 1985). Accordingly, the college impact conceptual model has three components. First, an outcome of interest is measured before, during and after exposure to college. The pre-test, post-test design allows researchers to isolate change over time while also accounting for individual differences because in a pre-test, post-test design, students serve as their own control group. Second, a host of background factors such as students' high school academic ability, race, gender and parental education are controlled to avoid confounding the "treatment effects" of exposure to collegiate experiences. Third, multiple collegiate experiences are measured simultaneously, which allows researchers seeking to document the effects of good practices to control for the potential confounding effects of other educational experiences.

The college impact conceptual model is well-suited to the present study because it permits examination of the effects of good practices across the four years of college while attempting to control for the theoretically significant confounding effects of student background characteristics and other collegiate experiences.

The Effects of Good Practices on Academic Motivation

No previous research has explored the connection between the good practices and academic motivation. Accordingly, this study is an extension of the existing college impact literature because it seeks to document the extent to which the good practices are related to academic motivation. Extending the good practices framework to examine academic motivation is appropriate for two reasons. First, the college outcomes that the good practices predict, namely college GPA and persistence/retention, are the same outcomes that are at the center of the existing academic motivation literature (see Robbins et al., 2004). Second, academic motivation has been shown to change during college (see Gillig Dissertation, Paper #1). This paper assumes that the observed change is not an accident; something is occurring during college that may affect students' motivation. Therefore, understanding whether good practices affect academic motivation may guide postsecondary educators' efforts to foster and maintain high levels of academic motivation amongst their students.

RESEARCH QUESTIONS

This paper addresses the following research questions:

1. Does exposure to the good practices predict change in academic motivation during the first year of college?
2. Does exposure to the good practices predict change in academic motivation across the four years of college?

DATA AND METHODS

Data

Sample. Data for this study came from the Wabash National Study of Liberal Arts Education ("WNS"), a multi-institutional study of college experiences and outcomes. WNS utilizes a longitudinal pre-test, post-test design to isolate the effects of college experiences on measured outcomes including academic motivation. A total of 19 American colleges and universities participated in the initial round of WNS data collection from 2006 to 2010. Those institutions were selected from 60 that responded to a call for participation. This study excludes two community colleges that were part of the original WNS institutional sample. As a result, this study has an analytic sample of 17 institutions.

WNS collected data from students at three time points: at the beginning of the first year of college (time 1), at the end of the first year of college (time 2) and at the end of the fourth year of college (time 3). At time 1, students completed extensive questionnaires about their demographic characteristics, family background, and high school experiences. In addition, participating institutions provided students' academic data, including students' scores on the ACT/SAT. At time 1, students also completed pre-tests of each of the outcomes measured by WNS, including critical thinking, moral reasoning, and academic motivation.

At time 2, WNS collected data on student experiences using two measures: the National Survey of Student Engagement ("NSSE") and the WNS Student Experiences Survey. Both measures are designed to measure students' exposure to empirically vetted good practices in undergraduate education. For instance, students report whether they have engaged in research with a faculty member, whether they have been exposed to effective teaching, whether their

instructors have high expectations, and whether they had meaningful interactions with their peers. Subsequent to completing these measures of student experience, respondents were given a short break after which they completed the WNS outcome measures, including the academic motivation instrument.

At time 3, students were again asked to recount their academic and co-curricular experiences using the NSSE and WNS measures; this time students were asked to report collegiate experiences across all four years of college. Afterwards, students again completed the WNS outcome measures, including the academic motivation instrument.

The longitudinal design of the WNS data is uniquely suited to this study's research questions. Because students completed the outcome measures at three time points, it is possible to observe change in those outcome scores. Moreover, the collection of student experience data at time 2 (end of the first year of college) and time 3 (end of the fourth year of college) raises the possibility of examining the possible substantive differences between first-year and upper-class student experiences.

Selection Effects and Attrition. In addition, the longitudinal pre-test, post-test structure of the data helps to mitigate methodological weaknesses that commonly confront studies of students' college experiences, namely the selection effect. Because students cannot be randomly assigned to attend college, or to attend a particular college, there is no control group against which to assess whether college students are affected by their collegiate experiences. To remedy this, WNS employs a pre-test, post-test design in which students essentially function as their own controls. Indeed, by controlling for a student's pre-college score on a particular variable of

interest, researchers can remove the effect (on that variable at least) of a student's self-selection into a particular college.

Attrition between the initial (time 1) and follow up (times 2 and 3) data collection points raises a concern of response bias. This concern is particularly acute in this study because of the possible relationship between academic motivation and persistence in the study—in short, it is possible that more motivated students persisted in the study while students with less motivation did not. To help correct for sampling bias at time 2 and time 3, WNS calculated weights using an algorithm based on sex, race, academic ability, and institution type. Academic ability was calculated using ACT (or SAT equivalent) score. Though these weights help to ensure that the final analytic sample used in this study reflects the initial sample with regards to the demographics used to calculate the weights, it cannot adjust for nonresponse bias. Accordingly, nonresponse bias must be conceived of as a limitation of this study.

Measure of Academic Motivation. The dependent variable in this study is academic motivation. The WNS measure of academic motivation is an operationalization of intrinsic academic motivation. The measure consists of eight Likert-scale items relating to students' intrinsic drive to complete academic tasks; for instance: "I enjoy the challenge of learning complicated new material." WNS measured academic motivation during each wave of data collection: before the start of college, after the first year of college and after the fourth year of college. The scale, which was vetted and pilot tested before administration to WNS participants, has an internal consistency reliability (Cronbach's α) of .69. Higher scores indicate higher levels of academic motivation.

Measures of Good Practices. In selecting the good practices, this study was guided by a body of literature that links undergraduate education experiences to personal and intellectual growth during college (see Astin, 1993; Chickering & Reisser, 1991; Kuh, 2009; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Pascarella & Terenzini, 1991, 2005). To measure these good practices, WNS adapted empirically-vetted scales and items from the National Study of Student Learning (Cruce et al., 2006; Pascarella et al., 2006) and the National Survey of Student Engagement (Kuh, 2001). These scales were designed to tap a range of good practices that include such dimensions as doing individual research with a faculty member, quality of faculty-student interaction, quality of instruction received, academic challenge and high expectations, cooperative learning experiences, co-curricular involvement and positive interactions with peers, and involvement in diversity experiences. A growing body of evidence indicates that the good practice dimensions tapped by such measures are significantly linked to student cognitive and personal development during college (see Cruce et al., 2006; Kuh, 2009; Pascarella et al., 2006, 2009).

This study utilized measure of seven good practices: (1) worked with a faculty member on a scholarly research project; (2) good teaching and high quality interactions with faculty; (3) academic challenge and high expectations; co-curricular involvement and positive interactions with peers; (4) frequency of interactions with faculty and student affairs staff; (5) cooperative learning experiences with other students; and (6) interactional diversity experiences. All of the dimensions of good practices, with the exception of faculty research, were measuring using composite scales derived from factor analysis and constructed by computing the scale mean across items. The first good practice—worked with a faculty member on a research project—was a single dummy-coded item. For that item, students were asked to indicate whether or not

during their attendance at the institution they had worked on a research project with a faculty member outside of course or program requirements; responses were coded 1 = “done” or 0 = “not done.”

Good teaching and high quality interactions with faculty was a 23-item scale that combined items on students’ perceptions from four subscales: (a) overall exposure to clear and organized instruction at the institution attended (frequency that faculty give clear explanations, frequency that faculty make good use of examples and illustrations to explain difficult points, frequency that class time is used effectively, frequency that course requirements are clearly explained); (b) faculty interest in teaching and student development (the extent to which faculty are interested in helping students grow in more than just academic areas, the extent to which faculty are generally interested in teaching, and the extent to which faculty are willing to spend time outside of class to discuss issues of interest and importance to students); (c) prompt feedback (how often faculty informed students of level of performance in a timely manner, how often faculty checked to see if students had learned the material well before going on to new material); and (d) quality and impact of non-classroom interactions with faculty (extent to which non-classroom interactions with faculty had an impact on one’s: intellectual growth and interest in ideas; personal growth, values and attitudes; and career goals and aspirations). The internal consistency reliability (Cronbach’s α) for the 23-item scale was .92.

Academic challenge and high expectations was a 31-item scale that combined items on students’ perceptions from four subscales: (a) academic effort (how often one worked harder than one thought he or she could to meet an instructor’s standards or expectations, number of hours a week spent preparing for class, extent to which one’s institution emphasizes sending significant amounts of time studying and on academic work, number of assigned textbooks,

books, or book-length packs of course readings one read during the current year); (b) challenging classes and high faculty expectations (how often faculty: asked challenging questions in class; challenged student's ideas in class; asked students to argue for or against a particular point of view; asked students to point out any fallacies in basic ideas, principles, or points of view presented in the course); (c) Frequency of higher-order exams and assignments (how often exams or assignments required students to: write essays, compare or contrast topics or ideas from a course, argue for or against a particular point of view and defend an argument); and (d) integration of ideas (extent to which one agrees that courses have helped him or her understand the historical, political, and social connections of past events; how often one has worked on a paper or project that required integrating ideas or information from various sources; how often one put together ideas or concepts from different courses when completing assignments or during class discussions). The alpha reliability (Cronbach's α) for the 31-item scale was .88.

Co-curricular involvement and positive interactions with peers was a 9-item scale that measured the number of hours per week students spent in co-curricular activities such as organizations, campus publications, student government, fraternities or sororities, intercollegiate or intermural athletics, etc. as well as the degree to which students reported positive interactions with peers (the student friendships developed are personally satisfying; interpersonal relationships with other students have a positive influence on intellectual growth and interest in ideas; interpersonal relationships with other students have a positive influence on personal growth, attitudes, and values). The 9-item scale had a reliability (Cronbach's α) of .85.

Interactions with faculty and student affairs staff was a 9-item scale based on student self-reports that combined items from two subscales: (a) frequency of interactions with faculty (how often one discussed grades or assignments with and instructor, how often one worked with

faculty members on activities other than coursework such as committees, orientation, student life activities); and (b) frequency of interactions with student affairs staff (how often one discussed a personal problem or concern with student affairs professionals; how often one worked on out-of-class activities, such as committees, orientation, student life activities with student affairs professionals). The reliability (Cronbach's α) for the 9-item scale was .83.

Cooperative learning experiences was a 4-item scale based on student self-reports (in classes, students taught each other in addition to faculty teaching; participation in one or more study groups study groups outside of class, how often one worked with other students on projects outside of class). The 4-item scale had a reliability (Cronbach's α) of .70.

The final good practice measured students' interactions with diverse peers. The interactional diversity scale included 9-items based on student self-reports from two subscales: (a) diversity experiences (extent to one's institution encourages contact among students from different economic social, and racial/ethnic backgrounds; how often one had serious conversations with students of a different race or ethnicity than one's own; how often one participated in a racial or cultural awareness workshop during the academic year); and (b) meaningful discussions with diverse peers (how often one had meaningful and honest discussions about issues related to social justice with diverse peers, how often one had discussions regarding intergroup relations with diverse peers). The reliability (Cronbach's α) for the 9-item scale was .80.

Control Variables. A number of conceptual models are available to guide studies of college impact (Astin, 1991, 1993; Pascarella, 1985; Pascarella & Terenzini, 1991, 2005). These models suggest that to accurately estimate the net or unique influence of any single college

experience the researcher must take into account three other sets of influences: (1) the individual capabilities, characteristics, and experiences students bring to postsecondary education; (2) the characteristics of the institution attended; and (3) other college experiences which may covary with the treatment variable in question. This general framework was used to select this study's control variables. Student precollege characteristics and experiences included: a precollege measure of the dependent variable, academic motivation; ACT (or SAT equivalent) score as provided by each institution; sex; race (person of color/white); parental graduate education (whether or not at least one parent had a graduate degree); and a measure of high school social/academic involvement. The high school involvement scale was seven items (talking with teachers outside of class, extracurricular involvement, studying with other students) and had an alpha reliability (Cronbach's α) of .60.

