Learning to Reason and Communicate in College: Initial Report of Findings from the CLA Longitudinal Study

THE SOCIAL SCIENCE RESEARCH COUNCIL

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While this research would not have been possible without the contributions from the individuals and institutions identified above, Richard Arum and Josipa Roksa are fully responsible for all findings presented, claims made, and opinions expressed in this report. Address correspondence to highered@ssrc.org.

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Executive Summary

This research emerged from the Social Science Research Council's collaborative partnership with the Pathways for College Network, with technical assistance in data collection provided by the Council for Aid to Education. The project has followed over 2,300 students at 24 institutions over time to examine what factors are associated with learning in higher education. Learning is assessed along the dimensions of critical thinking, analytical reasoning and written communication, as measured by the Collegiate Learning Assessment (CLA). We consider factors related to individual development as well as patterns of inequality associated with disadvantaged groups of students (including students from racial/ethnic minority groups, less advantaged family backgrounds, non-English speaking homes, and high schools that are comprised primarily of non-white students). Students were initially tested at the beginning of their freshman year (Fall 2005) and then followed up at the end of their sophomore year (Spring 2007). In addition to the CLA measures of learning, supplementary data was collected from student surveys, college transcripts and secondary sources of institutional data to generate a Determinants of College Learning longitudinal dataset. The scale and scope of this project offers a unique opportunity to explore factors associated with learning in higher education.

Our analysis has identified a broad set of individual, social and institutional factors associated with learning in higher education. Identification of factors associated with improvement in CLA performance can serve to focus policymaker and practitioner attention on student experiences and institutional practices that are conducive to promoting reasoning and communication skills. Specifically, our findings include:

- Students with stronger high school academic preparation, measured by both Advanced Placement coursework and grade point average, demonstrate higher CLA performance as entering freshmen, with the gap between students who have not had this prior preparation significantly increasing over the first two year of college.
- Measures of college engagement exhibit varying relationships to growth in CLA scores: some forms of engagement are negatively associated with improvement in CLA performance (e.g., hours spent studying in groups and hours spent in fraternities/sororities); while hours spent studying alone are positively associated with improvement in CLA performance.
- Working on campus for moderate amounts is positively associated with improvement in CLA performance over the first two years of college; working on campus more than 15 hours per week or working off campus is negatively associated with CLA performance.
- Student perceptions of high faculty expectations are strongly associated with improvement in CLA performance.
- Fields of study in college vary to the extent to which they contribute to growth in reasoning and communication skills as measured by the CLA; students concentrating in math, science, social sciences and humanities coursework have higher levels of improvement than students in education, human services or business subject areas.
- Institutional differences in student learning as measured by longitudinal changes in CLA performance are great; 29 percent of variation in longitudinal growth in CLA performance occurs across schools.

Our research also identifies groups of students who enter higher education from disadvantaged backgrounds and examines how they fare in postsecondary institutions over time in terms of improving their reasoning and communication skills as measured by the CLA. Findings identify four dimensions of group disadvantage that are associated with both students' lower initial performance on the CLA as entering freshmen as well as, more troublingly, often lower levels of individual improvement on this measure over the first two years of college. Specific findings on learning trajectories of students from disadvantaged backgrounds include:

- Students whose parents completed only a high school education or less start college with lower CLA scores and progress less on this measure during the first two years of college than students whose parents obtained graduate/professional degrees. Students from other family backgrounds enter higher education with lower CLA scores than those whose parents hold graduate/professional degrees but gain as much over time.
- Students from families where English is not the primary home language start college with lower CLA scores and progress less on this measure during the first two years of college than students from families with English spoken at the home.
- Students who attended high schools that were predominately non-white (i.e., more than 70 percent non-white) start college with lower CLA scores and progress less on this measure during the first two years of college than other students.
- Non-white students, including Asian students, start college with lower CLA scores and, with the exception of Hispanic students, progress less on this measure during the first two years of college than white students.

We examined various factors associated with learning in higher education to assess the extent to which we could identify individual, social and institutional determinants of these gaps in CLA performance. In particular our research highlights the following factors associated with the gaps in longitudinal growth:

- Including high school preparation and individual-level college experiences accounts for much of the differential rates of growth in CLA performance by parental education (the gap is reduced by 40 percent and is no longer statistically significant).
- Institutional differences account for approximately one-third of the gaps in longitudinal CLA performance between African American and white students.
- The gaps in longitudinal growth in CLA performance persist for students who attended high schools with predominately non-white peers or were from families where English was not the primary language, regardless of inclusion of the additional individual, social and institutional measures examined.

Overall, the reported findings have important implications for policy, practice and research. In terms of policy, the research suggests the need to focus future social policy not just on increasing access to college and reducing student attrition, but also on assuring success in terms of learning for students attending higher education institutions. This project also has important lessons for practitioners: institutions vary tremendously on the extent to which students attending them demonstrate growth on CLA performance. The longitudinal findings identified here suggest the need for additional systematic future study of student learning in higher education.

Learning in Higher Education

Mounting pressures to hold higher education accountable for student outcomes over the last several decades have culminated in the Secretary of Education's Commission on the Future of Higher Education's report, *A Test of Leadership*. Reminiscent of *The Nation at Risk* critique of K–12 in the 1980s, the Commission placed the responsibility for the nation's competitiveness in the global economy on the doorsteps of educational institutions. With respect to learning, the Commission noted that "the quality of student learning at U.S. colleges and universities is inadequate, and in some cases, declining" (p. 3). Based on sobering statistics from the National Assessment of Adult Literacy, the Commission urged both improvement and accountability of learning in higher education.

