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The Effects of Teacher Behaviors on Students' Inclination to Inquire and Lifelong Learning

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Keywords
Teacher behaviors need for cognition literacy

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Abstract

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Introduction

The literature on the characteristics of effective teaching behaviors at the primary and secondary school levels is vast (see Brophy & Good, 1986; Dunkin & Biddle, 1974). Although not quite as extensive, there is a substantial amount of research on effective teaching behaviors in higher education as well (see Pascarella & Terenzini, 1991, 2005; Perry & Smart, 2007). More limited, however, is the higher education literature examining effective teacher behaviors on measures of inclination to inquire, lifelong learning, and intellectual development. As Pascarella and Terenzini note, there is still much left unexplored about teaching and learning at the college level.

In this paper we analyze data from a pretest/posttest longitudinal study of several U.S. colleges and universities to explore whether specific teacher behaviors affect certain

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measures of students' inclination to inquire and lifelong learning during the first year of college. Our results extend prior research by exploring a more broad conception of teacher behaviors than has previously been examined. In short, our research suggests that certain teacher behaviors have a positive net impact on students' Need for Cognition (NFC) and Positive Attitudes Toward Literacy (PATL). Interestingly, the net effect of effective teaching behaviors on students' inclination to inquire and lifelong learning appears to be both general and conditional. That is, most of the benefits of effective teaching behaviors on students' inclination to inquire and lifelong learning accrue equally for all students, while some of the effects appear to differentially impact students with different precollege characteristics.

NFC is a measure of an individual's inclination to inquire and engage in effortful cognitive activities (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Individuals who score high on the NFC scale are more likely to "seek, acquire, think about, reflect back on information to make sense of stimuli, relationships, and events in their world" (p. 198). Conversely, individuals who score low on the NFC scale are likely to rely on other individuals to make sense of their surroundings. As it relates to college student growth, NFC has been positively associated with high levels of verbal ability, generating complex attributions for human behavior, desire to maximize information gained over maintaining one's perceived reality (Cacioppo, et al.), and college grades (Elias & Loomis, 2002). The reliability of the NFC scale ranges from .83 to .91 in samples of college students (Cacioppo, Petty, & Kao, 1984). PATL refers to the extent to which an individual personally enjoys literacy activities, such as reading literature, poetry, scientific texts, and/or historical material, and expressing their ideas through writing (Bray, Pascarella, & Pierson, 2004). The PATL scale has been positively correlated with reading unassigned books, reading comprehension, and library use within college student samples (Bray, et al.).

There is an extensive body of literature on the relationship between specific teacher behaviors and course-related knowledge acquisition and student achievement. This literature has been summarized by a number of meta-analyses and narrative syntheses (for example, Abrami, d'Apollonia, & Rosenfield, 2007; Braskamp & Ory 1994; Cashin, 1999; Cashin, Downey, & Sixbury, 1994; d'Apollonia & Abrami, 1997; Feldman, 1996, 1997; Greenwald, 1997; Marsh, 1987; Marsh & Dunkin, 1997; Marsh & Roche, 1997; McKeachie, 1997; Wachtel, 1998). With respect to the current study, we are principally interested in a specific subset of teacher behaviors. Most of these teacher behaviors – organization, clarity, classroom challenge/faculty expectations, and support have relatively large positive correlations (0.36 to 0.57) with student achievement. Although the relationship is a bit more modest in size, prompt feedback is also positively correlated (0.23) with student achievement (Cohen, 1981; Feldman, 1997).

Despite the substantial amount of research on effective teacher behaviors and course-related knowledge acquisition and student achievement, relatively little is known about the relationship between specific teaching behaviors and students' inclination to inquire and lifelong learning. In our review of the literature, we uncovered only three studies that explore how teacher behaviors influence students' inclination to inquire and/or lifelong learning. In the first study, Bray et al. (2004) explored the effect of postsecondary education on literacy development. They found that net of other factors, students' perceptions of effective teaching (a summed scale that captured perceived instructional skill/clarity and perceived instructional organization/preparation) failed to have more than chance effect on the PATL measure. While this study provides a glimpse into the effect of teacher behaviors on PATL, it does not provide a clear picture as to the unique relationships among a host of specific teaching behaviors and students' attitudes toward literacy.

In a single-institution study, Mayhew, Wolniak, & Pascarella (2008) investigated how educational practices affect the development of lifelong learning orientations among students. They included a scale termed "instruction-based educational practices" that measured items such as, the extent to which the respondent had engaged in positive interactions with faculty and whether he/she was encouraged to participate in classroom discussions, for example. They found that net of other factors, effective classroom instructional practices led to statistically significant gains in students' NFC. Similar to the Bray et al. (2004) work, however, this evidence is somewhat limiting in that it is unclear as to what specific effective teaching behaviors led to these gains in students' NFC. Moreover, the sampling of a single institution severely limits the generalizability of the findings.