The measure of institutional context was attendance at a liberal arts college as opposed to a regional institution or research university. Whether a student attended a liberal arts college was an important measure to take into account because attendance at a liberal arts college appears to increase the likelihood that students will be exposed to the good practices at issue in this study (Pascarella et al., 2004; Seifert et al., 2010).

Finally, because this study seeks to determine whether exposure to good practices predicts academic motivation, it seemed important that other college experiences be represented by students' major field of study. To do this, two dummy variables were created to represent three basic categories of undergraduate major: (1) social sciences or arts & humanities major; and (2) science, technology, engineering, or mathematics major. All other majors were the comparison group and coded zero. Table 1 presents the descriptive statistics for the measures utilized in this study, and Table 2 provides a correlation matrix of the same measures.

ANALYSIS

To estimate the relationship between the seven good practices and academic motivation, two OLS regressions were run. First, academic motivation at time 2 (end of the first year of college) was regressed on end-of-first-year measures of the good practices and all of the control variables described above, including the time 1 (pre-college) academic motivation score. Second, academic motivation at time 3 (end of the fourth year of college) was regressed on end-of-fourth-year measures of the good practices and all of the control variables described above. All analyses are based on weighted sample estimates, adjusted to the actual sample size for more accurate standard errors. Because both regression models were detailed and had more variables than individual sampling units (i.e., 17 institutions), procedures to statistically adjust artificially smaller standard errors for the nesting or clustering effect in the data were unavailable. Accordingly, a more stringent alpha level ($p < .01$) for statistical significance was used to reduce the probability of making a Type I error (Raudenbush & Bryk, 2002). All continuous variables, including the dependent variables, were standardized prior to the regression analyses. Thus, all regression coefficients can be considered as effect sizes: the fraction of a standard deviation increase or decrease in the dependent variable for a one unit increase in the independent variable, all other influences held constant.

RESULTS

Research Question 1: Does Exposure to the Good Practices Predict Change in Academic Motivation During the First Year of College?

The results of the OLS model predicting academic motivation at the end of the first year of college is summarized in Table 3. The model accounted for 47% of the variance in time 2

academic motivation. Net of background characteristics, including pre-college academic motivation score and institution type, four of the good practices measures were related to time 2 academic motivation in a statistically significant way. The largest effect was for good teaching and high quality interactions with faculty, which netted a .25 standard deviation increase in academic motivation. A similar sized effect (.22 standard deviation increase) was seen with regards to academic challenge and high expectations. Frequency of interaction with faculty and staff was also positively related to academic motivation, though its impact was of a lesser magnitude (.10 standard deviations). Finally, co-curricular involvement and positive peer interactions had a negative effect on academic motivation (-.10 standard deviations); it was the only statistically significant good practice variable to be negatively related to time 2 academic motivation.

Several of the background variable coefficients were also related to time 2 academic motivation is statistically significant ways. Time 1 academic motivation was a strong predictor of time 2 academic motivation (.40 standard deviations). But so too was gender, with men having over a tenth of a standard deviation less academic motivation at time 2 than did women (-.16). Though students of color had higher academic motivation net of other factors, the finding was not statistically significant. The other notable background characteristic was students' major, with being a STEM major relating to higher levels of academic motivation (.25 standard deviations). The implications of these findings are explored in a subsequent section.

Research Question 2: Does Exposure to the Good Practices Predict Change in Academic Motivation Across the Four Years of College?

The results of the OLS model predicting academic motivation at the end of the fourth year of college is also summarized in Table 2. The model accounted for 35% of the variance in time 3 academic motivation. Net of control variables, five of the good practices statistically significantly predicted academic motivation. The largest was, again, good teaching and high quality interactions with faculty, which was related to a .29 standard deviation increase in academic motivation. Faculty challenge and high expectations, as well as frequency of interaction with faculty and staff were again positive predictors of academic motivation (.18 and .09 standard deviations, respectively). Co-curricular involvement and positive peer interactions again had a negative effect on academic motivation (-.09), and was again the only negative statistically significant good practice. The only newly significant good practice was research with a faculty member. Students who engaged in research with a faculty member score .19 standard deviations higher in academic motivation.

Students' background characteristics continued to be significant predictors of academic motivation at time 3. Again, pre-college academic motivation significantly predicted academic motivation at time 3, though to a lesser extent (.28 standard deviations) than at time 2. Additionally, STEM majors continued to have greater academic motivation (2.2 standard deviations) relative to the comparison group. However, gender was no longer a significant predictor of academic motivation, net of other factors.

Interpretation of these results follows.

IMPLICATIONS

This section explores the implications—both practical and empirical—of the findings outlined above. Each of the principal findings is described in turn, beginning with those related to the good practices. As a preliminary matter, though, it is worth noting that the model predicting academic motivation at time 2 had considerably more explanatory power (R^2 = .48) than the model predicting academic motivation at time 3 (R^2 = .36). This may indicate that students' academic motivation levels are more susceptible to programmatic and instructional intervention during the first year of college, and become less apt to change after that time. Such an interpretation would lend empirical support to the notion that the first year of college is especially important in terms of setting students on a path toward long-term success (see Tinto, 2001). On the other hand, the greater explained variance at the end of the first year of college may be an artifact of how undergraduate life is structured. In particular, students just entering college tend to have more uniform schedules and curricular requirements than students about to leave it. If this be the case, it is possible that the educational practices that WNS measures are more uniformly applied to students early in their college careers, and thus more apt to account for changes in those students' underlying motivation to engage in academic tasks.

Under either conception, it appears clear that end-of-first-year academic motivation and end-of-fourth year academic motivation should be treated as analytically distinct. Examining one without the other has the potential to mask potentially divergent findings, as the next sections will explore.

Good Practices

Faculty Challenge and High Expectations. Whether faculty assignments and questions challenged their students was a significant positive predictor of academic motivation at both the end of first year, and the end of fourth year. With each standard deviation increase in faculty challenge, students achieved .22 standard deviations increase in academic motivation at time 2, and .18 standard deviations increase at time 3.

This finding extends the extant good practices literature by finding that, beyond improving students' critical thinking or moral reasoning skills, providing students with challenging tasks can also improve their basic motivation to engage in future tasks. This finding highlights the possibility of a sort of self-feedback loop, wherein each successive assignment presents an opportunity to improve academic motivation to engage in future assignments. Such a feedback loop could provide a blueprint for instructors seeking to design courses that capture and retain students' attentions and best efforts. Additional research is needed to determine conclusively whether such a feedback loop exists and, if it does, how instructors can best structure their assignments to maximize academic motivation. Such analyses will likely require more granular (e.g., classroom-level) data than is available from WNS.

Nonetheless, the WNS data does provide insight into another instructional implication of the faculty challenge finding. WNS's measure of faculty challenge is a self-report measure. Students are asked to report whether their various instructors pose challenging questions, or require completion of challenging assignments. The fact that these self-report scale scores are positively related to academic motivation would seem to indicate that what is relevant is less the "objective" difficulty of a task, and more the level of subjective challenge that students perceive.

This should lead instructors to consider both the way that academic tasks are framed, and also individual differences amongst their students. It is possible that one student might find a task so challenging that they decline to really try and complete it, while another finds it so simple that concerted effort is unnecessary. Moreover, some students might respond positively to an instructor's critiques, while another may become defensive and withdrawn. Accordingly, any consideration of the appropriate metering of challenge should also consider students' aptitude for perseverance, which some scholars have described using the term "grit" (see Duckworth, Peterson, Matthews, & Kelly, 2007).

Frequency of Contact with Faculty and Staff. Frequency of contact with faculty and staff is also a positive predictor of academic motivation, both at the end of the first and the fourth years of college. This result would indicate that interactions with university personnel may have some focusing effect on students' academic pursuits. Exactly how is a question that cannot be readily addressed by the WNS data, and may be more appropriate to a qualitative inquiry. However, additional analyses are needed to determine whether the positive general effects observed at time 2 and time 3 translate to all student groups. Indeed, past research analyzing other outcome variables has concluded that at least some of the effects of faculty and staff interactions is conditioned on students' background characteristics (see Seifert, Gillig, Hanson, Pascarella, & Blaich, 2014). Accordingly, additional analyses are necessary.

Good Teaching and Clarity of Instruction. Good teaching and clarity of instruction were statistically significant predictors of academic motivation at both time 2 and time 3. Moreover, the effect size for good teaching, unlike those for the other good practices, actually increased between time 2 and time 3 (.249 to .282 standard deviations). Thus, it would appear that good teaching not only retains its importance, but may actually grow in importance during

the four years of college. This finding expands the existing good teaching literature, which has documented a positive connection to numerous college outcomes, by finding that good teaching can also improve students' underlying motivation to complete academic tasks. This finding may also combat the anecdote-driven argument forwarded by some instructors who insist that their planned instructional model failed because of poor student motivation. On the contrary, this finding would suggest that high quality instruction can improve student motivation. Accordingly, student motivation is not a prerequisite of effective instruction, but is instead of its beneficiaries.

Peer Interactions. The only good practice negatively related with academic motivation is positive peer interactions. The peer interactions scale score is largely determined by the frequency of interactions with peers outside of the classroom, particularly in co-curricular activities. The most straightforward interpretation of the negative relationship between positive peer interactions and academic motivation is that the students that are most involved in co-curricular pursuits experience a sort of motivational penalty. The academic motivation scale asks only about academic tasks. Accordingly a student that spends a great deal of time focused on activities outside purely academic pursuits might, net of other factors, have less motivation left over to expend on schoolwork. Of course, this finding does not detract from existing empirical work that documents the positive relationship between positive peer interactions and desirable college outcomes. However, it does suggest that those gains might be act a cost. Further research is needed to determine whether there is a discernable sub-sample of highly involved students for whom co-curricular pursuits eclipse academics, and if so, whether any of the other good practices might protect against decline in academic motivation for these students.

Research with a Faculty Member. Participation in research with a faculty member was positively correlated with academic motivation, but only at time 3. This result would seem to indicate that, like faculty contact, students' motivation benefits from working closely with a faculty member on a research project. Moreover, it is plausible that those benefits might accrue over time, as the student becomes acclimated to the professor's work and is trusted with greater autonomy and responsibility. Accordingly, this study extends the existing good practices literature to suggest that, in addition to its positive effect on desirable college outcomes, research with a faculty member leads to gains in students' academic motivation.

Background Characteristics

Pre-College Academic Motivation. Pre-college academic motivation scores had a statistically significant effect on time 2 and time 3 academic motivation. This finding is unsurprising given that the conceptual model that guided this study places great emphasis on pre-test controls (see Pascarella & Terenzini, 2005). Of note, however, is the decreased relationship between the pre-test and outcome academic motivation at time 3 compared with time 2. This result may be further confirmation that academic motivation, though stable, is susceptible to change over time. If so, this result would strongly indicate the necessity of using longitudinal data to examine college students' academic motivation. Otherwise, researchers risk missing the changes that motivation undergoes over time.

Gender. Men had statistically significantly lower academic at the end of the first year of college, but not differences were statistically reliable at the end of the fourth year of college. This finding begs further inquiry. In particular, future research should consider whether any of

the good practices is particularly helpful to men during the first year of college. In other words, does exposure to any of the good practices afford protective features that are unique to men?

Major. Students majoring in STEM—science, technology, engineering, and mathematics—had higher academic motivation levels. However, the structure of the WNS data makes determining the causal ordering of the major-motivation relationship difficult. That is because WNS only collected disaggregated major data at time 3. Accordingly, it is unclear whether students are more motivated by studying STEM subjects, or already motivated students self-select into those subjects. As a result, it is difficult to full assess the implications of the relationship between major and academic motivation. At minimum, however, it appears clear that major has some connection with students' levels of academic motivation. Thus, it remains important to control for major when analyzing whether educational experiences affect students' academic motivation.

Limitations. Although the findings of this study are robust, they are subject to several limitations. The first is that this study relied on students' self-reports of both academic experiences and academic motivation. While relying on self-report measures of academic motivation is not unusual—in fact, every published study of academic motivation relies on a self-report measure—it poses a particular causal ordering challenge when coupled with self-report measures of student experiences.