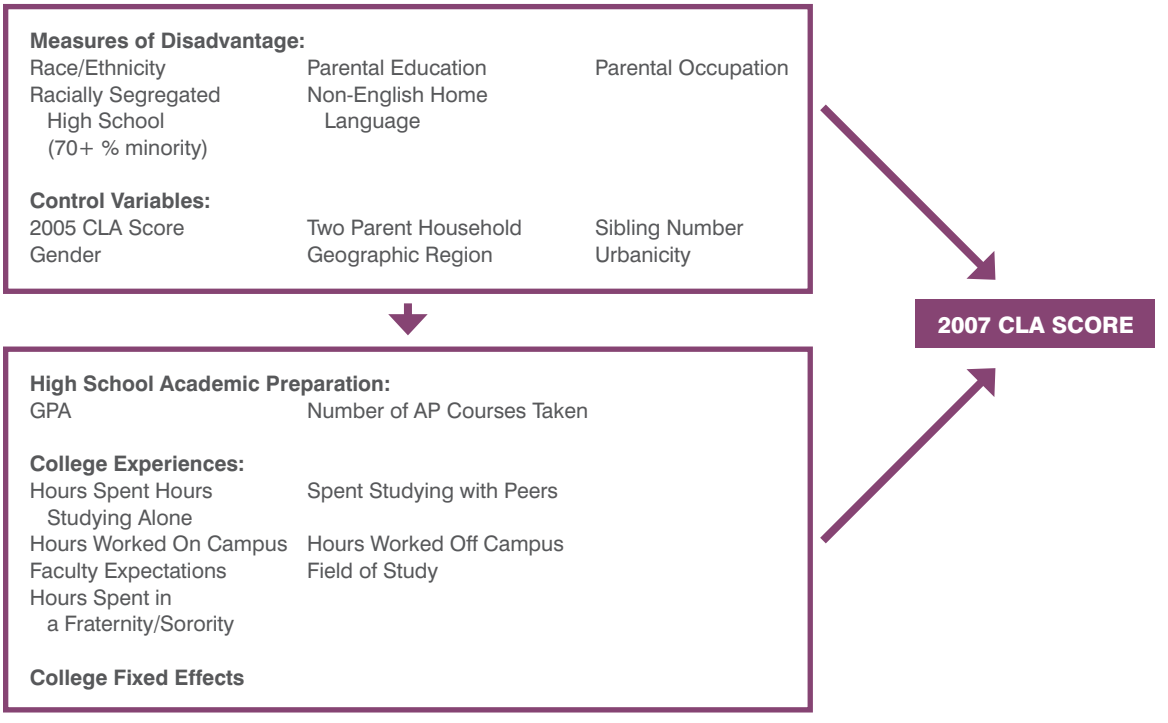
To avoid the pitfalls of narrowly focused externally imposed measures of learning, a growing number of institutions and other higher education agencies are thinking about ways to assess and improve performance in this area. A newly released report by the Association of American Colleges and Universities and the Council for Higher Education Accreditation, for example, urges all institutions to develop "ambitious, specific, and clearly stated goals for student learning" as well as "gather evidence about how well students in various programs are achieving learning goals." With learning at the forefront of current discussions in higher education, developing new measures of learning and a better understanding of factors associated with improvement in students' performance on cognitive tasks is crucial.

We contribute to this endeavor by studying factors associated with changes in student performance of over 2,300 individuals at 24 four-year institutions across the nation. This project is conducted in partnership with the Council for Aid to Education (CAE) and builds on their large-scale longitudinal study, the Collegiate Learning Assessment (CLA) Longitudinal Project. CAE has assessed students' skills when they first entered higher education in the Fall of 2005 and again at the end of their sophomore year, in the Spring of 2007. Learning is assessed through the Collegiate Learning Assessment (CLA), which relies on open-ended questions to measure broad ability skills such as critical thinking, analytical reasoning and written communication. Students' average spring 2007 CLA scores were 0.18 standard deviations higher than their original Fall 2005 performance—indicating moderate student growth over the first two years of college on this measure. We extended this endeavor to discern how student experiences and institutional contexts are related to the development of cognitive skills as measured by CLA performance during the first two years of college.

We begin this report by examining how a range of different factors, from high school preparation to college experiences and postsecondary institutions attended, are related to changes in students' performance on cognitive tasks involving reasoning and communication over the first two years of college, as measured by the CLA. Following identification of these factors we focus on experiences of disadvantaged groups of students, where disadvantage is broadly defined to reflect socioeconomic background, race/ethnicity, segre-gation of the high school attended, and language spoken in the home. We would expect disadvantaged groups of students to perform less well on the CLA upon entry into higher education. However, the crucial question is what happens thereafter—do they catch up or fall further behind? And moreover, can we identify a specific set of factors that may facilitate learning of disadvantaged groups of students and help narrow the gap in CLA performance?

The figure below presents the conceptual framework used in this study. The layout of the report does not follow the figure step-by-step, but instead presents a selected set of results focusing on students' high school and college experiences. As learning in higher education potentially enhances the capacity for life-long success and intellectual development, improving learning outcomes for all students and decreasing inequality in learning across different groups of students, may not only benefit colleges and universities today but may also facilitate students' participation in the political and economic world of tomorrow.

FACTORS ASSOCIATED WITH GROWTH ON THE CLA



Overview of the Conceptual Model Employed in the Study

Factors Associated with Growth on the CLA

There is substantial consensus on the fundamental skills students should acquire in higher education, such as the universally accepted claim that students should learn how to think critically (Bok 2006). Agreement on how to measure and improve critical thinking, on the other hand, is much more tenuous. In this project, we assess student learning through the Collegiate Learning Assessment (CLA), developed and administered by the Council for Aid to Education (CAE). The CLA asks students to write essays in response to "real world" scenarios. Due to the open-ended nature of the questions, the CLA aims to measure three dimensions of learning deemed important in higher education: critical thinking, analytical reasoning and written communication (Klein et al., 2008).[1] For the purposes of this study, we are focusing on one component of the CLA: the performance task measure, an example of which is presented in Appendix A.[2]

Previous literature reveals a range of college experiences that may influence students' cognitive growth (for a review see Pascarella and Terenzini 2005). Several key factors appear particularly relevant: social and academic integration, institutional climate, employment patterns, and field of study. Moreover, although the literature on cognitive development during college tends to focus less on pre-college experiences, we will also examine students' academic experiences during high school, and particularly their academic preparation. In the course of the project, we have considered how each set of experiences may be related to cognitive growth. Specifically, we employ a multivariate statistical framework to examine factors associated with 2007 CLA performance task score while controlling in the analysis for prior 2005 performance task score. A more detailed explanation of the sample and statistical methods is included in the appendices of this report.