In the third study, Cruce, Wolniak, Seifert, and Pascarella (2006) investigated the effects of good practices in higher education on cognitive development, learning orientations, and graduate degree plans during the first year of college. One scale used in the study, Effective Teaching and Interaction with Faculty, included such items as teacher skill/clarity, course challenge, support, and feedback. They found that Effective Teaching and Interaction with Faculty failed to significantly influence either measure of PATL or NFC (termed "preference for higher-ordered cognitive tasks").

Although somewhat different from the scale we employed, Cruce et al. (2006) utilized another scale, termed "Faculty Challenge/High Expectations" that assessed academic effort/involvement, using computers, and number of textbooks assigned, for example. Faculty Challenge/Expectations was associated with gains in students' PATL, but not their preference for higher-ordered cognitive tasks. Finally, Effective Teaching and Interaction with Faculty led to gains in PATL for women and students of color, while Faculty Challenge/High Expectations were associated with gains in PATL for males, and students attending community colleges, Historically Black Colleges/Universities (HBCUs), regional universities, and research universities. The conditional effects found in the Cruce et al. (2006) study are particularly important, as they alerted us to the possibility that not only might the effect of teacher behaviors on students' inclination to inquire and lifelong learning (termed "learning orientations") be conditional on certain student background characteristics, but also the type of institution attended. These findings are quite intriguing, considering Mayhew et al. (2008) did not uncover any conditional effects.

Collectively, the works of Bray et al. (2004), Cruce et al. (2006), and Mayhew et al. (2008) are important to our understanding of how teacher behaviors influence students' inclination to inquire and lifelong learning. Having a better understanding of what motivates students to learn – in this case types of effective instruction, is particularly important now considering the recent concerns raised about the amount students are learning in colleges and universities across the US (Arum & Roksa, 2011). While these studies provide insight into the relationship between teacher behaviors and student inclination to inquire and lifelong learning, this is still a relatively neglected area of empirical inquiry (Bray et al., 2004).

The findings from the Cruce et al. (2006) study, which are based on data collected in the 1990s, are limited by the inability to discern the unique effects of specific teaching behaviors on students' inclination to inquire and lifelong learning. Furthermore, although Cruce and his associates examined 18 separate institutions, they did not account for the clustered nature of the data, which could lead to artificially reduced standard errors and, therefore, a greater chance of committing Type I error.

The findings from the Bray et al. (2004) study, which are also based on data collected in the 1990s, capture only two dimensions of effective instruction: Organization and clarity – and one aspect of inclination to inquire and lifelong learning – PATL. The current study addresses the aforementioned limitations by, 1) controlling for the clustering effect, 2) using recently collected data from 49 institutions, and 3) exploring the unique effects of a host of individual teaching behaviors on two dimensions of students' inclination to inquire and lifelong learning: PATL and NFC.

The purpose of this investigation is to explore the effects of specific teacher behaviors on measures of students' inclination to inquire and lifelong learning. We were guided by prior research in selecting the effective teaching behaviors examined in this study. As noted earlier, meta-analytic research indicates each of the teacher behaviors – organization, clarity, classroom challenge/faculty expectations, and support, are positively associated with student achievement (Cohen, 1981; Feldman, 1997). Moreover, these measures have been employed in other research that has uncovered links between these effective teaching techniques and students' NFC and PATL (Cruce et al., 2006), as well as their overall cognitive development during college (Pascarella, Edison, Hagedorn, Nora, & Braxton, 1996).

In his work on effective teaching behaviors, Perry (1991) suggested that certain teaching behaviors activate unique cognitive processes within students. In particular, he argues that although it is a somewhat under-researched area, effective teaching behaviors are positively associated with students' motivation to learn. He noted that much of the work on effective classroom instruction is focused on student achievement, and suggests that other outcomes associated with teacher behaviors, such as students' inclination to learn, should be further explored. In fact, more recent evidence suggests that instructor behavior not only influences students' inclination to learn (Cruce et al., 2006; Mayhew et al., 2008), but also their overall cognitive development (Pascarella et al., 1996). Further, Hayek and Kuh (1998) demonstrated that certain curricular activities, such as those emphasizing analysis, synthesis, and quantitative reasoning are positively associated with gains in students' proclivity to learn. Given Perry's (1991) hypothesized linkages between effective teaching behaviors and students' inclination to learn, and the aforementioned research that reinforces his hypothesis, we aim to extend the current research on teacher behaviors and inclination to inquire and lifelong learning by exploring the unique effects of specific teaching behaviors on two dimensions of students' inclination to inquire and lifelong learning – the PATL and NFC.