The WNS data collections at time 2 and time 3 first required students to answer the WNS student experience questionnaires, which included the questions used to construct the good practices measures central to this study. Students were then given a short break. After the break, students were administered the outcome measures, including the measure of academic

motivation. It is possible that this ordering of self-reporting may prompt students to more closely recall the academic experiences associated with the good practices (e.g., recall a teacher whose instruction was clear and organized). Then, with those memories fresh in students' minds, they are asked to complete the academic motivation scale. Any effect of this paring may be mitigated by the fact that the types of questions that students answer with regards to their experiences are quite different from the question on the academic motivation measure (the former being more objective; the latter more subjective and introspective). Moreover, the sheer number of questions that students answer about their experiences and in completing the outcome measures may mitigate any causal ordering problems. Future researchers of academic motivation should consider imposing greater separation between administration of measures of student experiences and measures of academic motivation. (Indeed, classroom-level data collection employing both qualitative classroom observations and quantitative measure of academic motivation may eliminate the need for students to self-report instructional practices altogether.)

The argument for causal ordering may also be undermined by the fact that students are, to a large degree, permitted to self-select into academic and co-curricular experiences. Some of this self-selection may be controlled for by the major variable used in this study, but even within majors, students often have wide latitude to choose which classes and which instructors to take. Accordingly, it is possible that students are no so much gaining motivation as a result of the instructional techniques, but are self-selecting into courses that motivate them.

Though this self-feedback loop of self-selection and motivation may complicate the causal ordering of the relationships documented in this paper, it may not render this paper's results any less valuable to instructors or program administrators. Indeed, the fact that several of

the good practices are associated with higher motivation may suggest that students merely "vote with their feet" and self-select into classes taught by instructors that teach in a way that motivates them. This causal dynamic does not negate the importance of the good practices, but may instead indicate the good practices have some sort of inertial effect. Such an interpretation would only enhance the importance of the good practices as a tool for instructors, not diminish it. Future research should endeavor to more fully develop this line of inquiry. In particular, it should inquire whether students self-separate into groups (e.g., high motivation group, low motivation group) membership of which affects course-enrollment patterns and perceptions of instructor performance. This inquiry is especially relevant in light of this study's finding that the good practices explained considerably more variance in academic motivation after the first year of college than after the fourth. Indeed, it is possible that students enter college without sufficient exposure to collegiate teaching and co-curricular activities to properly self-select into classrooms that will improve their motivation. Future research should seek to further develop explanations for how the good practices may be especially important during the first year of college in order to aid instructors and administrators in designing first-year curricula that maximizes students' academic motivation.

CONCLUSION

The results of this paper appear to rebut any presumption that educational practices cannot affect students' level of academic motivation. On the contrary, many of the very same good practices that have been linked with gains in desirable college outcomes like growth in critical thinking are related with increased levels of academic motivation. Of particular import are the findings relating to faculty challenge and high expectations, and clear and organized instruction. Both of those good practices are not only well within instructors' control, they are

readily available across any one instructor's entire teaching load. While universal implementation of all of the relevant good practices—for instance, conducting research with a faculty member—may be difficult and beset by serious resource limitations, developing a challenging course plan that is highly organized and oriented around clarity of explanation is well within the power of virtually all college instructors. Accordingly, the results of this study provide a useful starting point for instructors that wish to teach in a manner conducive not only to improving students' cognitive skills, but also to improving their academic motivation. In short, the oft-made argument that more challenging, rigorous instruction will ultimately fail because students lack the requisite motivation seems without merit in light of these findings. Additional research should, however, examine the dynamics of faculty challenge and clear and organized instruction more precisely than was possible in this study. In particular, future researchers should examine whether the environment of a particular academic setting—be it an entire university, a college, or a department—is replete with faculty challenge and organized instruction such that mere exposure to the environment improves students' academic motivation. Put another way, are there "types" of academic settings that foster academic motivation?

The results of this study also indicate that the good practices have greater explanatory power during the first year of college than across the four years of college. This result may indicate that the first year of college is particularly important to the development of students' academic motivation. The more uniform nature of the first year curriculum, when most students are engaged in general education courses not of their choosing, may also ameliorate any effect of student self-selection into classes or co-curricular experiences. Additional research is needed to more fully examine how first year experiences may uniquely support the development and

retention of academic motivation. Such inquiries will likely require more granular, classroom-level data than those provided by WNS.

The results of this study also highlight the need for additional research for which the WNS data is well-suited. The results raised potential differences in academic motivation based on students' background characteristics, namely pre-college academic motivation, gender, and major. The literature raises many more demographic characteristics that should be subject to additional analysis (see Seifert et al., 2014). In particular, future research should explore whether various student groups benefit more or less from the good practices whose general effects were documented in this paper. For instance, perhaps men benefit more from certain of the good practices than do women, and students of color from another subset of practices. That research should draw on the results of this study to help document more tailored ways in which postsecondary educators can design programs and instruction to bolster students' intrinsic motivation to complete academic tasks.

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Table 1. **Descriptive Statistics***

Time 1: measures taken before the first year of college.

Time 2: measures taken at the end of the first year of college.

Time 3: measures taken at the end of the fourth year of college.

Predictor Variable	*Predictor Variable Description*	**Time 1 Means** (s.d.)	**Time 2 Means** (s.d.)	**Time 3 Means** (s.d.)
Academic motivation	Academic motivation scale score measured before participant started college.	0 (1)	-.09 (1.02)	-.13 (.99)
Student of color	1 = student of color. 0 = white student.	.18		
Male	1 = male. 0 = female.	.47		
Parental graduate education	1 = parent has graduate degree. 0 = parent has less than graduate degree.	.44		
High school involvement	Scale score; measures degree of students' involvement in high school activities.	0 (1)		
Pre-college academic ability	Scale score; students' pre-college SAT or ACT score converted to a common scale.	0 (1)		
Institution type	1 = liberal arts college. 0 = all other institution types.	.54		
Faculty challenge and high expectations	Scale score; measures student perceptions of the degree to which their instructors pose challenging questions/assignments.		-.13 (1)	-.21 (.99)

Table 1—continued

Diversity experiences	Scale score; student self-reports of experiences with diverse peers, including meaningful discussions.		-.07 (.99)	-.09 (.96)
Frequency of contact with faculty and staff	Scale score; frequency of contact with faculty and staff outside of the classroom.		-.02 (1)	-.19 (.96)
Good teaching and clarity of instruction	Scale score; measures student perceptions of the quality and clarity of instruction received.		-.16 (1)	-.28 (1.03)
Peer interactions	Scale score; measures the frequency of peer contact outside of the classroom, particularly for co-curricular activities.		-.1 (1)	-.09 (1)
Cooperative learning	Scale score; measures the frequency of participation in peer learning groups and activities.		-.09 (1.02)	-.02 (.97)
Participated in research with a faculty member	1 = participated in research with a faculty member. 0 = did not participate in faculty research.		.04	.05
Social science or humanities major	1 = majored in the social sciences or humanities. 0 = did not major in social science or humanities.			.48
Stem major	1 = science, technology, engineering, or mathematics major. 0 = non-STEM major.			.26

* Note that all continuous variables have been standardized. Descriptive statistics were run using weighted samples.

Table 2. **Correlation Coefficients**

Time 2	*Time 2 Academic motivation*	*Time 1 Academic motivation*	*Student of color*	*Male*	*Parental graduate education*	*High school involvement*	*Pre-college academic ability*	*Institutional type*	*Faculty challenge and high expectations*	*Diversity experiences*	*Contact with faculty/staff*	*Good teaching*	*Peer interactions*	*Cooperative learning*	*Faculty research*	*Social Science major*	*STEM major*
Time 2 Academic motivation	1																
Time 1 Academic motivation	.56	1															
Student of color	.05	.06	1														
Male	-.05	-.05	-.06	1													
Parental graduate education	-.02	-.01	-.11	.05	1												
High school involvement	.26	.26	.04	-.23	.03	1											
Pre-college academic ability	.01	.01	-.26	.09	.25	.07	1										
Institution type	.12	.13	-.05	.03	-.05	-.07	-.19	1									
Faculty challenge and high expectations	.49	.48	.01	-.01	.03	.28	.01	.13	1								
Diversity experiences	.24	.24	.19	.03	.02	.18	.03	.04	.49	1							
Frequency of contact with faculty and staff	.36	.36	.08	.02	-.05	.30	-.09	.06	.49	.49	1						
Good teaching and clarity of instruction	.45	.45	-.08	.04	.03	.17	.10	.21	.55	.26	.32	1					
Peer interactions	.08	.08	-.14	.01	.08	.17	.13	.05	.25	.19	.20	.30	1				
Cooperative learning	.28	.28	.03	.02	.06	.22	.07	.01	.42	.29	.39	.32	.30	1			
Participated in research with a faculty member	.08	.08	.04	.01	.01	.04	-.01	.01	.08	.07	.09	.03	.02	.09	1		
Social science or humanities major	-.01	-.01	.03	-.02	.09	.03	.06	.22	.12	.18	.01	.08	-.04	-.09	-.03	1	
Stem major	.16	.16	.16	.09	.03	.01	.16	.07	-.04	-.06	.01	04	-.01	.20	.07	-.40	1

Table 2—continued

Time 3	*Time 3 Academic motivation*	*Time 1 Academic motivation*	*Student of color*	*Male*	*Parental graduate education*	*High school involvement*	*Pre-college academic ability*	*Institutional type*	*Faculty challenge and high expectations*	*Diversity experiences*	*Contact with faculty/staff*	*Good teaching*	*Peer interactions*	*Cooperative learning*	*Faculty research*	*Social Science major*	*STEM major*
Time 3 Academic motivation	1																
Time 1 Academic motivation	.42	1															
Student of color	.02	.07	1														
Male	-.07	-.10	-.05	1													
Parental graduate education	-.03	-.04	-.11	.05	1												
High school involvement	.22	.35	.04	-.23	.04	1											
Pre-college academic ability	-.02	.03	-.27	.09	.24	.07	1										
Institution type	.14	.05	-.05	.03	-.05	-.08	-.19	1									
Faculty challenge and high expectations	.46	.22	.01	.01	.03	.28	.01	.13	1								
Diversity experiences	.24	.19	.19	.03	.02	.17	.03	.03	.49	1							
Frequency of contact with faculty and staff	.36	.21	.08	.02	-.05	.30	-.09	.06	.49	.49	1						
Good teaching and clarity of instruction	.43	.15	-.08	.04	.03	.16	.09	.21	.55	.26	.32	1					
Peer interactions	.08	.04	-.14	.01	.08	.17	.13	.05	.26	.19	.20	.30	1				
Cooperative learning	.25	.13	-.01	.02	.05	.22	.08	.01	.43	.29	.39	.33	.29	1			
Participated in research with a faculty member	.26	.19	.02	.01	.01	.04	-.01	-.01	.08	.07	.09	.03	.02	.09	1		
Social science or humanities major	-.01	.01	.04	-.02	.10	.03	.06	.22	.12	.18	.01	.08	-.04	-.10	-.02	1	
Stem major	.16	.16	-.01	.09	.03	.01	.16	-.07	-.04	-.06	.01	.04	-.01	.20	.07	-.40	1

Table 3. **OLS Regression Coefficients**

Model 1: Predicting academic motivation at the end of the first year of college.
Model 2: Predicting academic motivation at the end of the fourth year of college.