HIGH SCHOOL ACADEMIC PREPARATION

Although high school experiences have only been given scant attention in prior research on cognitive growth during college, academic preparation is one of the most important factors shaping student success in higher education (e.g., Adelman 1999; 2006). We thus begin by examining the relationship between students' high school grades and AP coursework with growth on the CLA performance task measure during college. Figure 1 shows that students who took four AP courses, and particularly those who took 5 or more AP courses, have a substantially higher growth on the CLA performance task than students who took no AP courses. Moreover, students with higher high school GPA's experienced higher growth than those with lower GPA's.[3]

It is important to note that our results control for the 2005 performance task score; academically prepared students thus not only perform better at the point of entry into higher education, but also experience higher rates of *growth* in their cognitive skills. While most of the current discussions regarding the need to improve high school preparation focus on low persistence in higher education, our findings present another reason

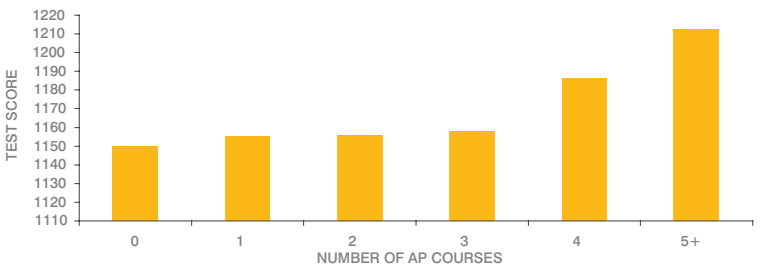


Figure 1 Predicted 2007 Test Score by Number of High School AP Courses

Note: Predictions based on the full model reported in Table 3C. All other variables are set at the mean.

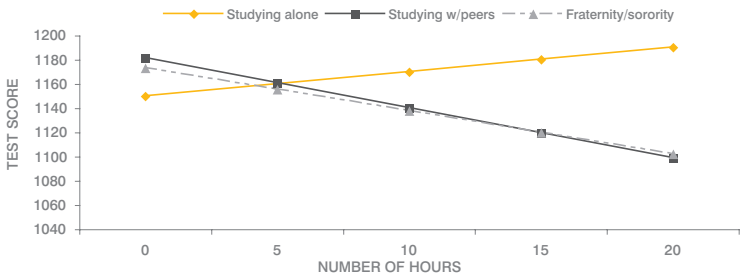


Figure 2 Predicted 2007 Test Score by College Engagement and Involvement Measures

Note: Predictions based on the full model reported in Table 3C. All other variables are set at the mean.

to think about high school preparation. Students who perform poorly in high school will not only start higher education at a disadvantage, but will also gain less from higher education over time. Two alternative explanations suggested by this association are worth considering. First, one possible interpretation for this finding is that students who have done well in high school are selected on a range of unmeasured social-psychological factors (such as educational motivation, attachment and commitment) that continue to be associated with higher rates of learning for these students in higher education institutions. Alternatively, academically prepared students are potentially able to apply their high school skills to better take advantage of experiences in the college environment in ways that improve their rate of learning as measured by the CLA. Regardless of these alternative interpretations, the gap between more and less successful high school students on an assessment of their ability to reason and communicate is significantly increased in the first two years of college.

SOCIAL AND ACADEMIC INTEGRATION

A substantial amount of attention in the previous literature on college learning has been dedicated to understanding whether various operationalizations of Austin's (1993) concept of involvement and Tinto's (1993) social and academic integration are related to cognitive development. General measures of academic effort and engagement as well as specific factors such as amount studied or books read improve students' critical thinking (Carini and Kuh 2003; Kuh et al. 1991; Terenzini et al. 1995). Similarly, social integration, measured by interactions with peers and faculty, is positively related to students' development in measured performance on complex cognitive tasks (e.g., Astin 1993; Frost 1991; Kuh 1995; Twale and Sanders 1999; Whitt et al. 1999). However, not all engagement is positive—some forms of engagement, such as participation in Greek clubs, may not always lead to higher cognitive growth (for a review and critique, see Pike 2000).

We explored a range of different measures of engagement/integration, but in this report present only the statistically significant results. It would be expected that the amount of time students spend studying is positively related to cognitive growth. However, we find that this is dependent on the context of studying, and specifically whether students study alone or with peers. As Figure 2 illustrates, the relationship between studying alone and cognitive growth is positive while that of studying with peers and cognitive growth is negative.[4] Every hour spent studying is not alike. These results are reason for pause, given that many institutions today emphasize studying with peers. It is possible that studying with peers helps students integrate better into the college life and thus increase their persistence. While persistence is a desirable goal, it is important to think about other potential consequences of peer studying, such as those for learning. Moreover, it is possible that particular forms of studying with peers, such as institutional sponsored and coordinated study groups, have a positive relationship to learning. Unfortunately, we are not able to distinguish between different types of peer study groups at this time. Nevertheless, these results suggest the need for a more careful examination of what studying with peers entails and whether it benefits or harms students in developing their cognitive skills.

Another form of engagement that does not appear beneficial for the development of cognitive skills, as measured by the CLA, is hours spent in fraternities/sororities: the more hours students spend in Greek activities, the lower their cognitive growth.[5] It is important to note that this finding, as well as that for studying with peers, may be a consequence of self-selection. The models control for the 2005 performance task scores and a range of other student characteristics and experiences. Nonetheless it is possible that different types of students spend time in fraternities/sororities as well as studying with peers, and thus that the negative relationship is not a consequences of participation in those activities, but of the factors associated with selection into them. We are not able to eliminate that explanation given our data, but only to establish that there is a relationship

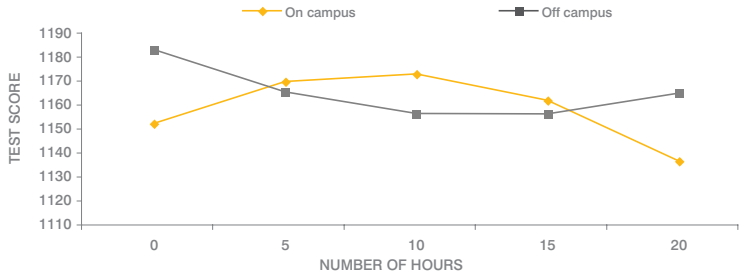


Figure 3 Predicted 2007 Test Score by Employment Measures

Note: Predictions based on the full model reported in Table 3C. All other variables are set at the mean.

between specific forms of student engagement and cognitive growth. However, even if these relationships are due to self-selection, the findings suggest the need to think more thoroughly about different ways through which all students, even those not necessarily inclined toward learning, can benefit from higher education and develop their cognitive skills.