Some research has conceptualized PATL and NFC as "orientations toward learning" (for example, Cruce et al., 2006). However, there is a relatively large corpus that frames NFC and PATL as an inclination to inquire and lifelong learning, respectively (for example, Mayhew et al., 2008; Pascarella, Seifert, & Blaich, 2010; Salisbury, Pascarella, Padgett, & Blaich, 2012; Seifert, Goodman, Lindsay, Jorgensen, Wolniak, Pascarella et al., 2008). Consistent with the extant literature on this subject, we have conceptualized these measures as "an inclination to inquire and lifelong learning." Interestingly, students' inclination to inquire and lifelong learning also appears to be influenced by other experiences during college, such as student socialization and socioeconomic status (Padgett, Goodman, Johnson, Saichaie, Umbach, & Pascarella, 2010), interactions with student affairs professionals (Martin, & Seifert, 2009), and participation in intercollegiate athletics (Wolniak, Pierson, & Pascarella, 2001). Thus, previous research supports the notion that students' inclination to learn is indeed malleable.

Although the Bray et al. (2004), Mayhew et al. (2008), and Cruce et al. (2006) studies provide insight into the influence of teacher behaviors and inclination to inquire and lifelong learning, what is still unknown is what individual effective teaching techniques uniquely influence NFC and PATL. Another dimension yet to be explored is whether the relationship between these specific teaching behaviors and inclination to inquire and lifelong learning differentially affect students with different precollege characteristics and students attending different types of institutions.

The specific research questions guiding our study are:

1. To what extent do teacher behaviors influence students' inclination to inquire and lifelong learning?

2. Is the effect of teacher behaviors on students' inclination to inquire and lifelong learning conditional on student background characteristics and type of institution attended?

Research Methods

Conceptual Model Guiding the Current Study

To explore the effects of teacher behaviors on students' inclination to inquire and lifelong learning, we were guided by the work of Astin (1993), Chickering & Reisser (1993), and Pascarella (1985). Specifically, they suggest at least four sources of influence should be considered in assessing the impact of college on students: Student background and pre-college traits, organizational characteristics of institutions, first-year academic experiences, and first-year social/non-academic experiences. To that end, we created fully-specified models to assess the impact of effective teaching on the inclination to inquire and lifelong learning outcomes. In particular, we included controls for student precollege characteristics (for example, race, sex, academic motivation, ACT or equivalent score), institutional type, other college experiences (for example, college grades, number of liberal arts courses taken), and other college non-academic experiences (for example, on or off-campus residence, work responsibilities during college).

Samples

Funded by the Center of Inquiry in the Liberal Arts at Wabash College, the Wabash National Study of Liberal Arts Education (WNS) is a large, pretest/posttest longitudinal investigation of the effects of the liberal arts experience on educational outcomes theoretically associated with liberal arts education. Colleges and universities that were invited to participate in the WNS study vary in institutional type, size, selectivity, and location in the United States.

Institutional Sample

Our study utilized data from 49 institutions that participated in the WNS. Nineteen institutions were included in the initial 2006 data collection, and seven new institutions joined the study in 2007. An additional 26 institutions were included in the study in 2008. Included in these cohorts are three returning institutions: Wabash College, Hampshire College, and the University of Rhode Island. Three two-year institutions participated in the WNS, but were removed from this analysis. Finally, liberal arts colleges are purposefully over-represented within the institutional sample because of the theoretical focus of the WNS.

Student Sample

The individuals in this analysis were first-year, full-time undergraduates from three separate cohorts of students from 2006, 2007, and 2008. Students from larger universities within the institutional sample were randomly selected from the first-year incoming class, whereas first-year incoming students from smaller institutions, including all the liberal arts colleges, were invited to participate in the study. Participants from the 2006 cohort were offered a $50 stipend to complete the instruments in each of two waves of data collection. The 2007 and 2008 cohorts were not offered nor received a stipend. The offering of a stipend between cohorts is the only difference in how the administration of the study was conducted. However, institutions from the 2007 and 2008 cohorts created incentives such as gift cards for their students to sustain appropriate response rates. All three cohorts were ensured in writing that any information or answers they chose to provide would be remain confidential and would never be recorded into their institutional records.

The breakdown of invited participants from each cohort is as follows: 2006 cohort includes 4,501 first-year students from two community colleges, three regional universities, three research universities, and 11 liberal arts colleges; the 2007 cohort includes 3,375 first-year students from three regional universities, one research university, and three liberal arts colleges. Finally, the 2008 cohort includes 9,628 first-year students from one community college, four regional universities, two research universities, and sixteen liberal arts colleges.