Predictor Variable	*Predictor Variable Description*	**Model 1 coefficients** (s.e.)	**Model 2 coefficients** (s.e.)
Pre-college academic motivation	Academic motivation scale score measured before participant started college.	.399** (.02)	.281** (.02)
Student of color	1 = student of color. 0 = white student.	.10 (.05)	.021 (.05)
Male	1 = male. 2 = female.	-.155** (.04)	-.034 (.04)
Parental graduate education	1 = parent has graduate degree. 0 = parent has less than graduate degree.	.009 (.04)	-.081 (.04)
High school involvement	Scale score; measures degree of students' involvement in high school activities.	-.018 (.02)	.004 (.02)
Pre-college academic ability	Scale score; students' pre-college SAT or ACT score converted to a common scale.	-.026 (.02)	-.08** (.02)
Institution type	1 = liberal arts college. 0 = all other institution types.	.018 (.04)	-.055 (.05)
Faculty challenge and high expectations	Scale score; measures student perceptions of the degree to which their instructors pose challenging questions/assignments.	.220** (.03)	.180** (.03)
Diversity experiences	Scale score; student self-reports of experiences with diverse peers, including meaningful discussions.	-.043 (.02)	-.057 (.02)

Table 3—continued.

Frequency of contact with faculty and staff	Scale score; frequency of contact with faculty and staff outside of the classroom.	.094** (.02)	.090** (.03)
Good teaching and clarity of instruction	Scale score; measures student perceptions of the quality and clarity of instruction received.	.249** (.02)	.282** (.02)
Peer interactions	Scale score; measures the frequency of peer contact outside of the classroom, particularly for co-curricular activities.	-.101** (.02)	-.099** (.02)
Cooperative learning	Scale score; measures the frequency of participation in peer learning groups and activities.	.012 (.02)	.032 (.02)
Participated in research with a faculty member	1 = participated in research with a faculty member. 0 = did not participate in faculty research.	.106 (.09)	.191** (.05)
Social science or humanities major	1 = majored in the social sciences or humanities. 0 = did not major in social science or humanities.	.025 (.04)	-.022 (.05)
Stem major	1 = science, technology, engineering, or mathematics major. 0 = non-STEM major.	.246** (.05)	.218** (.05)
		R^2 = .48	R^2 = .36

*p<.01; **p<.001.

PREDICTING CHANGE IN ACADEMIC MOTIVATION: CONDITIONAL EFFECTS

Paper #3

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ABSTRACT

This study explores the conditional effects of good practices in higher education on academic motivation across the four years of college. Using longitudinal data from the Wabash National Study of Liberal Art Education, this study determines that the effects of the good practices differ based on student background characteristics. It then explores those differences by running separate OLS models predicting academic motivation for relevant student sub-groups. It finds that faculty challenge and high expectation, and clear and organized instruction are positively related with academic motivation across all student groups and across all four years of college. It also finds that various other of the good practices have differential effects across student groups. It concludes by exploring the implications of those differential findings, and providing suggestions for future research.

INTRODUCTION

College students' academic motivation—their intrinsic motivation to engage in academic tasks—is a predictor of desirable college outcomes. Moreover, research indicates that good practices in higher education, such as high faculty expectations, have the potential to increase students' academic motivation (see Gillig, Dissertation Paper #2). However, there is reason to believe that the effects of the good practices on academic motivation may be moderated by students' background characteristics. For instance, men exhibit greater declines in academic motivation during the first year of college than did women (see Gillig, Dissertation Paper #1). Additionally, past research has found that the effects of the good practices in higher education on outcomes like critical thinking are at least partially conditioned on students' background characteristics (see Seifert, Gillig, Hanson, Pascarella, & Blaich, 2014).

Researchers and theorists have noted the need "use data to represent educational processes and outcomes on a large scale to reveal inequities and to identify social or institutional perpetuation of systemic inequities in such processes and outcomes" (Stage, 2007, p. 10). This paper seeks to do just that by documenting the ways in which students' background characteristics moderate the connection between the good practices and academic motivation.

LITERATURE

This paper draws on three distinct bodies of literature: the academic motivation literature, the good practices literature, and the conditional effects literature. Each is described in turn.

Academic Motivation

Motivation consists of the "factors and processes that initiate and direct the magnitude, persistence, and quality of goal-directed behaviors" (Dweck & Elliott, 1983; Elliott & Dweck, 1988; Paulsen & Feldman, 1999, p. 18). Past scholarship that applies motivation theory to

academic setting has not converged on a single definition of motivation. However, a common definition utilized in empirical work is the "goal" theory, which defines motivation as the effort a student expends to achieve a particular goal (see Eccles & Wigfield, 2002). The key element of this theoretical framework is the difference between goals that are external to the learner, like getting a high GPA or being admitted to graduate school, and goals internal to the learned, such as mastery of a particular topic. This distinction is known more commonly as the difference between extrinsic and intrinsic motivation, with intrinsic motivation being linked to greater gains in desirable educational outcomes. Theorists have defined intrinsic motivation as "(a) preference for hard and challenging tasks, (b) learning that is driven by curiosity or interest, and (c) striving for competence or mastery" (Eccles & Wigfield, 2002, p. 114). The existing theory of intrinsic motivation—at least as applied to academic settings—conceives of motivation as a trait-like characteristic. Unlike affect or emotion, academic motivation is not changeable over short periods of time. Yet, it is also more changeable and variant than a trait, which may remain stable over even a long period of time. Thus, academic motivation is stable, yet subject to change over time. Analysis of longitudinal data from the Wabash National Study of Liberal Arts Education revealed that roughly half of the overall variance in students' academic motivation scores rested within students, which lends empirical support to the theory that academic motivation is susceptible to change over time (Gillig Dissertation, Paper #1).

Several empirical studies have linked intrinsic motivation to positive educational outcomes such as: achievement (Chemers, Hu, & Garcia, 2001; Struthers, Perry, & Menec, 2000); persistence (D. Allen, 1999; J. Allen, Robbins, Casillas, & Oh, 2008; Lotkowski, Robbins, & Noeth, 2004); and cognitive gains (Garcia & Pintrich, 1992). In addition, some of that research indicates that student demographic characteristics such as race and gender may

moderate the effects of academic motivation (see Robbins, et al., 2004). In particular, academic motivation appears to play a more important role for students of color in terms of persistence and performance. Similarly, academic motivation was more strongly related to positive educational outcomes for women than for men. These studies would seem to indicate that research and programmatic efforts should be directed at improving students' intrinsic academic motivation, or at minimum, practices that are positively associated with academic motivation should be retained. The existing theoretical literature, as well as some initial empirical findings indicate that academic motivation is a stable, trait-like characteristic that is nonetheless susceptible to change over time, including during the four years of college (see Gillig, Dissertation Paper #1). Moreover, some initial empirical analyses indicate that students' exposure to some of the same sort of practices that have been shown to improve critical thinking and moral reasoning skills—namely clear and organized instruction and faculty challenge and high expectations—are positively associated with students' self-reported academic motivation levels, both at the end of the first and end of the fourth years of college (see Gillig, Dissertation Paper #2). Accordingly, there is reason to inquire further into the ways that academic motivation may be affected by students' exposure to academic experiences, and in particular whether certain students benefit more from certain of those experiences than do others.

Good Practices in Higher Education

There is an extensive body of scholarly work—both empirical and theoretical—that documents the efficacy of postsecondary programs and curriculum. This body of work is generally known as the "college impact" literature. A portion of this literature seeks to identify empirically verifiable "good practices," which are associated with increases in desirable college outcomes such as critical thinking skills. This good practices scholarship is largely oriented

around Chickering and Gamson (1987, 1991) synthesis of principles of good practice in undergraduate education. The principles—(a) student-faculty contact; (b) cooperation among students; (c) active learning; (d) prompt feedback to students; (e) time on task; (f) high expectations; and (g) respect for diverse students and diverse ways of knowing—have become highly influential in research on the effects of college on students, and are frequently studied. For instance, the scales and items that comprise the influential and well-used National Survey of Student Engagement (NSSE) are in large part an operationalized version of Chickering and Gamson's principles of good practice (Kuh, 2001).

Since their synthesis by Chickering and Gamson, the principles of good practice have been subjected to rigorous empirical review. The results of these studies demonstrate, in the main, that "various measures of the good practice dimensions are significantly and positively linked to desired aspects of cognitive and non-cognitive growth during college" (Pascarella et al., 2006, p. 254). Extensive research has documented the positive effects of the good practices on desirable college outcomes (Kuh & Hu, 2001). These studies have included examinations of diversity experiences (Gurin, Dey, Hurtado, & Gurin, 2002; Gurin, Nagda, & Lopez, 2004; Pascarella, Martin, Hanson, & Trolian, 2014; Pascarella, Palmer, Moye, & Pierson, 2001); student faculty interactions (Kuh & Hu, 2001; Terenzini, Springer, Pascarella, & Nora, 1995); and cooperative student learning experiences (Cabrera et al., 2002). (For an exhaustive list of good practices studies, see Pascarella et al., 2006.)

Many of these college impact studies employ studies of the good practices employ Pascarella and Terenzini's (2005) analytic model to isolate the effects of educational practices on college outcomes. This so-called "college impact" model is based on the recognition that students come to college with a host of background characteristics including their academic

preparedness, sociodemographic characteristics, and orientations toward learning that may affect in-college processes and outcomes (Astin, 1993; Pascarella, 1985). Accordingly, the college impact analytic model has three components. First, an outcome of interest is measured before, during and after exposure to college. This pre-test, post-test design allows researchers to isolate change over time while also accounting for individual differences because in a pre-test, post-test design, students serve as their own control group. Second, a host of background factors such as students' high school academic ability, race, gender and parental education are controlled to avoid confounding the "treatment effects" of exposure to various collegiate experiences. Third, multiple collegiate experiences are measured simultaneously, which allows researchers seeking to document the effects of good practices to control for the potential confounding effects of other educational experiences.

Conditional Effects

A small, but growing, body of literature documents the ways in which students' background characteristics moderate the effects of the good practices on college outcomes. A recent study by Seifert and colleagues found that gender, pretest scores and pre-college academic ability all moderated the effects of at least one good practice (Seifert et al., 2014). Using data from the Wabash National Study of Liberal Arts Education, the authors concluded that "future conceptualizations of high impact/good practices that do not investigate the potential conditional effects between student background characteristics and experience of good practice on student learning outcomes risk not only inaccuracy but may also miss important findings" (p. 557).

Past research has identified several characteristics relevant to the detection of conditional effects of good practices in higher education. These background characteristics include, race,

gender, pre-college academic ability and parental education (Padgett, Johnson, & Pascarella, 2012; Seifert et al., 2014; Trolian, 2014). Additionally, past research has noted that certain of the good practices may have compensatory effects for students who enter college with lower levels of the outcome of interest (for instance, critical thinking skills). Adapting these findings to the present study, it is possible that students who enter college with lower levels of academic motivation may realize greater benefits from exposure to one or more the good practices.

Though the nascent conditional effects literature provides a foundation for the current study, no previous research has examined the extent to which the impact of good practices on students' academic motivation differs based on students' background characteristics. This paper addresses this novel issue.

RESEARCH QUESTION

Based on the foregoing, this paper addresses the following research question:

1. Is the relationship between students' exposure to good practices and academic motivation conditioned on student background characteristics, including:
    a. Race
    b. Gender
    c. Pre-college academic ability
    d. Parental education
    e. Pre-college academic motivation

DATA AND METHODS

Data

Sample. Data for this study came from the Wabash National Study of Liberal Arts Education ("WNS"), a multi-institutional study of college experiences and outcomes. WNS utilizes a longitudinal pre-test, post-test design to isolate the unique effects of various college experiences on measured outcomes including critical thinking skills and moral reasoning. Forty-three four-year colleges and universities of diverse institutional types and selectivity participated in WNS across its four cohorts of data collection; this study utilizes data from the WNS cohort that began college in fall 2006, resulting in an analytic sample size of roughly 1600 students from 17 institutions. Institutional types in the WNS study included liberal arts colleges, regional comprehensive universities, and large research universities. Although the 2006 cohort of WNS also included two community colleges, data from those institutions was excluded from this paper's analysis.

WNS collected data from students at three time points: at the beginning of the first year of college (time 1), at the end of the first year of college (time 2), and at the end of the fourth year of college (time 3). This longitudinal design allows for evaluation of changes in academic motivation across time because, through use of the time 1 pre-test score, students serve as their own controls.