COLLEGE EMPLOYMENT

Another dimension of college experience that is often considered a reflection of student engagement is employment. Working on campus is perceived to reflect engagement, while working off campus represents a lack of engagement with the college community. Employment, of course, can be consequential for student outcomes not only as a proxy for engagement but also due to the time commitment involved—hours spent working (and commuting to work) are hours that cannot be spent in other ways, including reading and studying. Several recent studies (Pascarella et al. 1994, 1998) suggested that employment during college is not consequential for learning. However, this contradicts an extensive body of literature showing that there is a negative relationship between employment, especially when involving long hours, and a range of educational outcomes, especially persistence and attainment (see reviews in Pascarella and Terenzini 2005; Riggert et al. 2006).

The patterns of results in this study, highlighted in Figure 3, mimic those for persistence/attainment: hours spent working are related to cognitive growth as measured by the CLA, but the relationship varies by whether students are working on vs. off campus. Hours spent working on campus have a positive relationship to cognitive growth, although at a diminishing rate (the relationship is curvilinear).[6] In contrast, hours spent working off campus have a negative relationship to cognitive growth, although this relationship is slightly curvilinear as well. Thus, as was the case for studying, every hour spent working is not the same. The context of work also matters—only on-campus employment is associated with the development of cognitive skills, as assessed by the CLA.

INSTITUTIONAL CLIMATE

Learning may not only be influenced by what students do in college, but also by the overall climate of the institution attended. Previous findings are largely inconclusive regarding the role of institutional characteristics in facilitating student learning. However, institutional climate, particularly institutional emphasis on scholarship and learning as well as students' interaction with faculty, appears to enhance student learning (Astin 1993; Hu and Kuh 2003; Lundberg and Schreiner 2004; Terenzini et al. 1994). We asked students to rate a range of statements about their postsecondary institutions and one of them stood out in terms of its association with our

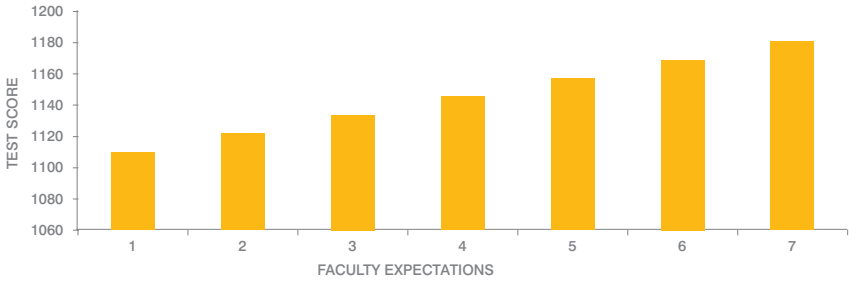


Figure 4 Predicted 2007 Test Score by Level of Faculty Expectations

Note: Predictions based on the full model reported in Table 3C. All other variables are set at the mean.

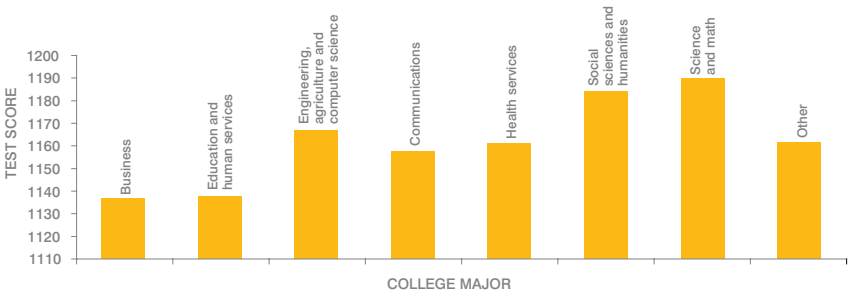


Figure 5 Predicted 2007 Test Score by College Major

Note: Predictions based on the full model reported in Table 3C. All other variables are set at the mean.

measurement of growth in CLA performance: faculty expectations.[7] When faculty members have high expectations students experience substantially higher gains in cognitive skills, as measured by the CLA. This finding supports the classic Wisconsin model of status attainment, which long argued for the importance of significant others, including teachers, for student outcomes (Sewell, Haller and Portes 1969).

FIELD OF STUDY

Although American higher education tends to provide general as opposed to vocationally specific credentials, not all bachelor's degree programs are the same. One prominent dimension of differentiation is college major. Students choose a particular field of study, and by extension a particular curriculum, which may be consequential for their cognitive development during college. Indeed, several recent studies have suggested that field of study is related to cognitive growth (e.g., Li, Long, and Simpson 1999; Pike and Killian 2001). Our analyses confirm the relevance of college major. Students majoring in science and math as well as those majoring in social sciences and humanities exhibit higher growth in cognitive skills, as measured by the CLA, than students majoring in business. Students majoring in engineering, agriculture, and computer science also experience more cognitive growth, although of smaller magnitude.[8]

These results raise questions about the specific curricula and learning experiences afforded by different fields of study. To explore these issues in more depth, we are examining data from college transcripts and are currently carefully examining students' course-taking patterns. Although not available at this time, we hope that these analyses will provide insights into the curricular trajectories of students across different fields of study. In the meantime, the presented results urge a careful evaluation of college curricula in specific majors. Some fields are more conducive to the development of general cognitive skills measured by the CLA, such as critical thinking, analytical reasoning, and written communication.

INSTITUTIONAL CHARACTERISTICS

Previous studies report mixed results regarding the role of institutional characteristics in facilitating cognitive growth during college (for a review see Pascarella and Terenzini 2005). Since we have only 24 institutions in the sample, instead of considering specific institutional characteristics, we choose to examine the extent to which overall institutional contexts are related to cognitive growth.

After controlling for the 2005 performance task score and a range of individual characteristics and experiences, we found substantial differences across institutions in the degree to which they facilitate cognitive growth. These differences are not simply a reflection of different student populations served by specific institutions, as many of the relevant individual level characteristics are included in the model. While the small number of institutions prevents an in-depth analysis of these differences, presented results demonstrate notable variation in the development of cognitive skills across institutions, which warrants a more careful study in both large-scale national endeavors as well as by individual institutions.[9]

Notably, accounting for institutional variation—by including institutional "fixed effects" in the model—alters some of the previously observed relationships between student experiences and cognitive skills. In particular, hours spent studying alone and hours spent working on and off campus are of substantially lower magnitude and no longer statistically significant. Moreover, the role of college major, particularly the previously strong relationship between science and math and cognitive growth, is substantially attenuated. Thus what students do, such as their study habits, employment, and major pursued, matters partly in relation to where it is done. These findings provide further evidence that the institutional contexts in which students are embedded are consequential for the development of their cognitive skills.