Data Collection

The data collection for the WNS was conducted in two separate waves. The initial data collection (lasting an estimated 90 minutes) took place sometime during the first few weeks of the fall semester. The initial data collection included WNS precollege survey instrument, which asked first-year students to provide information on demographics, family background characteristics, high school and precollege experiences. In addition, students also completed a number of cognitive and psychosocial instruments, including the PATL and NFC surveys. To comprehensively measure the first-year experience, the follow-up data collection (lasting an estimated 2 hours) was conducted during the spring semester of the first-year. Student experience data were collected using two complementary survey instruments, the National Survey of Student Engagement student survey and the WNS Student Experiences Survey. These instruments provide measures across a number of student experiences, levels of student engagement, and exposure to vetted good practices. Students also completed the same cognitive and psychosocial instruments, providing posttest data comparable to the pretest data from the initial fall collection.

Response rates for the follow-up data collection resulted an anticipated decline across each cohort (n = 3,081 for the 2006 cohort; n = 1,306 for the 2007 cohort, n = 4,228 for the 2008 cohort). To modify the sample to more accurately resemble the total first-year student population, we created a weighting algorithm on each institution's first-year undergraduate population by sex (male or female), race (Caucasian, African American/Black, Hispanic/Latino, Asian/Pacific Islander, or other), and ACT score (or COMPASS/SAT equivalent). It is important to note the weighting algorithm does not adjust for non-response bias. After eliminating cases with missing data and removing students from two-year institutions, we had useable data for 6,028 students.

Variables

Dependent Measures

Full descriptions of all dependent variables are located in Table 1. We used two measures, described in fuller detail earlier in the paper, to examine students' inclination to inquire and lifelong learning – the NFC and PATL scales. NFC was measured with an 18-item scale (Cacioppo et al., 1996). This scale has an alpha, internal consistency reliability of .90. PATL was assessed with a six-item scale (Bray et al., 2004) that has an alpha, internal consistency reliability of .71.

Table 1.

Variable Definitions

Variable Name	**Operational Definition**
(Teacher) Organization	A five-item scale (< [1] = 0.85) that asks the respondents the following: 1. The presentation of the material is well-organized. 2. Teachers are well-prepared for class. 3. Class time is used effectively. 4. Course goals and requirements are clearly explained. 5. Teachers have good command of what they are teaching.
(Teacher) Clarity	A five-item scale (< = 0.84) that assesses the extent to which respondents have observed the following teaching behaviors: 1. Teachers give clear explanations. 2. Teachers make good use of examples and illustrations to explain difficult points. 3. Teachers effectively review and summarize the material. 4. Teachers interpret abstract ideas and theories clearly. 5. Teachers give assignments that help in learning the course material.
Classroom challenge/faculty expectations	A six-item scale (< = 0.82) that includes items that estimate how often faculty: 1. Asked challenging questions in class. 2. Presented concepts in class that were applied to actual problems. 3. Asked students to point out fallacies in course topics. 4. Asked students to argue their point of view. 5. Challenged student's ideas. 6. Had students challenge each other's ideas
(Teacher) Support	A three-item scale (< = 0.80) that includes the following: 1. Faculty interest in students.

[1] The alpha, internal consistency reliability

	2. Faculty interest in student development outside academics. 3. Faculty willingness to discuss issues with students outside of class.
Prompt Faculty Feedback	A three-item scale (α = 0.67) that includes the following: 1. How often faculty informed students of their performance. 2. Promptness of written or oral feedback. 3. How often faculty checked with students to make sure material was understood before preceding forward.
Need for Cognition	An 18-item scale (α = 0.90) that asks participants to respond to the following: 1. I would prefer complex to simple problems. 2. I like to have the responsibility of handling a situation that requires a lot of thinking. 3. Thinking is not my idea of fun. 4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities. 5. I try to anticipate and avoid situations where there is likely a chance I will have to think in depth about something. 6. I find satisfaction in deliberating hard and for long hours. 7. I only think as hard as I have to. 8. I prefer to think about small, daily projects to long-term ones. 9. I like tasks that require little thought once I've learned them. 10. The idea of relying on thought to make my way to the top appeals to me. 11. I really enjoy a task that involves coming up with new solutions to problems. 12. Learning new ways to think doesn't excite me very much. 13. I prefer my life to be filled with puzzles that I must solve. 14. The notion of thinking abstractly is appealing to me. 15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought. 16. I feel relief rather than satisfaction after completing a task that required a lot of mental effort. 17. It's enough for me that something gets the job done; I don't care how or why it works. 18. I usually end up deliberating about issues even when they do not affect me personally.
Positive Attitude Toward Literacy	A six-item scale (α = 0.71) which includes the following: 1. I enjoy reading about history. 2. I enjoy reading poetry and literature. 3. I enjoy reading about science. 4. I enjoy expressing my ideas in writing. 5. If I have something good to read, I am never bored. 6. After writing about something, I see that subject differently.

Teaching Behavior Measures
Full descriptions of all independent variables are located in Table 1. A series of principal-component factor analyses were conducted using similar items that were validated in prior models (Pascarella et al., 1996), and yielded sound goodness-of-fit indexes. Only items with factor loadings of 0.33 or greater were eligible for inclusion in the factor solution. The scale's alpha, internal consistency reliability (denoted as "α") was performed to test the strength of each factor solution.