Good Practices. This study was guided by the college impact literature in selecting practices and experiences in undergraduate education that are linked to personal and intellectual growth during college (see Astin, 1993; Chickering & Reisser, 1991; Kuh, 2009; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Pascarella & Terenzini, 1991, 2005). The WNS measures of

the good practices were adapted, or adopted in whole, from the National Study of Student Learning (Cruce et al., 2006; Pascarella et al., 2006) and the National Survey of Student Engagement (Kuh, 2001). The good practices measures were designed to measure the same good practices synthesized by the college impact literature, including doing individual research with a faculty member, quality of faculty-student interaction, and quality of instruction received. As previously noted, a robust body of evidence has grown up around these measures, and indicates that the good practices measured by the National Study of Student Learning and the National Survey of Student Engagement are significantly linked to student cognitive and personal development during college (see Cruce et al., 2006; Kuh, 2009; Pascarella et al., 2006, 2009).

In sum, this study employed seven different dimensions of good practices:

- Worked with a faculty member on a research project
- Good teaching and high quality interactions with faculty
- Academic challenge and high expectations
- Co-curricular involvement and positive interactions with peers
- Interactions with faculty and student affairs staff
- Cooperative learning experiences
- Interactional diversity

The last six dimensions of good practices were measuring using composite scales derived using factor analysis and constructed by first standardizing each item and then computing the scale mean across items. Worked with a faculty member on a research project was a single item; students were asked to indicate whether or not during their attendance at the institution they had

worked on a research project with a faculty member outside of course or program requirements and responses were coded 1 = “done” or 0 = “not done.”

The good teaching and high quality interactions with faculty measure was a 23-item scale that combined four subscales: (1) exposure to clear and organized instruction (e.g., the frequency with which faculty gave clear explanations and make good use of examples and illustrations to explain difficult points, frequency that class time was used effectively); (2) faculty members’ interest in teaching and the extent to which faculty are interested student development, which is defined as helping students grow in more than just academic areas; (3) prompt feedback, namely how often faculty timely provided students with information about their level of performance, and how often faculty checked to determine whether material had been mastered before moving on to new material); and (4) quality of non-classroom interactions with faculty, including the extent to which non-classroom interactions with faculty had an impact on intellectual growth and development of new ideas. The internal consistency (alpha) reliability for the 23-item scale was .92.

Academic challenge and high expectations was a 31-item scale that consisted of four subscales: (1) academic effort, including how often a student believed they worked harder than he or she thought they could to meet an instructor’s expectations, the number of hours per week spent preparing for class, extent that the student’s institution emphasizes sending significant time studying, number of assigned books that the student read during the current year); (2) challenging class experiences and high faculty expectations, including how often faculty asked challenging question, challenged a student’s ideas during class, asked students to argue the pros and cons of a particular issue, and asked students to point out weaknesses in materials covered in the course; (3) frequency of higher-order exams and assignment, which measured how frequently

exams or assignment required students to write essays, argue for or against a particular point of view, and pursue a particular line of argument; and (4) integration of ideas, which measured the extent to which students believe that their courses have helped them to understand political, historical, and social connections between past events, and how often they were required to write a paper or complete a project that required integrating ideas from several sources. The alpha reliability for the 31-item scale was .88.

Co-curricular involvement and positive interactions with peers was a 9-item scale. The scale measured the number of hours per week that students spent engaged in co-curricular activities including campus organizations, fraternity and sorority life, athletics (both intercollegiate and intermural), and student government. The measure also asked about the degree to which students reported positive interactions with peers, including the extent to which their friendships with students are personally satisfying and interpersonal relationships with other students have a positive impact on their intellectual growth. The 9-item scale had an alpha reliability of .85.

Interactions with faculty and student affairs staff was a 9-item scale based on student self-reports. The scale combined items two subscales: (1) frequency of interactions with faculty, such as how often a student discussed grades or assignments with their instructors, and how often the student worked with faculty members on activities such as committees, orientation, and student life-related activities; and (2) frequency of interactions with student affairs staff, which asked about the frequency with which students discussed serious issues and problems with students affairs professionals, and the frequency with which students worked on out-of-class activities such as committees with student affairs staff. The alpha reliability for the 9-item scale was .83.

Cooperative learning experiences was measured using a 4-item scale based on student self-reports of in- and out-of-class activities where students taught each other, or participated in study groups, or worked with other students on projects. The 4-item scale had an alpha reliability of .70.

The last good practice measured students' interactions with diverse peers. The 9-item interactional diversity scale is composed of student self-reports from two subscales: (1) diversity experiences, which measured the extent to which students' institutions encourage meaningful contact among students from differing social, economic, and racial/ethnic backgrounds, as well as how often students had serious conversations with a person different from themselves; and (2) meaningful discussions with diverse peers, which assessed the frequency with which one had meaningful and honest conversations concerning issues related to social justice with students different from themselves. The alpha reliability for the 9-item scale was .80.

Control Variables. The college impact conceptual model used in this study (see Astin, 1991, 1993; Pascarella, 1985; Pascarella & Terenzini, 1991, 2005) suggests that to accurately estimate the unique influence of the good practices on an outcome variable (e.g., academic motivation), the following sets of influences must be controlled for: (1) capabilities, characteristics, and experiences that a student brings with them to college; (2) the institutional characteristics of each student's college or university; and (3) the myriad college experiences that may covary with the outcome variable of interest. This study controlled for a number of student background characteristics, including precollege characteristics and experiences: a precollege (time 1) measure of the dependent variable, academic motivation; ACT (or SAT equivalent) score, which was provided by each institution; sex; race (person of color/White); parental graduate education (whether or not at least one parent had a graduate degree); and a

measure of high school social/academic involvement. The high school involvement scale consisted of seven items (e.g., talking with teachers outside of class, extracurricular involvement, studying with other students) and had an alpha reliability of .60.

The measure of institutional context was a dummy-coded variable for attendance at a liberal arts college (attended liberal arts college = 1; attended another type of institution = 0). Past research indicates that controlling for institutional type in this way is particularly important in studies of the good practices because attendance at a liberal arts college increases the probability that students will be exposed to the good practices at issue in this study (Pascarella et al., 2004; Seifert et al., 2010).

Finally, because this study seeks to determine whether exposure to good practices predicts academic motivation, and because student experiences may be different based on major, it was deemed important to statistically control for students' major field of study. To do this, two dummy variables were created to represent three rough categories of undergraduate major: (1) social sciences or arts and humanities major; and (2) science, technology, engineering, or mathematics (STEM) major. All other majors were the comparison group and coded as zero.

Academic motivation measure. The dependent measure examined in this study is students' intrinsic motivation to engage in academic tasks. WNS measured academic motivation using an eight-item measure consisting of Likert-scale items that asked students to self-report their level of intrinsic motivation (e.g., "I enjoy the challenge of learning complicated new material"). WNS measured academic motivation during each wave of data collection: before the start of college (time 1), after the first year of college (time 2), and after the fourth year of college (time 3). The scale, which was vetted and pilot tested before administration to WNS

participants, has an internal consistency reliability (Cronbach's α) of .69. Higher scores indicate higher levels of academic motivation.

Table 1 presents the descriptive statistics for all measures utilized in this study.

ANALYSIS

Analyses consisted of OLS regressions and were carried out in two stages. In the first stage, two general effects models were estimated: (1) time 2 (end of first-year) academic motivation was regressed on all of the time 2 good practice measures and the control variables described above; and (2) time 3 (end of fourth-year) academic motivation was regressed on all of the time 3 good practice measures and the control variables described above. Then, to determine the presence of conditional effects, a series of cross-product terms were added to the general effects equations (Cohen, Cohen, West, & Aiken, 2013). These cross-products terms were computed as follows:

a. *Race*: the dummy variable indicating that a respondent was a student of color was crossed with all good practice measures.
b. *Gender*: the dummy variable indicating that a respondent was male was crossed with all good practice measures.
c. *Pre-college academic ability*: the continuous measure for pre-college academic ability was analyzed and quartile cutoff scores were determined. Two dummy variables were created—one for top quartile academic ability, and one for bottom quartile academic ability—and crossed with each of the good practice measures.
d. *Parental education*: the dummy variable indicating that a respondent's parents had a graduate degree was crossed with each of the good practice measures.

e. *Pre-college academic motivation*: the continuous measure for pre-college academic motivation and quartile cutoff scores were determined. Two dummy variables were created—one for top quartile academic motivation, and for bottom quartile motivation—and crossed with each of the good practice measures.

If, when added to the general effects equations, any set of cross-product terms was associated with a statistically significant increases in explained variance ($p<.05$), then analyses proceeded to the second stage. In the second stage, the sample was disaggregated into separate subsamples to examine the nature of the conditional effect (Aiken, West, & Reno, 1991). Separate models were run for each subsample. All cross-product terms were standardized to reduce collinearity (Jaccard & Turrisi, 2003).

All analyses are based on weighted sample estimates, adjusted to the actual sample size for correct standard errors. Although statistical controls for the nesting of students within institutions are preferable, the regression models in this study were detailed and had more variables than individual sampling units (i.e., 17 institutions). Therefore, statistical procedures were unavailable to adjust the standard errors for the nesting or clustering effect in the data (Raudenbush & Bryk, 2002). Consequently, a more stringent alpha level ($p < .01$) was used for statistical significance to reduce the probability of making a Type I error. However, given the substantially smaller subgroup sample sizes, a more liberal level of significance ($p < .05$) was employed for the subgroup analyses.

Prior to analyses, all continuous variables were standardized with a mean of 0 and a standard deviation of 1 to permit comparison of otherwise incommensurable explanatory variables (Fox, 1997). For continuous variables, the coefficients represent that part of a standard deviation change in the dependent measure for every one standard deviation increase in the independent measure, all other influences held constant. For categorical independent variables, the coefficients represent that

part of a standard deviation change in the dependent measure for each one unit increase in the independent variables (e.g., difference between female and males).

RESULTS

Phase 1 Analyses: Entering Cross-Product Terms

Race. Addition of the race cross product terms to the model predicting academic motivation at time 2 yielded a statistically significant improvement in explained variance ($p<.05$). The model revealed that the faculty challenge, faculty interaction, good teaching, and peer interactions were all significant predictors of academic motivation.

Addition of the race cross product terms to the model predicting academic motivation at time 3 also resulted in a statistically significant improvement in proportion of variance explained ($p<.01$). In that model, faculty challenge, faculty interaction, good teaching, peer interaction, cooperative learning, and research with a faculty member were significant predictors of academic motivation.

Gender. Addition of the gender cross product terms to the model predicting academic motivation at time 2 yielded a statistically significant increase in the proportion of explained variance ($p<.001$). Faculty challenge, faculty interaction, good teaching, and peer interactions were significant predictors of academic motivation at time 2.

Addition of the gender cross product terms at time 3 also yielded greater explained variance ($p<.001$). However, at time 3 only faculty challenge and good teaching were statistically significant predictors of academic motivation.

Pre-college academic ability. Addition of the bottom-quartile academic ability cross product terms resulted in a significant increase in explained variance at time 2 ($p<.01$). In the time 2 model, faculty challenge, good teaching, and peer interactions each predicted academic motivation. At time 3, addition of the bottom-quartile academic ability cross products also resulted in improved variance explained ($p<.001$). In that model, all of the good practices—faculty challenge, diversity experiences, faculty interactions, good teaching, peer interactions, cooperative learning, and research with a faculty member—were significant predictors of academic motivation.

Addition of the top-quartile academic ability cross products to the model predicting academic motivation at time 2 did not yield a statistically significant increase in explained variance. The same was true at time 3, where the top-quartile academic ability cross products improved variance explained, but not to a statistically significant level ($p=.056$).

Parental education. Addition of the parental education cross product terms to the model predicting academic motivation at time 2 yielded a significant improvement in explained variance ($p<.001$). In the time 2 model, faculty challenge, faculty interactions, good teaching, and peer interactions were statistically significant predictors of academic motivation.

Addition of the parental education cross products did not explain statistically significantly more variance in the time 3 model.