Patterns of Social Inequality on the CLA

Not all students enter higher education with the same level of critical thinking, analytical reasoning, and written communication skills. Variation among students emerges through a complex set of personal and contextual factors. The overall patterns of academic performance in part reflect the stratification of society at large and inequality in K–12 experiences. Consequently, we expected specific groups of students to enter higher education with lower levels of skills assessed by the CLA, including students from less educated families and racial/ethnic minority groups, students attending segregated high schools that are predominately non-white, and students for whom English is not the primary home language.[10] The crucial question is: What happens after students enter higher education? Do disadvantaged groups of students learn at similar rates to their more advantaged peers, do they catch up, or fall even further behind? The answer to that question depends on the social axis or form of disadvantage examined.

Our conceptualization of social disadvantage is grounded in prior sociological research on schooling that suggests how different aspects of disadvantage might potentially be related to learning outcomes. Specifically, James Coleman (1966) argued that racial segregation of high schools shaped student peer climates and had profound effects on shaping educational aspirations, expectations, norms and behaviors associated with student performance. These high schools also typically suffer from fewer resources. Theories of variation in performance by race include resistance theories advanced by scholars such as Ogbu and Fordham (1986) as well as theories of stereotype threat advanced by Steele and Aronson (1995). Effects of parental education, or social background more broadly, have been theorized to have long term effects on expectations, attitudes and behaviors related to student educational trajectories by sociologists such as Christopher Jencks (1972) and Robert Mare (1980). Effects of home language on student performance have been examined by researchers such as Kenji Hakuta (1986) and Min Zhou (1997), whose explanatory mechanisms vary from cognitive dissonance associated with language acquisition to variation in cultural expectations

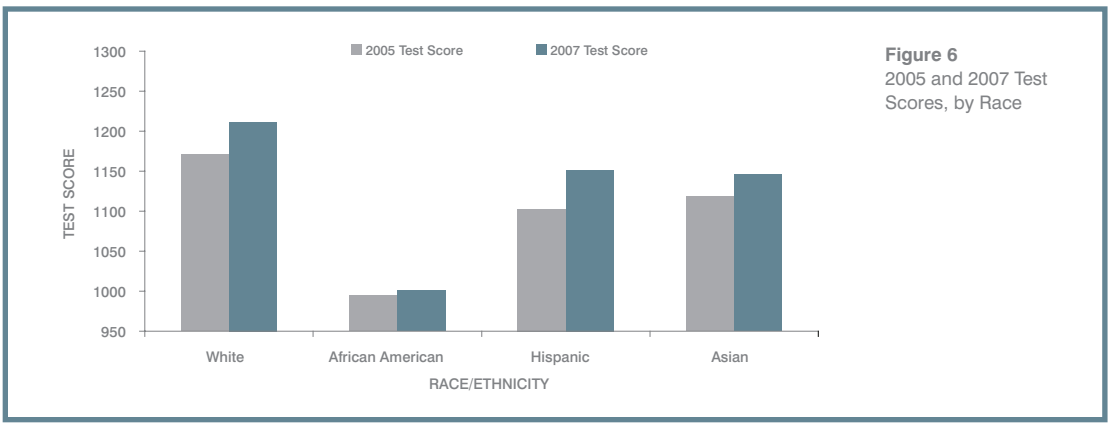


Figure 6
2005 and 2007 Test Scores, by Race

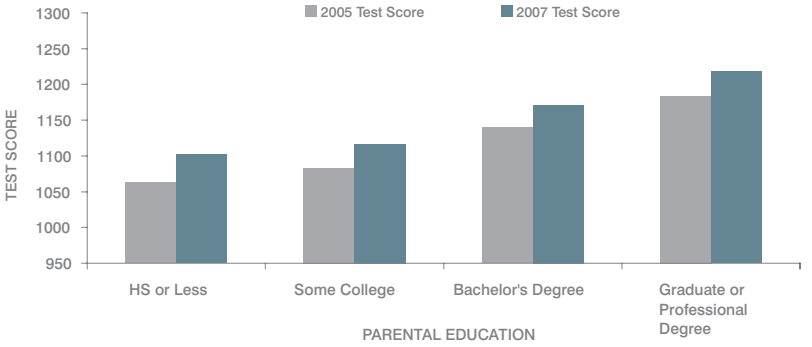


Figure 7
2005 and 2007 Test Scores, by Parental Education

and aspirations to the significance of segregated peer environments.

Figure 6 reports descriptive results for the CLA performance task scores in the Fall of 2005 and Spring of 2007 across different racial/ethnic groups. All racial/ethnic minority groups scored lower than white students at the point of entry into higher education. While all racial/ethnic groups perform less well than whites, the low scores of African American students are particularly cause for concern given their magnitude and are the focus of our analysis of racial differences in this report.[11] African American students entered higher education scoring substantially (almost one standard deviation) below white students on the CLA performance task. Even more troubling are the patterns of growth over time: African American students in our sample gained virtually no points on the CLA performance task over time. Consequently, the gap between African American and White students widens during the first two years of college. The extent to which social psychological factors such as stereotype threat and anxiety over test score performance are implicated in these patterns is an important area for future research.

Other racial/ethnic minority groups experience slightly more growth, although only Hispanic students experience the same growth in cognitive skills measured by the CLA as white students. Thus, the gaps between white students and students from other racial/ethnic groups increased over time, except for Hispanic students.