The factor measuring *organization* yielded a 5-item factor solution with a scale reliability of $\alpha = 0.85$ and was comprised of variables associated with teaching organization, including organization of presented material, preparedness for class, use of class time, course requirements were clearly explained, and knowledge of material taught. The second factor measuring *clarity* yielded a 5-item factor solution with a scale reliability of $\alpha = 0.84$, including items estimating faculty's clarity of explanations, use of examples to explain topics, review and summarization of material, interpretation of abstract ideas and theories, and usefulness of assignments relating to course material. The third factor measured *classroom challenge and faculty expectations*. The 6-item factor solution yielded a scale reliability of $\alpha = 0.82$, and included items estimating how often faculty asked students challenging questions, how often concepts in class were applied to actual problems, how often faculty asked students to point out fallacies in course topics, how often students were asked to argue their point of view, how often faulty challenged students' ideas, and how often students challenged each other's ideas.

The fourth factor measured *support*, with the 3-item factor yielding a scale reliability of $\alpha = 0.80$. Items comprising the support teaching behavior scale included faculty interest in students, faculty interest in student development outside academics, and faculty willingness to discuss issues with students outside of class. The fifth and final factor measuring *prompt faculty feedback* was a 3-item scale and yielded a scale reliability of $\alpha = 0.67$. The three items that composed the scale estimated how often faculty informed student performance, promptness of written or oral feedback, and how often faculty checked with students to make sure material was understood before preceding forward.

Control Measures
In addition to the teaching behavior scales, a battery of control variables was included in the analyses to account for differences in student background and precollege characteristics. Specifically, the following precollege control variables were included in all analyses: Race, sex, ACT or equivalent score, whether the respondent received a federal student aid grant, level of interaction with teachers in high school, amount of work during high school, academic motivation, and degree aspirations. The following college-level controls were also included in all analyses: Pretest controls for each outcome variable, institutional type, college grades, total hours worked in college, college residency, participation in a living-learning community, number of courses taken in liberal arts and professional areas.

Data Analysis
We ran initial missing data analyses across sex and race and found no respondent bias, suggesting the missing data were random and unbiased to the dependent measures (Allison, 2001). As such, we utilized listwise deletion across our entire analytic sample. We examined our covariates, including the scales, for potential multicollinearity and conducted

a variance inflation factor test. The variance inflation factor ranged from 1.06 – 2.49 with a mean of 1.33, suggesting the multicollinearity of the covariates is within an acceptable range (Myers, 1990; Stevens, 2002).

The data utilized for this analysis are comprised of multiple cohorts of students from the 2006, 2007, and 2008 administration of the WNS. To account for potential differences between each cohort, we included a series of controls to distinguish cohorts. Furthermore, the analyses were conducted using multi-institutional longitudinal data. In addition to the aforementioned controls, we also accounted for the nested or clustered nature of the data. The nested nature of the data assumes that student respondents are nested within unique institutions and are likely to respond similarly than would respondents among various institutions. Though the effect sizes would have been unaffected, there would be a greater likelihood of negative bias in the standard errors unless proper adjustments for the nested data were made. To account for the nested nature of the data, statistical procedures were performed throughout each model to control for clustering using the *svy* command in Stata 11.

General Effects

While controlling for clustering, we conducted a series of ordinary least squares regressions to estimate the general effects of teaching behaviors on first-year inclination to inquire and lifelong learning outcomes. For ease of interpretation with regard to the teaching behavior factors, continuous dependent and independent measures were standardized so that the coefficients represent effect sizes. Each outcome was regressed on an array of precollege and background characteristics, including sex, a dichotomous measure representing race/ethnicity (White versus student of color), a variable indicating whether the respondent received a federal student aid grant, ACT composite score, a measure of teacher interaction in high school, a measure of working during high school, how academically motivated the student was prior to college, degree aspirations prior to college, and a precollege pretest score on each outcome. Additionally, a number of college-level covariates were included, such as dichotomous variables representing institutional type, a number of college experience variables, and the teaching behavior measures.

Conditional Effects

To estimate if the effects of teaching behaviors on first-year inclination to inquire and lifelong learning outcomes differed across various student characteristics and institutional types, we first created a series of cross-product terms between the teacher behaviors and student background characteristics/institutional type. A statistically significant increase in R^2 after the addition of the cross-product terms to the general effects model indicates the presence of conditional effects (Pedhazur, 1982). After identifying a significant interaction, we then conducted analyses to explore whether the influence of instructor behaviors on students' inclination to inquire and lifelong learning is conditional on student background characteristics and/or type of institution attended. Specific conditional effects were investigated by disaggregating the sample above/below the median for a continuous variable such as ACT or equivalent score, for example, and then re-estimating the effects of the individual teaching behavior scales on the dependent variables. We then conducted z-tests of differences between regression coefficients for each subsample to ensure statistically significant differences indeed existed between the groups (see Clogg, Petkova, & Haritou, 1995; Paternoster et al., 1998).