Pre-college academic motivation. Addition of the bottom-quartile academic motivation cross products led to greater variance explained in the model predicting time 2 academic motivation ($p<.05$). In that model, faculty challenge, faculty interaction, good teaching, and peer interactions were statistically significant predictors of academic motivation. Addition of the

bottom-quartile academic motivation cross products to the time 3 model did not yield any statistically reliable improvement in variance explained.

Addition of the top-quartile academic motivation cross products to the model predicting academic motivation at time 2 yielded an improvement in variance explained ($p<.001$). Faculty challenge, good teaching, and peer interactions were statistically significant predictors of academic motivation at time 2. Addition of the cross product terms to the model predicting academic motivation at time 3 did not yield significant improvement in variance.

Phase 2 Analyses: Predicting Academic Motivation for Student Sub-Samples

The results described in the preceding section indicate the following. At time 2 (end of the first year of college), race, gender, bottom-quartile academic ability, parental education, bottom-quartile pre-college academic motivation, and top-quartile pre-college academic motivation appeared to moderate the effects of the good practices on academic motivation. At time 3, race, gender, and bottom-quartile academic ability appeared to moderate the effects of the good practices on academic motivation. Accordingly, in this phase of the analysis, separate analyses were run on sub-samples consisting of the relevant demographic groups at time 2 and time 3.

Academic Motivation at Time 2

The time 2 results are reported in Table 2. The far-left column provides the results of the OLS model predicting time 2 academic motivation for the entire sample. This model acts as a baseline for the other models run on the relevant sub-models. Results are described for each sub-sample analyzed at time 2 (end of the first year of college).

Race. With regards to the good practices, students of color evidenced several interesting findings. First, frequency of contact with faculty and staff appeared to be more important for students of color ($\beta = .129$; $p<.05$) than for all students, as measured by the baseline model ($\beta = .094$; $p<.01$), and for white students ($\beta = .081$; $p<.01$). At the same time, clear and organized instruction, though still as statistically significant positive predictor, appeared to be slightly less important for students of color relative to white students ($\beta = .186$; $p<.01$). In addition, cooperative learning experiences, which did not predict academic motivation in a statistically reliable way for the entire sample or for white students, did positively predict academic motivation among students of color ($\beta = .122$; $p<.05$).

In terms of the demographic controls, students of color majoring the in the social sciences and humanities appeared to have statistically significantly lower levels of academic motivation at time 2 than the comparison group ($b = -.216$; $p<.05$). There was also a statistically significant negative relationship between high school involvement and academic motivation at time 2 ($\beta = - .145$; $p<.05$); this result was not observed in the baseline model or for white students.

Gender. Male students, like the overall sample, benefited from faculty challenge and high expectations ($\beta = .263$; $p<.001$) more than women did ($\beta = .189$; $p<.001$). Male students saw a negative relationship between diversity experiences ($\beta = -.083$; $p<.05$) that was not observed in the baseline model or for women. Male students also appeared to benefit more from clear and organized instruction ($\beta = .284$; $p<.001$) relative to the baseline sample ($\beta = .249$; $p<.001$) and relative to their female counterparts ($\beta = .227$; $p<.001$). Peer interactions ($\beta = -.131$; $p<.001$) and cooperative learning ($\beta = -.063$; $p<.05$) both had negative relationships with academic motivation for men at time 2.

When compared with white men, male students of color had statistically significantly higher levels of academic motivation at time 2 ($b = .378$; $p<.001$). Male students in social science and humanities ($b = .195$; $p<.01$), and STEM ($b = .399$; $p<.001$) had higher levels of academic motivation than the comparison group. Women in a STEM major also had higher levels of academic motivation ($b = .149$, $p<.05$), but to a lesser extent than their male counterparts.

Parental Education. Students whose parents attained a graduate degree continued to see a positive relationship between academic motivation and faculty challenge and high expectations ($\beta = .222$; $p<.001$). Good teaching and organized instruction had a greater positive impact on these students' academic motivation ($\beta = .338$; $p<.001$) than it did for the overall sample ($\beta = .249$; $p<.001$). Diversity experiences ($\beta = -.083$; $p<.05$) and cooperative learning ($\beta = -.063$; $p<.05$) had negative effects on academic motivation. However, students in this group saw a statistically significant relationship between participation in faculty research and academic motivation ($b = .298$; $p<.05$). The prime difference between students with a parent that achieved a graduate degree and students whose parents did not was with regards to faculty contact, which did not significantly predict academic motivation among the former group, but was a statistically reliable positive predictor ($\beta = .135$; $p<.001$) among the latter.

Men in this group saw lower levels of academic motivation ($b = -.156$; $p<.05$), while social science and humanities ($b = .125$; $p<.05$) and STEM majors ($b = .265$; $p<.001$) saw higher levels.

Bottom-quartile pre-college academic ability. The impact of faculty challenge and high expectations, though still significant, was smaller for students in the bottom-quartile of pre-college academic ability scores ($\beta = .158$; $p<.01$) relative to the entire sample ($\beta = .220$; $p<.001$). However, the effect of clear and organized instruction was slightly higher ($\beta = .275$; $p<.001$) than for the overall sample ($\beta = .249$; $p<.001$). The impact of contact with faculty and staff was also lower for students with low academic ability scores ($\beta = .086$; $p<.05$) than for the overall sample ($\beta = .094$; $p<.001$). Peer interactions exerted a negative effect ($\beta = -.138$; $p<.001$). However, research with a faculty member exerted a strong positive effect on academic motivation for these students ($b = .409$; $p<.001$). By contrast, students in the upper quartiles of academic ability saw a negative relationship between diversity experiences and academic motivation ($\beta = -.107$; $p<.001$) that was not observed among the lower-ability group.

Men with low pre-college academic ability scores also had lower academic motivation than women in this group ($b = -.247$, $p<.001$). Students of color in the upper quartiles of academic ability had greater academic motivation than did white students ($b = .254$; $p<.001$). Students enrolled with low academic ability scores enrolled at liberal arts colleges also had lower levels of academic motivation than students enrolled at other institutional types ($b = -.18$; $p<.05$). STEM majors had higher levels of academic motivation ($b = .175$; $p<.05$), but to a lesser extent than for the baseline model ($b = .246$; $p<.001$).

Bottom-quartile pre-college academic motivation. Students in the bottom-quartile of pre-college academic motivation scores still saw a positive relationship between motivation and faculty challenge and high expectations ($\beta = .194$, $p<.001$), but to a lesser extent than the whole sample ($\beta = .220$, $p<.001$). Clear and organized instruction also saw a smaller relationship with academic motivation for these students ($\beta = .145$, $p<.01$) versus the overall sample ($\beta = .249$,

p<.001). However, frequency of faculty and staff contact had a larger positive effect on academic motivation for these students (β = .111, p<.05) relative to the overall sample (β = .094, p<.001). Neither peer interactions nor cooperative learning had any statistically reliable effect on academic motivation for these students.

Men in the bottom-quartile group had lower levels of academic motivation than did women (b = -.208; p<.01). High school involvement also exerted a negative effect (β = -.096, p<.01). STEM majors had higher levels of academic motivation at time 2 (b = .308; p<.01).

It is also worth noting that the model for students in this low pre-college academic motivation group explained a smaller proportion of the variance (.22) in time 2 academic motivation than did the other sub-sample models (e.g., .51, .53, .50, etc.). The implications of this disparity are explored in a subsequent section.

Top-quartile pre-college academic motivation. Faculty challenge and high expectations was less important for students with high pre-test scores (β = .113, p<.05) than for the overall sample (β = .220, p<.001). However, frequency of contact with faculty and staff was more important (β = .153, p<.001) relative to the whole sample (β = .094, p<.001). Good teaching and quality of instruction was also more important for students with high pre-test scores (β = .385, p<.001) than for all students (β = .249, p<.001). Peer interactions exerted a negative effect (β = - .154, p<.001).

Both social science and humanities (b = .182, p<.05) and STEM majors (b = .221, p<.05) saw higher levels of academic motivation among the students with high pre-test scores.

Academic Motivation at Time 3

The time 3 results are reported in Table 3. Again, the far-left column provides the results of the OLS model predicting time 3 academic motivation for the entire sample. The results for each sub-sample model are described in turn.

Race. At time 3, faculty challenge and high expectations exerted no significant effect on the academic motivation of students of color, while exerting a positive effect on white students' motivation ($\beta = .208$, $p<.001$) than for the entire sample ($\beta = .180$, $p<.001$). Frequency of contact with faculty and staff likewise had no effect on students of color at time 3, while having a significant positive effect for the entire sample ($\beta = .090$, $p<.001$). Good teaching and quality of instruction, however, had a slightly smaller effect for students of color ($\beta = .186$, $p<.001$) than for the whole sample ($\beta = .282$, $p<.001$) and for white students ($\beta = .291$; $p<.001$). Peer interactions exerted no statistically reliable effect for student interactions, and cooperative learning experiences, which did not statistically significantly predict academic motivation for the entire sample, negatively predicted academic motivation for students of color ($\beta = -.124$, $p<.05$), while becoming a positive predictor for white students ($\beta = .067$; $p<.01$).

Male students of color had statistically significantly higher academic motivation ($\beta = .222$; $p<.05$) than female students of color. The opposite dynamic is observable among white students, where men had a lower level of academic motivation than women ($\beta = -.097$; $p<.05$). Additionally, students of color majoring in STEM had much higher levels of academic motivation ($b = .449$; $p<.01$) than white students in the group of majors ($b = 169$, $p<.01$), relative to the respective comparison groups. The effect of the pre-college pre-test score also had a much

larger influence on the academic motivation of students of color (β = .443; p<.001) than it did for white students (β = .245; p<.001).

Gender. At time 3, men continued to benefit from faculty challenge and high expectation (β = .124, p<.01), but to a lesser extent than the overall sample (β = .180, p<.001) and women (β = .236; p<.001). They saw a larger effect than the overall sample with regards to frequency of interaction with faculty and staff (β = .115, p<.01 for men versus =β = .090, p<.001 overall). They saw a much larger effect for clear and organized instruction (β = .408, p<.001) than the overall sample (β = .282, p<.001) and female students (β = .215; p<.001). But peer interactions had a larger negative effect for men (β = -.195, p<.001) than for the whole sample (β = -.99, p<.001). Research with a faculty member yielded a larger effect on academic motivation for men (b = .297, p<.001) than for the sample as a whole (b = .191, p<.001); for women, working with a faculty member on research had no statistically significant effect.

Male students of color had higher academic motivation than did their white counterparts at time 3 (b = .219, p<.01). And male students with parents that possess a graduate degree had less academic motivation at time 3 (b = -.159; p<.05). Women benefited to a greater degree than men from majoring in STEM (b=.263; p<.001).

Bottom-quartile pre-college academic motivation. Faculty challenge and high expectation (β = .176, p<.001) and clear and organized instruction (β = .289, p<.001) both positively affected academic motivation at time 3 for students with low pre-test scores to a degree similar to the overall sample. Frequency of faculty and staff contact had a slightly larger effect for students with low pre-test scores (β = .098, p<.05) than for the overall sample (β = .090 p<.001). However, peer interactions had a larger negative effect on students with low pre-test

scores (β = -.148, p<.001) than for the whole sample (β = -.099, p<.001). The same was true of cooperative learning (β = -.126, p<.01), which yielded no statistically significant relationship with academic motivation in the baseline model, and had a positive effect on academic motivation for students in the upper quartiles of pre-college academic motivation (β = .109; p<.001).

Students in the low pre-test score group saw negative relationships for a range of demographic characteristics, including high school involvement (b = -.083; p<.05), attending a liberal arts college (b = -.32, p<.001), and being in a social science or humanities major (b = - .183, p<.05).

The explained variance for this low pre-test group was higher at time 3 than at time 2. At time 3, the model explained 39% of the variance in academic motivation. Implications are explored next.

IMPLICATIONS

These results suggest several implications, which are explored in this section. They are broken into two broad themes: practical and empirical. Each is explored in turn.