The patterns of results also vary across other dimensions of disadvantage. As Figure 7 indicates, performance on the CLA assessment improves with parental education—students from more educated families score higher on the CLA performance task upon entry into higher education than students from less educated families. However, these gaps are not as large as those reported for different racial/ethnic groups: comparing the two extremes, students whose parents have only a high school education or less score approximately 2/3 of a standard deviation below students whose parents hold graduate or professional degrees. Moreover, all groups of students appear to develop cognitive skills at approximately the same rate during their first two years of college. Thus, with respect to parental education, there is a pattern of persisting inequality: original gaps are largely preserved over time, which is a more positive pattern of results than that revealed for different racial/ethnic groups.[12]

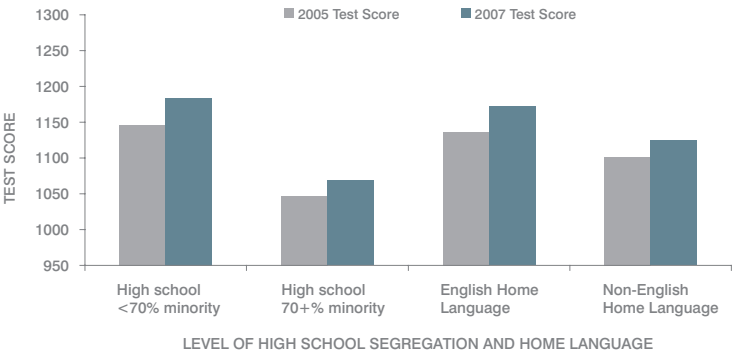


Figure 8
2005 and 2007 Test Scores, by Level of High School Segregation and Home Language

Students for whom English is not the primary language scored lower on the 2005 CLA performance task and experienced smaller gains by the end of their sophomore year than did students for whom English is the primary language (Figure 8). The same pattern, but much more pronounced, was revealed for students who attended high schools where non-white students were concentrated (high schools composed of 70 percent or more racial/ethnic minority students). Students attending high schools where non-white students were concentrated entered higher education scoring approximately one-half standard deviation on the CLA performance task below their peers who attended high schools that were not predominately non-white. And although improving their skills over time, the growth of students from high schools with high rates of non-white student composition was only about one half of the growth experienced by students from more racially integrated high schools.

It may be expected that a part of the disadvantage associated with attending high schools that are predominately non-white is due to the overlap between segregation and other dimensions of disadvantage, particularly family background and race/ethnicity. Indeed, different measures of disadvantage examined in this study are correlated with each other. To better understand unique contributions of each measure to change in CLA performance, we simultaneously considered all these factors in a multivariate statistical framework.

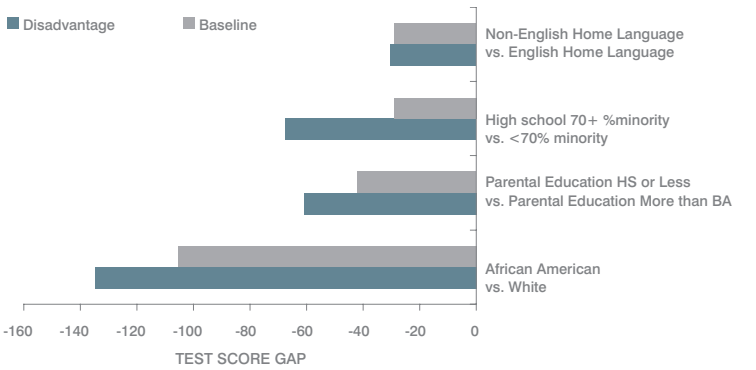


Figure 9
Test Score Gaps in Baseline and Disadvantage Models

Note: Disadvantage regression model predicts 2007 score, controlling for the 2005 score and the specific dimension of disadvantage. The baseline model also includes other measures of disadvantage and a range of background characteristics. Non-significant differences are shaded.

Focusing on our measures of disadvantage, Figure 9 reports a comparison between disadvantage and baseline models. The disadvantage model predicts spring 2007 test scores while controlling for fall 2005 test scores and a specific measure of disadvantage, while the baseline model also includes other measures of disadvantage and a range of background characteristics. For three of the four comparisons considered, the gap in the baseline model is significantly smaller than that reported when one considers the relationship between growth in individual test scores and a separately considered dimension of social disadvantage. After controlling for other dimensions of disadvantage, and other relevant factors, the gap between white and African American students is reduced by 22 percent. The reduction of the gaps between students from different family backgrounds (measured by parental education) and between students who do and do not attend segregated high schools is even more pronounced: a reduction of 31 percent and 57 percent respectively. The gap between students who do and do not speak English as their primary language is the only measure of disadvantage that is not substantively reduced by a substantial amount.

Thus, some of the stark gaps between more and less advantaged groups of students revealed in descriptive statistics are reduced when one controls for other dimensions of disadvantage and other relevant background characteristics. However, even after these adjustments, students from disadvantaged backgrounds lag behind their more advantaged peers in the extent to which their CLA test score performance improves over the first two years of college. Although of differing magnitudes, all differences shown in Figure 9 in the baseline model that controls for a range of social background factors are statistically significant. The next section explores the extent to which the associations between social disadvantage and improvement in CLA performance during the first two years of college can be accounted for by considering high school and college experiences.

Explaining Inequality in CLA Performance

To what extent may high school and college experience help to explain the observed patterns of inequality across groups of students in the development of cognitive skills in higher education? To consider this question, we examined factors discussed in the preceding section: high school academic preparation, college engagement/involvement, employment patterns, institutional climate, and field of study. We considered one set of factors at a time, carefully teasing out the extent to which each of those may explain some of the gaps between more and less advantaged groups of students.

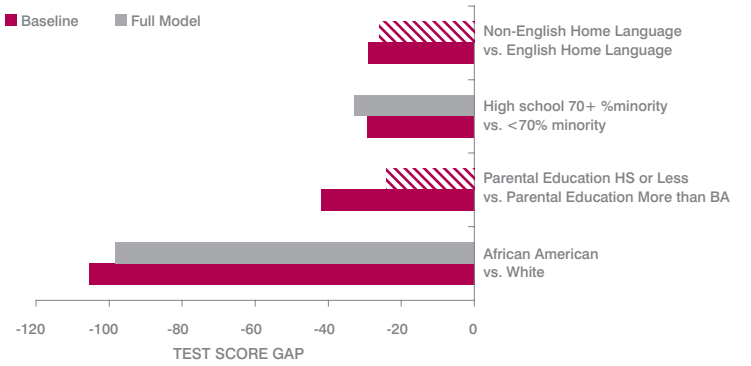


Figure 10
Test Score Gaps in Baseline and Full Models

Note: Baseline regression model predicts the 2007 score, controlling for the 2005 score and a range of background characteristics. Full model also includes measures of high school academic preparation and college experiences. Non-significant differences are shaded.