Results

The weighted descriptive statistics are presented in Table 2, and the coefficients from our general effects models are illustrated in Table 3. For ease of interpretation with regard to the teaching behavior scales, continuous dependent and independent measures were standardized so that the coefficients represent effect sizes. Despite the appearance of relatively small effect sizes throughout our results, it is important to remember that given the fully-specified prediction equations used in each analysis, it is not uncommon to have a relatively conservative estimate of the magnitude of the relationship of any single predictor with the outcome(s) (Bray et al., 2004; Pascarella & Terenzini, 1991). Accordingly, any variable that significantly predicts either of the outcomes is considered substantive.

Table 2

Descriptive Statistics (n=6,028)

Variables	Mean	SD	Freq.	%	Min.	Max.
Male			2,248	37.29	0	1
White			4,786	79.4	0	1
ACT Composite Score	25.73	4.58			8	36
Received Federal Grant			903	14.98	0	1
Interacted with Teachers During HS			4,896	81.22	0	1
Worked During HS			4,072	67.55	0	1
Academic Motivation	3.608	0.557			1.125	5
Degree Aspirations	4.423	1.17			1	6
Inst. Type - Liberal Arts College			3,099	51.41	0	1
College Grades	6.102	1.55			1	8
Lives on Campus			5,619	93.21	0	1
Living Learning Community			1,259	20.89	0	1
Total Hours Worked	5.041	7.749			0	73
Math Courses Taken	1.07	0.961			0	5
Natural Science Courses Taken	1.27	1.346			0	5
Engineering Courses Taken	0.116	0.553			0	5
Social Science Courses Taken	1.5	1.166			0	5
Business Courses Taken	0.232	0.68			0	5
Health Courses Taken	0.173	0.572			0	5
Education Courses Taken	0.204	0.644			0	5
NFC Pretest Measure	3.459	0.613			1	5
NFC Posttest Measure	3.461	0.631			1	5
PATL Pretest Measure	3.283	0.763			1	5

PATL Posttest Measure	3.277	0.797	1	5
Organization Scale[a]	-0.000	0.794	-4.12	1.2
Clarity Scale[a]	-0.000	0.786	-3.62	1.54
Challenge/Expectations Scale[a]	0.015	0.73	-2.59	1.5
Support Scale[a]	-0.000	0.846	-3.84	1.13
Feedback Scale[a]	0.012	0.772	-2.33	1.76

[a] All five teaching behaviors have been standardized across entire sample

First, as illustrated in Table 3 (general effects), we found a number of teacher behaviors led to gains in both NFC and PATL. Specifically, net of potential confounding influences, instructor clarity, classroom challenge/faculty expectations, and prompt feedback were all positively associated with gains in NFC and PATL. Additionally, teacher organization was positively associated with gains in NFC, but not PATL. Teacher support had only a chance relationship with either of the dependent variables. While four out of the five teaching behaviors had a positive net effect on either (and in some cases, both) of the outcome variables, it should be noted that the largest magnitude of any effect was only slightly less than 0.08 of a standard deviation. Finally, it should also be noted that because we included a pretest measure of each dependent variable in every equation, we are stating that students who experienced these effective teaching techniques made greater *gains* in NFC and PATL than did students who did not report exposure to the same effective instruction (Pascarella, Wolniak, & Pierson, 2003).

Table 3

Standardized Effects of Teaching Behaviors on Need for Cognition and PATL using the Wabash National Study of Liberal Arts Education (n = 6,028)

	NFC		***PATL***	
Variables[a]	*General Effects*	*Std Error*	*General Effects*	*Std Error*
Male	0.043	0.031	-0.018	0.023
White	-0.028	0.038	-0.056	0.038
ACT Composite Score	0.06***	0.014	0.039**	0.013
Received Federal Grant	0.012	0.033	-0.074	0.039
Interacted with Teachers in HS	0.017	0.036	0.065	0.036
Worked during High School	-0.029	0.030	-0.072*	0.029
Academic Motivation	0.049***	0.013	0.003	0.02
Degree Aspirations	-0.016	0.016	0.031*	0.015
Pretest Measure	0.633***	0.016	0.64***	0.025
Liberal Arts College	0.067	0.034	0.04	0.023
College Grades	0.068***	0.011	-0.016	0.015
Total Hours of Work in College	0.009	0.009	0.024	0.014