Practical implications

The results of this study present several novel implications for postsecondary educators. They are explored in turn, from most specific to more general.

Race. The results at time 2 and time 3 suggest that, in addition to benefiting from faculty challenge and clear and organized instruction, students of color's academic motivation is uniquely benefited by participating in cooperative learning experiences, but only at time 2. The

opposite is true at time 3, where cooperative learning experiences actually exert a negative effect on students' academic motivation. This is an important finding for first-year instructors in areas where students of color are historically underrepresented, such as STEM. Instructors in these areas may wish to consider implementing instructional programs and assignments that are both challenging and allow for students to engage in cooperative learning. However, by time 3, students of color no longer seem to benefit from faculty challenge and high expectations nor cooperative learning. There are numerous possible reasons for this finding. Perhaps it is how students of color are treated, particularly at the predominately white institutions like those in the WNS sample. Faculty challenges, which were once motivating, cease to encourage students to invest their time and energy in academics. And cooperative learning experiences, which during the first year of college pushed students of color to higher levels of motivation, now fail to do so. Additional research is needed to understand the dynamics of this change. This area would seem ripe for qualitative or mixed-methods inquiry that would follow a group of students of color—possibly alongside a group of white peers—during college. Such an inquiry could observe students' interactions, and gather data on students' reflections on their cooperative learning experiences, and on the effects of faculty challenge.

Gender. With the exception of men of color, male students had lower levels of academic motivation across the four years of college. However, apart from benefiting from faculty challenge and organized instruction, women appeared to particularly benefit from participating in a STEM major. This effect was detected during the first year of college, though that result is somewhat difficult to interpret (see the next section on empirical implications). Though this study highlighted good practices that may improve male students' academic motivation, it cannot easily explain why they exhibit lower levels of motivation. Additional research is necessary to

more fully understand the ways in which men are differently motivated to engage in academic tasks, or at least why they appear to be so on self-report measures like the outcome measures in this study. Moreover, researchers should focus on this study's findings concerning men of color, who appear to have higher degrees of academic motivation. This might be addressed in a number of ways, and from a wide variety of theoretical perspectives. At minimum, researchers should examine whether different students approach the WNS academic motivation measure in different ways to mitigate for possible measurement bias.

Parental education. Students with parents who had a graduate degree appeared to benefit especially from clear and organized instruction, and least from academic experiences involving their peers. This result might indicate a sort of "I know what I'm doing" ethos among these students. Indeed, students with highly educated parents are most likely to possess the knowledge and informal networks to be successful during college, or at least during the first year of college, which was the only time during which parental education cross product terms added significantly to the variance explained. It is possible that academic motivation is, for all practical purposes, less important for these students because they possess a sort of academic safety net. Additional research is needed to more fully explore the ways in which students with this particular type of privilege may differ from their less privileged counterparts in terms of academic motivation. Future research might also explore the reasons why parental education helps to explain greater variance in academic motivation during the first year of college, but not across the full four years of college.

Bottom-quartile pre-college academic ability. Academic ability helped to explain greater variance in academic motivation only during the first year. Students in this group benefited from faculty challenge and clear and organized instruction, as did their counterparts

that scored higher on pre-college standardized testing. But one unique finding is the powerful effect of conducting research with a faculty member. Students in this group that engaged in faculty research during the first year of college saw higher academic motivation (to the tune of almost half of a standard deviation) than their peers that did not. This result is particularly striking because students on the low end of academic ability are perhaps less likely to have the opportunity to participate in faculty research than their high-ability colleagues. This finding highlights the potential protective effects of engaging atypical students in faculty research projects, especially early in their college careers.

Bottom- and top-quartile pre-college academic motivation. The impact of the good practices also appeared to differ based on students' pre-college academic motivation. The students who came to college with the highest academic motivation scores appeared to need mostly clear and organized instruction in order to keep motivation levels high. Though faculty challenge had a positive effect, it was not as robust as it was for other groups, or for the baseline model. This may be because students at the high end of the academic motivation spectrum do not need their instructors to motivate them—they are motivating themselves.

Students that entered college with the lowest levels of academic motivation also benefited from the good practices, but those relationships were not as robust as for the whole sample. Moreover, the model explaining first year variance in academic motivation explained a much lower proportion of that variance relative to the other sub-sample models. But that result is interesting when contrasted with the time 3 model. In the time 3 model, a greater proportion of the variance is explained, and the good practices predict academic motivation in a manner more consistent with the baseline model. These differential results may further confirm that academic motivation of the sort measured by WNS is a stable, trait-like characteristic that is nonetheless

susceptible to change over time (see Gillig, dissertation paper #1). It is possible that at time 2, the good practices have simply not yet had time to alter the motivation of students that enter at the bottom of the motivation spectrum. If true, this result would have important implication for postsecondary educators who may be otherwise inclined to give up on a student that just does not seem to be motivated to engage in college life. Instead, it may be beneficial to focus on exposing the student to the types of good practices that, even at time 2, has a positive effect on motivation, and allowing for change to come slowly.

Faculty challenge and good teaching. More generally, faculty challenge and high expectations, and good teaching and clear instruction were positive predictors of academic motivation in every student sub-group, with one single exception: faculty challenge did not predict increased academic motivation for students of color at time 3. This exception has potentially important implications and should be explained by further research. Are students of color simply not being challenged by their instructors? Are they interpreting challenging assignments differently from their white counterparts? These questions should be explored, possibly using qualitative of mixed-methods inquiry.

Apart from that exception, the effects of good practices are remarkably consistent across relevant student sub-groups. Accordingly, instructors should note the availability of these good practices to affect the motivation of their students generally. However, additional research is needed to determine the best manner for implementing these good practices in the classroom. For instance, it is entirely possible that instructors could set the bar too high and make demands too challenging for their students to cope with. On the other hand, instructors may, in an effort to make their instruction more clear, avoid complex topics and thereby devalue their instruction.

Additional study on the application and operation of these two promising good practices is necessary.

Student archetypes. A potentially troubling finding of this study is the consistent negative relationship between academic motivation and several of the good practices, including diversity experiences and peer interactions. Both WNS measures of these good practices stress frequency counts of different types of interactions with peers. Engaging in positive peer interactions and interactional diversity experiences takes time. It is possible that the students that score highest on these measures are simply more engaged in extracurricular activities in which these sorts of interactions are likely. This interpretation of the data is supported by the fact that the control variable for high school involvement yielded significant negative coefficients even at time 3 for some groups. Thus, it is possible that two "student archetypes" are at play: an archetypal student focused on academics—who reports low frequency of out-of-class peer interactions and low frequency interactional diversity—and an archetypal student focused on extra-curricular pursuits, who reports high frequency peer interactions and interactional diversity. Additional research is necessary to explore these dynamics and to document the interplay of collegiate social experiences and academic motivation more generally.

Empirical implications

This study illustrates the importance of conducting analyses beyond merely estimating the general effects of educational practices on student outcomes. As the results of this study indicate, differences exist between student groups that help to explain and complicate the results of general effects models. For instance, without examining the conditional effects model, a researcher might be satisfied that the good practices in higher education are applicable in equal

degrees across diverse student bodies. The results of this study indicate that though some good practices—specifically, faculty challenge and high expectations and clear and organized instruction—appear to have positive relationships across student groups, other good practices are uniquely helpful, or hurtful, to particular student groups. Indeed even the good practices with general positive impact across students groups do not have the same impact across those groups. Accordingly, it is necessary for scholars to disaggregate analysis of data to explore the ways in which educational practices have differential effects on college students based on their background characteristics.

In addition, the results of this study reveal that the good practices in higher education explain somewhat less variance in academic motivation at both the bottom and top of the pre-college academic motivation distribution. These findings may indicate that the measure of academic motivation employed by WNS should be adapted to more precisely meter students' levels of motivation. These findings also seem to indicate the need for future research. It is possible that addition of other measures of student experience—particularly of student social experiences—will help explain more variance in academic motivation across the four years of college. This implication is underlined by the fact that some of the more peer-oriented good practices (e.g., positive peer interactions, and cooperative learning) were negative predictors of academic motivation for many of the student groups explored in this study.

Additional analysis of institution types is also needed. The results of this study indicate that attending a liberal arts college had a negative effect on academic motivation for certain student sub-groups. This result could be explained by the differential types of instruction that students receive at liberal arts colleges. But past research has shown that liberal arts colleges are more likely to engage in the types of good practices that this study measured. Taken together,

this might indicate that liberal arts colleges in the WNS sample are getting the balance of pro-academic motivation good practices (e.g., faculty challenge, and clear and organized instruction) and motivation-diminishing good practices (e.g., peer interactions for many student groups) wrong. Or it is possible that some other institution-level process is affecting academic motivation that is not measured by the good practice variable. In any event, it is necessary to follow up on these findings with additional research.

The same is true of majors. The results of this study indicate STEM majors appear to have higher levels of academic motivation, though that is not true across all student groups. Social science and humanities majors have higher motivation in some student groups, lower in others, and no relationship with academic motivations in still others. Though it was important to control for student major in this study, interpretation of the results is handicapped by the fact that WNS collected detailed student major information only at time 3. Therefore major controls are not really controlling for what students have already done, but are controlling for what they will ultimately do by graduation. Additional research is needed to determine whether, for instance, STEM majors attract academically motivated students, or the STEM curriculum improves students' motivation, or both. It is plausible to surmise that STEM majors are more likely to receive challenging assignments and clear and organized instruction, and thus the STEM curriculum actually improves academic motivation, but that intuitive conclusion requires empirical verification.

Finally, it must be admitted that the WNS data paints with a broad brush. Students are asked to self-report a wide array of education experiences across a broad span of time. By contrast, isolating the unique effects of education practices on an unobservable student characteristic like motivation requires analytic and conceptual precision. Accordingly, this study

represents only an initial step towards more fully understanding the ways in which students' intrinsic motivation to engage in academic tasks changes during college, and what can be done to improve student motivation. The results indicate—in some instances, perhaps, definitively—that academic motivation is susceptible to change using the good practices in higher education, and that certain of those practices are more important for certain students. But the results of this study also demand further research using new data sources and methodologies, particularly data that will allow researchers to document changes in academic motivation and student experiences with precision.

CONCLUSION

This study documented the conditional nature of the impact of various good practices on academic motivation. It highlighted the continuing need for researchers to explore the ways in which the effects of education practices on student outcomes differ based on students' background characteristics. This study found that faculty challenge and high expectation were positively related with students' academic motivation across all student groups, though not equally across the four years of college. It also found that clear and organized instruction was universally related to gains in students' academic motivation scores. Other good practices had differential effects based on student group and time of measurement. Those differential findings will allow postsecondary educators to tailor programs and instruction based on the needs of various types of students.

In a broader sense, these results begin to tell a story of the good practices that is more nuanced and, as a result, more complex. In particular, the differential results between student groups highlight the explanatory power of how students are treated *during* college. Until

recently, much of the college impact literature has focused on controlling for selection effects with regards to student choice of whether to attend college, and partialing out the variance associated with the background characteristics and abilities that students bring with them to college. This study, and others like it, pose additional questions surrounding how best to control for student self-selection into collegiate experiences, and how that self-selection may form a feedback loop whereby students engage in positive experiences and are motivated to seek out similar experiences in the future. Future research must identify rigorous methodologies for locating and describing the within-college sorting of students towards desirable college outcomes. Future research should also explore institutional differences in terms of the policies and practices that help, or hinder, students in reaching those outcomes.

In a more practical sense, the results in this paper suggest that challenging, well-organized instruction and high faculty expectations improve students' motivation to engage in academic tasks. As such, the additional instructional effort required to design a well-organized and challenging course may well pay dividends both for instructors and for their students. Moreover, the oft-repeated excuse for declining to depart from rote, unchallenging pedagogy—namely that students are not motivated enough engage with a more challenging curriculum—does not enjoy support from this study's findings. Indeed, it appears that student motivation is not an impediment to effective instruction, but instead one of its primary beneficiaries. Accordingly, instructors and researchers alike should explore ways to more fully implement teaching strategies that enhance students' intrinsic motivation to complete academic tasks.