After accounting for high school and college experiences, the gap between students whose parents are highly educated (graduate/professional degrees) and those whose parents had at most a high school diploma has decreased by approximately 40 percent and is no longer statistically significant (Figure 10). Another difference rendered statistically non-significant after including high school and college experiences is that between students for whom English is and is not the primary home language. However, the decrease in the magnitude of the difference is quite small—only 2 points.[13] Similarly, there is virtually no change in the magnitude of the coefficient for high schools with high rates of non-white student concentration (the difference between the baseline and full models is only 3 points). Finally, the gap between African American and White students is not appreciably changed by considering these additional factors. Thus, while college experiences are associated with gains in CLA performance, they do not account for differences between more and less advantaged groups of students. The only exception is parents' educational background—high school and college experiences help to explain a good portion of the gap between students from more and less educated families.

Different groups of students may not only have distinct experiences during high school and college, but may also attend specific types of postsecondary institutions. As we noted in preceding sections, there are notable differences in the growth in cognitive skills across institutions. If students from less advantaged groups attend institutions with lower average growth, this may help to account for some of their lower levels of test score improvement during the first two years of college. Figure 11 presents results for a "fixed effect model"—an analysis that essentially removes institutional differences from the estimates of individual student growth in the CLA performance task between the freshman and sophomore years.

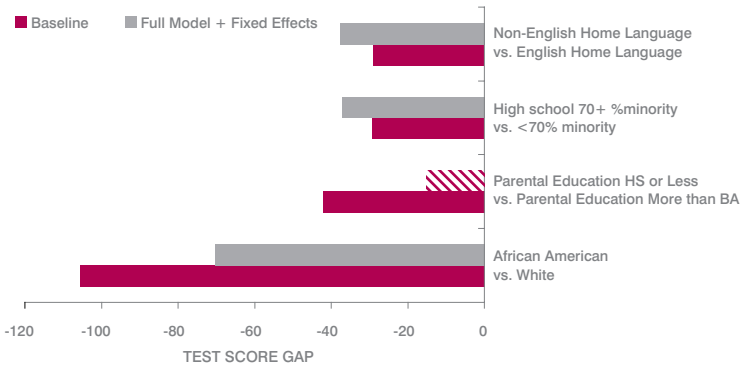


Figure 11
Test Score Gaps in Baseline and Full+Fixed Effects Models

Note: Baseline regression model predicts the 2007 score, controlling for the 2005 score and a range of background characteristics. Full model with fixed effects also includes measures of high school academic preparation, college experiences, and school fixed effects. Non-significant differences are shaded.

After controlling for institutions attended, the gap between students from different family backgrounds (based on parental education) virtually disappears—the difference is no longer statistically significant and is of a very small magnitude.[14] Moreover, the gap between African American and White students shows some decline. Although the difference is still statistically significant, the African American—White gap decreases by approximately one-third after controlling for institutional contexts. Thus, with respect to family educational background and African American race, students from disadvantaged groups are more likely to attend institutions with lower average growth, which helps to explain some of their weaker growth on the CLA performance task over time.[15]

The pattern of results for students attending high schools where non-white students are concentrated and from families not speaking English as their primary language in the home is in the opposite direction. Although the change in the magnitude of coefficients is not dramatic, the gap between students from these two disadvantaged groups and their more advantaged peers slightly increases after controlling for institutional differences. This change in coefficients implies that students attending high schools where non-white students are concentrated and from homes not speaking English as their primary language are more likely to attend institutions with higher average growth then would be expected by random dispersion of these groups of students over the postsecondary institutions included in our study.

This final figure presents a somewhat sobering set of results. Even after controlling for a range of high school and college experiences, as well as the specific institutions attended, disadvantaged groups of students gain less over time on the CLA performance task than other students. The only exception to this pattern is family's educational background—differences by family background are explained by high school and college experiences and institutions attended. The failure to account fully for the gaps in CLA performance during the first two years of college between more and less advantaged groups of students has prompted us to begin an in-depth analysis of students' academic experiences through the analysis of their college transcripts. Although not currently available, we hope that analyses of course-taking patterns will provide further insights into the observed gaps in cognitive skill development between more and less advantaged groups of students.

Conclusions and Implications

Students from socially disadvantaged groups enter higher education with lower levels of reasoning and communication skills measured by the CLA than their more advantaged peers. Moreover, gaps between more and less advantaged groups of students either remain stable or increase over time (a finding akin to the K–12 research on test scores). In addition to documenting the gaps in learning, we explore how different factors may help to explain the observed patterns. Our findings to date suggest that high school preparation and institutional differences in learning are strongly associated with gaps in demonstrated learning between different groups of students.

Overall our findings have implications for policy, practice and research. In terms of policy, we note that while successfully persisting in higher education, some students are not demonstrating significant improvement in CLA performance over the first two years of college. Public and private investment in higher education should be focused both on increasing the number of students attending college as well as ensuring that students are developing skills, including reasoning and communication, at reasonable rates of growth. Knowing what factors are associated with student learning as well as gaps between different groups of students can help institutions intervene and attempt to counter the patterns of disadvantage revealed in this study.

In terms of practice, we note in general that institutions matter—29% of variance in growth in CLA longitudinal scores occurs across institutions. Colleges and universities also vary extensively on the degree to which students from disadvantaged backgrounds successfully learn in their respective institutional settings. Students in particular are sensitive to perceptions of high faculty expectations. In addition, students with stronger high school academic preparation, studying more hours alone, not in fraternities and sororities and not working long hours (particularly off-campus) learn at higher rates. Students enrolled in math, science, social science and humanities also demonstrate greater rates of growth on the CLA than students in other fields of study.

Our findings in terms of social science research examining educational processes are noteworthy for several reasons. First, we note that the CLA, as a measure of learning in terms of reasoning and communicating in higher education, tracks remarkably well with sociological factors at the individual, social and institutional level. These associations are particularly noteworthy given that our measure of growth in CLA performance was based solely on the first two years of college attendance. In terms of a research instrument, although our research did not formally test the instruments psychometric properties nor its construct validity, the CLA indicator appears from a sociological perspective quite promising and

worthy of further research and development. In addition, these findings have important implications for the literature on learning which has rarely considered inequalities in learning, particularly across different dimensions of disadvantage (i.e., studying not only students from racial/ethnic minority groups, but also students from less advantaged family backgrounds, non-English speaking homes, and high schools that are predominately comprised of non-white students). Moreover, this study broadens the extensive literature on inequality in higher education, which often focuses on access and attainment without considering other aspects of college experience, such as student learning.