Live On Campus	0.055	0.043	-0.051	0.068
Living Learning Community	-0.019	0.021	0.076*	0.034
Number of Math Courses Taken	-0.026*	0.013	-0.021	0.021
Number of Science Courses Taken	0.027*	0.013	0.000	0.01
Number of Engineering Courses Taken	0.036***	0.008	-0.011	0.011
Number of Social Science Courses Taken	0.011	0.011	-0.028	0.017
Number of Business Courses Taken	-0.016	0.009	-0.04*	0.016
Number of Health Courses Taken	-0.033	0.020	-0.008	0.009
Number of Education Courses Taken	-0.02*	0.009	-0.013	0.011
Organization	0.044*	0.019	0.030	0.021
Clarity	0.043*	0.019	0.068***	0.017
Classroom Challenge/Expectations	0.054**	0.018	0.079***	0.019
Support	-0.035	0.019	-0.017	0.02
Prompt Feedback	0.038*	0.018	0.053**	0.019
R^2	0.58		0.53	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
[a] Although not listed in the table, variables were included in the analyses as dummy controls to account for potential differences between the 2006, 2007, and 2008 cohorts

Next, in our conditional effects analyses we looked for significant interactions between the teacher behaviors and student background characteristics/institutional type. Out of all the cross-products we generated, however, only the addition of the Teacher Behaviors x ACT Composite Score cross-products to the general effects model led to a significantly significant increase in the overall explained variance. As such, we disaggregated ACT or equivalent score as follows: "High ACT" = ACT or ACT equivalent ≥ 26, N=3,229; and "low ACT" = ACT or ACT equivalent < 26, N= 2,799. As noted in Table 4 (conditional effects), the effect of instructor behavior on students' inclination to inquire and lifelong learning varies by tested precollege academic preparation. For students with low pretested academic preparation, teacher support was negatively associated with gains in the NFC measure ($\beta = -0.06$, $p < 0.01$). However, we found only a chance relationship between teacher support and those students with high pretested academic preparation ($\beta = 0.00$, $p > 0.05$).

Table 4

Standardized Effects of Teaching Behaviors on Need for Cognition – Significant Conditional Effects by Tested Academic Preparation

	Need for Cognition	
Variables	*Conditional Effects*	*Standard Error*

Support		
Low ACT[a]	-0.06**	0.02
High ACT[a]	0.00	0.02

[a] Significantly different in magnitude at $p < .05$.

* $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$

Discussion

This study explored the effect of specific teacher behaviors on two measures of students' inclination to inquire and lifelong learning. Our findings appear to lend support for Perry's (1991) hypothesis that certain teaching behaviors activate unique cognitive processes within students. In particular, it seems that specific techniques used by an instructor influence students' desire to engage in literary and effortful cognitive activities. The results of this investigation align with other empirical findings, which also suggest that effective instructional techniques influence students' inclination to inquire and lifelong learning (for example, Cruce et al., 2006). Moreover, the results of this study lend support to the notion that certain experiences during college (examples noted earlier from other studies include such student experiences as socialization and socioeconomic status, interactions with student affairs professionals, and participation in intercollegiate athletics) do indeed influence students' inclination to inquire and lifelong learning (Martin & Seifert, 2009; Padgett et al., 2010; Wolniak et al., 2001). Furthermore, our findings reinforce Perry's (1991) assertion that effective teaching behaviors orient students toward their own achievement. Finally, this study adds to the dearth of empirical research that examines the effect of particular teaching behaviors on students' inclination to inquire and lifelong learning.

The first question guiding this study asked to what extent teacher behaviors influence students' inclination to inquire and lifelong learning. With the exception of teacher support (not statistically significant), it appears that several effective teaching techniques positively affect both measures of students' inclination to inquire and lifelong learning. Our second research question asked whether the effect of teacher behaviors on students' inclination to inquire and lifelong learning is conditional on student background characteristics and type of institution attended. With only one exception, the relationship between teacher behaviors and students' inclination to inquire and lifelong learning do not appear to be conditional on student background characteristics or type of institution attended. The exception to this is the influence of one dimension of effective instructional techniques, teacher support, on students' NFC. We found that teacher support was negatively associated with gains in NFC for students with low pretested academic preparation. It is important to note that the answer to our second research question underscores the importance of investigating the presence of conditional effects. In particular, as college and university student populations become increasingly diverse in many ways, it is especially important that researchers do not assume that experiences during college affect all students similarly (Pascarella, 2006).

Although this is the first study to look specifically at the unique effects of individual teacher behaviors on students' inclination to inquire and lifelong learning, the results of our general effects analyses are both consistent and inconsistent with similar studies. While neither Cruce et al. (2006) nor Bray et al. (2004) reported any significant main effects relationships

between effective teaching behaviors and PATL, Mayhew et al. (2008) found effective instruction to be positively related to gains in NFC. However, as mentioned earlier, the findings of the single-institution Mayhew study are somewhat difficult to compare to the current investigation, as they used only one scale as a general measure of effective teaching.