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Table 1. **Descriptive Statistics***

Time 1: measures taken before the first year of college.
Time 2: measures taken at the end of the first year of college.
Time 3: measures taken at the end of the fourth year of college.

Predictor Variable	*Predictor Variable Description*	**Time 1 Means** (s.d.)	**Time 2 Means** (s.d.)	**Time 3 Means** (s.d.)
Academic motivation	Academic motivation scale score measured before participant started college.	0 (1)	-.09 (1.02)	-.13 (.99)
Student of color	1 = student of color. 0 = white student.	.18		
Male	1 = male. 0 = female.	.47		
Parental graduate education	1 = parent has graduate degree. 0 = parent has less than graduate degree.	.44		
High school involvement	Scale score; measures degree of students' involvement in high school activities.	0 (1)		
Pre-college academic ability	Scale score; students' pre-college SAT or ACT score converted to a common scale.	0 (1)		
Institution type	1 = liberal arts college. 0 = all other institution types.	.54		
Faculty challenge and high expectations	Scale score; measures student perceptions of the degree to which their instructors pose challenging questions/assignments.		-.13 (1)	-.21 (.99)
Diversity experiences	Scale score; student self-reports of experiences with diverse peers, including meaningful discussions.		-.07 (.99)	-.09 (.96)

Table 1—continued.

Frequency of contact with faculty and staff	Scale score; frequency of contact with faculty and staff outside of the classroom.		-.02 (1)	-.19 (.96)
Good teaching and clarity of instruction	Scale score; measures student perceptions of the quality and clarity of instruction received.		-.16 (1)	-.28 (1.03)
Peer interactions	Scale score; measures the frequency of peer contact outside of the classroom, particularly for co-curricular activities.		-.1 (1)	-.09 (1)
Cooperative learning	Scale score; measures the frequency of participation in peer learning groups and activities.		-.09 (1.02)	-.02 (.97)
Participated in research with a faculty member	1 = participated in research with a faculty member. 0 = did not participate in faculty research.		.04	.05
Social science or humanities major	1 = majored in the social sciences or humanities. 0 = did not major in social science or humanities.			.48
Stem major	1 = science, technology, engineering, or mathematics major. 0 = non-STEM major.			.26

* Note that all continuous variables have been standardized. Descriptive statistics were run using weighted samples.

Table 2. **OLS Regression Coefficients—Time 2 Academic Motivation**

Predictor Variable	**Baseline Model Coefficients** (s.e.)	**Students of Color Coefficients** (s.e.)	**White Students Coefficients** (s.e.)	**Male Coefficients** (s.e.)	**Women Coefficients** (s.e.)	**Parents with Graduate Education Coefficients** (s.e.)	**Parents with Less Than Graduate Education Coeffs. (s.e)**	**Bottom-Quartile Academic Ability Coeffs.** (s.e.)	**Upper Quartiles Academic Ability Coeffs.** (s.e.)	**Bottom-Quartile Pre-college Academic Motivation Coeffs.** (s.e.)	**Upper Quartiles Pre-College Academic Motivation Coeffs.** (s.e.)	**Top-Quartile Pre-college Academic Motivation Coeffs.** (s.e.)	**Lower Quartiles Pre-College Acdemic Motivation Coeffs.** (s.e)
Pre-college academic motivation	.399** (.02)	.433** (.05)	.397** (.02)	.399** (.03)	.403** (.03)	.398** (.03)	.393** (.02)	.458** (.04)	.348** (.03)	.343** (.07)	.359** (.03)	.442** (.09)	.424** (.03)
Student of color	.10 (.05)			.378** (.07)	-.057 (.06)	.045 (.09)	.119 (.06)	-.036 (.08)	.254** (.07)	.032 (.10)	.115^{+} (.06)	-.055 (.10)	.162* (.06)
Male	-.155** (.04)	.040 (.09)	-.21** (.04)			-.156* (.05)	-.125^{+} (.05)	-.248** (.06)	-.114^{+} (.05)	-.208* (.07)	-.122* (.05)	-.115 (.08)	-.182** (.04)
Parental graduate education	.009 (.04)	-.120 (.11)	.03 (.04)	-.032 (.05)	.068 (.05)			.004 (.06)	-.018 (.05)	-.015 (.07)	.012 (.04)	-.029 (.08)	.011 (.04)
High school involvement	-.018 (.02)	-.145* (.04)	.016 (.02)	-.021 (.03)	-.021 (.03)	.009 (.03)	-.043 (.03)	-.013 (.04)	-.046 (.03)	-.096* (.04)	.018 (.02)	.040 (.05)	-.037 (.02)
Pre-college academic ability	-.026 (.02)	.104^{+} (.04)	-.06* (.02)	.03 (.03)	-.067* (.02)	-.052 (.03)	-.001 (.03)	.10 (.06)	.03 (.03)	.038 (.04)	-.052^{+} (.02)	-.026 (.04)	-.015 (.02)
Institution type	.018 (.04)	.148 (.12)	.018 (.04)	.086 (.06)	-.016 (.05)	.018 (.06)	.031 (.06)	-.18^{+} (.07)	.132^{+} (.06)	.058 (.08)	.008 (.05)	-.068 (.09)	.057 (.04)
Faculty challenge and high expectations	.220** (.03)	.238** (.07)	.213** (.03)	.263** (.04)	.189** (.03)	.222** (.04)	.214** (.03)	.158* (.05)	.253** (.03)	.194** (.05)	.246** (.03)	.113^{+} (.06)	.255** (.03)
Diversity experiences	-.043 (.02)	.003 (.07)	-.057^{+} (.03)	-.083^{+} (.04)	-.014 (.03)	-.109* (.03)	.019 (.03)	.074 (.04)	-.107** (.03)	-.002 (.04)	-.062^{+} (.02)	-.043 (.05)	-.047 (.03)
Frequency of contact with faculty and staff	.094** (.02)	.129^{+} (.06)	.081* (.02)	.051 (.04)	.120** (.03)	.038 (.04)	.135** (.03)	.086^{+} (.04)	.089* (.03)	.111^{+} (.05)	.082* (.02)	.153** (.05)	.073* (.03)
Good teaching and clarity of instruction	.249** (.02)	.186** (.06)	.267** (.02)	.284** (.03)	.227** (.03)	.338** (.03)	.183** (.03)	.275** (.03)	.202** (.03)	.145* (.05)	.279** (.02)	.385** (.04)	.186** (.02)
Peer interactions	-.101** (.02)	-.151 (.05)	-.086** (.02)	-.131** (.03)	-.08** (.02)	-.10* (.03)	-.116** (.03)	-.138** (.03)	-.057^{+} (.03)	-.03 (.04)	-.137** (.02)	-.154** (.04)	-.072* (.02)
Cooperative learning	.012 (.02)	.122^{+} (.05)	-.022 (.02)	-.063^{+} (.03)	.056^{+} (.03)	.019 (.03)	.009 (.02)	-.051 (.03)	.05 (.02)	.04 (.04)	-.001 (.02)	-.029 (.04)	.027 (.02)
Participated in research with a faculty member	.106 (.09)	-.043 (.23)	.198^{+} (.09)	.246 (.13)	.028 (.12)	.298^{+} (.14)	-.037 (.12)	.409** (.16)	-.077 (.12)	.007 (.2)	.129 (.09)	.194 (.18)	.056 (.11)
Social science or humanities major	.025 (.04)	-.216^{+} (.10)	.101^{+} (.04)	.195* (.06)	-.063 (.05)	.125^{+} (.06)	-.025 (.05)	.104 (.07)	.014 (.05)	.03 (.08)	.028 (.05)	.182^{+} (.09)	-.023 (.04)
STEM major	.246** (.05)	-.073 (.12)	.334** (.05)	.399** (.07)	.149^{+} (.06)	.265** (.07)	.258** (.06)	.175^{+} (.08)	.275** (.06)	.308* (.10)	.229** (.05)	.221^{+} (.09)	.236** (.06)

Table 2—continued.

	R^2 = .48	R^2 = .51	R^2 = .49	R^2 = .53	R^2 = .54	R^2 = .50	R^2 = .59	R^2 = .56	R^2 = .51	R^2 = .22	R^2 = .42	R^2 = .42	R^2 = .48
	n = 1777	*n* = 327	*n* = 1450	*n* = 787	*n* = 990	*n* = 770	*n* = 1007	*n* = 626	*n* = 1044	*n* = 581	*n* = *1195*	*n* = 444	*n* = 1333

$^{+}$p<.05; *p<.01; **p<.001.

Table 3. **OLS Regression Coefficients—Time 3 Academic Motivation**

Predictor Variable	**Baseline Model Coefficients** (s.e.)	**Students of Color Coefficients** (s.e.)	**White Students Coefficients** (s.e.)	**Male Coefficients** (s.e.)	**Female Coefficients** (s.e.)	**Bottom-Quartile Pre-college Academic Motivation Coeffs.** (s.e.)	**Upper - Quartiles Pre-college Academic Motivation Coeffs.** (s.e.)
Pre-college academic motivation	.281** (.02)	.433** (.05)	.245** (.02)	.269** (.03)	.304** (.03)	.349** (.04)	.263** (.03)
Student of color	.021 (.05)			.219* (.08)	-.101 (.06)	-.062 (.08)	.061 (.06)
Male	-.034 (.04)	.222^{+} (.10)	-.097^{+} (.04)			-.044 (.07)	-.064 (.05)
Parental graduate education	-.081 (.04)	-.206 (.11)	-.058 (.04)	-.159^{+} (.06)	-.157 (.05)	-.152 (.08)	-.041 (.04)
High school involvement	.004 (.02)	-.043 (.05)	.008 (.02)	.035 (.03)	-.032 (.03)	-.083^{+} (.04)	.031 (.03)
Pre-college academic ability	-.08** (.02)	-.066 (.05)	-.078* (.02)	-.078^{+} (.03)	-.092* (.03)	.069 (.07)	-.037 (.04)
Institution type	-.055 (.05)	-.094 (.14)	-.039 (.05)	-.114 (.08)	.002 (.06)	-.32** (.09)	.116 (.06)
Faculty challenge and high expectations	.180** (.03)	.106 (.06)	.208** (.03)	.124* (.05)	.236** (.03)	.176** (.05)	.177** (.03)
Diversity experiences	-.057 (.02)	-.014 (.07)	-.047 (.03)	-.086^{+} (.04)	-.046 (.03)	.086 (.04)	-.115** (.03)
Frequency of contact with faculty and staff	.090** (.03)	.062 (.06)	.079* (.03)	.115* (.04)	.058 (.03)	.098^{+} (.04)	.086* (.03)
Good teaching and clarity of instruction	.282** (.02)	.296** (.05)	.291** (.03)	.408** (.04)	.215** (.03)	.289** (.04)	.293** (.02)
Peer interactions	-.099** (.02)	-.067 (.05)	-.113** (.02)	-.195** (04)	-.047 (.03)	-.148** (.04)	-.081* (.02)
Cooperative learning	.032 (.02)	-.124^{+} (.06)	.067* (.02)	.034 (.04)	.03 (.03)	-.126* (.04)	.109** (.03)

Table 3—continued.

Participated in research with a faculty member	.191** (.05)	.057 (.18)	.205** (.05)	.297** (.08)	.097 (.05)	.165 (.11)	.207** (.04)
Social science or humanities major	-.022 (.05)	.014 (.11)	-.048 (.05)	-.063 (.08)	-.007 (.05)	-.183^{+} (.09)	.077 (.05)
STEM major	.218** (.05)	.449* (.13)	.169* (.06)	.151 (.09)	.263** (.07)	.171 (.10)	.239** (.06)
	R^2 = .36	R^2 = .37	R^2 = .38	R^2 = .54	R^2 = .36	R^2 = .39	R^2 = .38
	n = 1726	*n* = 363	*n* = 1363	*n* = 730	*n* = 996	*n* = 51	*n = 1163*

$^{+}$p<.05; *p<.01; **p<.001.