The results of our conditional effects analyses are relatively inconsistent with earlier findings. As noted earlier, the influence of teacher behaviors on students' inclination to inquire and lifelong learning has been found to be conditional on race/ethnicity, gender, and institutional type (Cruce et al., 2006). In our investigation, though, we did not uncover any PATL conditional effects. We did, however, find changes in students' NFC to be conditional on their tested precollege academic preparation (teacher support was negatively associated with gains in NFC for students with low pretested academic preparation). This is the first study to uncover such a relationship. This finding was quite unexpected, considering the abundant evidence positively linking student-faculty contact to a number of important academic student outcomes, including academic motivation (for example, Klem & Connell, 2004; Pascarella, Edison, Hagedorn, Nora, & Terenzini, 1996). Further, we expected students with low tested precollege academic preparation to be the greatest benefactors of instructors exhibiting supportive teaching behaviors.

Implications

Taken as a whole, these findings paint a relatively clear picture as to the relationship between effective teaching and students' inclination to inquire and lifelong learning. It appears that many specific dimensions of effective teacher behaviors do indeed have a positive net influence on both NFC and PATL for all students – regardless of race, sex, tested academic preparation, or type of institution attended. This is an important finding, as the first-year of college is a critical point in a student's collegiate experience. Considering the important role teacher behaviors have on influencing students' inclination to inquire and lifelong learning, it could be hypothesized that these linkages could affect other important student outcomes, such as academic achievement and persistence. In other words, given the ample evidence between academic achievement and persistence (Astin, 1993), if students are more motivated to engage in challenging cognitive activities and read unassigned materials, they may be more committed to their educational endeavors, and thus remain in college (Pascarella & Terenzini, 2005; Smith, 1990). This is a particularly important point, as the first year of college tends to be a pivotal time in terms of students' decisions to persist in college (Tinto, 1999). This is a potentially important area of research that should be explored.

These findings underscore the importance of how specific teaching behaviors influence students' inclination to inquire and lifelong learning. As Cruce et al. (2006) suggested, a multi-pronged approach should be taken by institutions in order to encompass the many styles of teaching and learning that occur at colleges and universities. Further, in their synthesis of how college affects students, Pascarella and Terenzini (2005) note that a variety of approaches to pedagogy and learning enhances student learning and development more than traditional approaches alone. Essentially, no one experience or course fully captures effective teaching – rather, it is a composite of good practices that become embedded into the ethos of an institution and its faculty.

Also notable is that these teaching behaviors appear to be eminently learnable by college faculty (Pascarella & Terenzini, 2005; Perry & Smart, 2007). Considering the well-documented links between effective teaching behaviors and a host of important student

outcomes noted throughout this paper, faculty may want to consider assessing how frequently and how well they employ effective teaching techniques in the classroom. Harry Murray's well-known "Teacher Behaviors Inventory" is widely-available and can be used to assess faculty members' use a host of empirically-grounded effective teaching behaviors (Murray, 1983). Additionally, other approaches to enhance learning experiences for students are readily available (for example, Fink, 2003) and give instructors additional tools on how best to integrate specific teaching behaviors into the design of their courses.

Conclusion

Given the evidence that effective teaching is learnable, and the potential link between students' inclination to inquire and lifelong learning and other student outcomes such as persistence, our findings lend support to the argument that colleges and universities should purposefully support the enhancement of effective teaching behaviors among their faculty. Despite the current economic challenges and constraints facing colleges and universities, institutions should consider Chickering and Gamson's (1991) suggestion that a consistent allocation of funds for faculty professional development be in place as a means to encourage and support the on-going development of effective teaching practices. Moreover, institutions should consider providing consistent funding for both discipline-specific and/or campus-wide faculty and professional development centers and programs, such as centers for teaching and learning (Lewis, 2010). Next, as the state of tenure-track comes under increasing scrutiny from legislators and measures of teaching effectiveness enter into proposed policies of productivity for faculty (Olson, 2011), the necessity to promote specific teaching behaviors becomes all the more paramount. As Perry (1991) suggests, it takes an intentional and sustained effort on the part of instructors to create an optimal learning experience. This type of commitment would mean faculty members could also have the freedom to instruct in creative and unique ways that distinguishes them as educators (Tiberius & Billson, 1991). Through institutional support and further research on effective teaching behaviors, colleges and universities can refine pedagogical practices to best serve students.

Limitations

While this study does add to what is known about the influence of specific teaching behaviors on student inclination to inquire and lifelong learning, it does have limitations. One limitation is that our sample consists only of students in their first year of college. While most of these particular teaching behaviors appear to have a positive net influence on students' inclination to inquire and lifelong learning, future research could follow students from their freshman to senior year in college, or at various stages of their postsecondary education (for example, graduate and professional school) to determine whether these effects persist throughout one's academic career. Finally, future research should incorporate a random sampling of institutions to better generalize these findings to more US colleges and universities.

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