We note, however, that our research on individual, social and institutional factors associated with learning in higher education was based solely on non-experimental data. Given that students are sorted and self-selected into various high school and college experiences, academic programs as well as higher education institutions, our findings here are able to do no more than identify patterns of existing associations with variation in individual longitudinal growth. Future longitudinal research, including experimental and quasi-experimental approaches, is required in this area to further explore both the character and robustness of the associations identified in the observational research presented here.

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FOOTNOTES

1 Other prominent endeavors aiming to assess learning in higher education are the National Survey of Student Engagement (NSSE) which relies on student self-reports, and the National Study of Student Learning (NSSL), which uses the Collegiate Assessment of Proficiency, a multiple choice assessment tool developed by the ACT Program. For comparisons and trade-offs between different assessment tools, see Chun 2002.

2 The performance task component of CLA was administered most uniformly across institutions and is thus the focus of our analyses.

3 Figures in this section report predicted 2007 test scores. All models on which these figures are based control for the 2005 test scores; thus, reported differences across categories can be interpreted as differences in growth.

4 The coefficients for hours spent studying alone and with peers are of similar magnitude if added to the baseline model. After controlling for high school academic preparation and other college experiences, the coefficient for hours spent studying alone decreases by approximately one half.

5 We have asked other questions regarding students' engagement, such as their participation in student organizations and volunteering. However, those variables were not statistically significant. Moreover, using factor analysis, we extracted one factor combining different measures of engagement, but the Cronbach's alpha was low and the factor was not related to growth in CLA scores.

6 The magnitude of the coefficient for hours spent working on campus is almost twice as large if only employment is added to the baseline model (i.e., without all the high school and college experiences). The coefficient decreases notably after inclusion of high school academic preparation.

7 Students were asked to rate the following statement: "Faculty members at my institution have high expectations for student like me" on a 7-point Likert scale, ranging from strongly disagree to strongly agree. Other statements about students (e.g., having high expectations or working hard) or faculty (e.g., holding students to high standards or being approachable, helpful, and understanding) were not statistically significant. Moreover, using factor analysis, we extracted one factor measuring overall institutional climate, but this factor had no statistically significant relationship to growth in CLA scores.

8 The coefficient for communications falls just below the conventional significance level of $p<0.05$. As can be noted from large standard errors, there is a great deal of variation within each field of study. In the future, we will conduct more nuanced analyses of course-taking patterns using college transcripts.

9 The overall pattern of results presented in this report holds with and without HBCU institutions included in the sample.

10 One dimension of potential disadvantage not included in this study is gender. In recent years, women's educational performance has equaled or surpassed that of men. Moreover, there are no significant gender differences in the CLA performance task measure between women and men.

11 After controlling for social background and initial 2005 CLA performance, Hispanic students did not differ from white students in their predicted Spring 2007 CLA performance. Asian students improved at significantly lower rates than white and higher rates than African American students during the first two years of college; given relatively high initial scores of Asian students, we will examine these differences more thoroughly in subsequent analysis.

12 We also asked students to report their parents' occupations, which we coded into six categories following the EPG schema. Parental occupation does not have a significant relationship to cognitive growth, as assessed by the CLA.

13 The coefficient drops below the significance level since it was already close to $p=0.05$ in the baseline; the change in the magnitude is negligible.

14 Although this difference was rendered non-significant in the full model, institutional controls further decrease the magnitude of the difference, dropping it to the 35 percent of the gap in the baseline model.

15 For African Americans we found the patterns discussed robust, regardless of whether HBCUs were included or excluded from the analysis. Consideration of other aspects of social background, high school and college experiences, as well as institutional experiences does not help to account for the gap between white and Asian students in predicted 2007 CLA performance.

APPENDIX A:
CLA Instrument Example

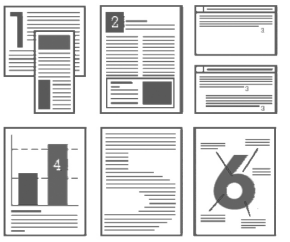
Collegiate Learning Assessment

RAND Council for Aid to Education

Sample Performance Task

You are the assistant to Pat Williams, the president of DynaTech, a company that makes precision electronic instruments and navigational equipment. Sally Evans, a member of DynaTech's sales force, recommended that DynaTech buy a small private plane (a SwiftAir 235) that she and other members of the sales force could use to visit customers. Pat was about to approve the purchase when there was an accident involving a SwiftAir 235. You are provided with the following documentation:

1: Newspaper articles about the accident
2: Federal Accident Report on in-flight breakups in single engine planes
3: Pat's e-mail to you & Sally's e-mail to Pat
4: Charts on SwiftAir's performance characteristics
5: Amateur Pilot article comparing SwiftAir 235 to similar planes
6: Pictures and description of SwiftAir Models 180 and 235



Please prepare a memo that addresses several questions, including what data support or refute the claim that the type of wing on the SwiftAir 235 leads to more in-flight breakups, what other factors might have contributed to the accident and should be taken into account, and your overall recommendation about whether or not DynaTech should purchase the plane.

Sample Writing Prompts

The make-an-argument prompt presents an opinion on an issue and asks the students to address the issue from any perspective(s) they wish, so long as they provide relevant reasons and examples to explain and support their views on topics such as: *"Public figures such as actors, politicians, and athletes should expect people to be interested in their private lives. When they seek a public role, they should expect that they will lose at least some of their privacy."*

The break-an-argument prompt requires students to critique an argument by discussing how well reasoned they find it; they must do so by considering the soundness of the argument's logic (rather than agree or disagree with the position presented). An example prompt is: *"The following is from an editorial in the* Midvale Observer, *a local newspaper. "Ever since the 1950's, when television sets began to appear in the average home, the rate of crimes committed by teenagers in the country of Alta has steadily increased. This increase in teenage crime parallels the increase in violence shown on television. According to several national studies, even very young children who watch a great number of television shows featuring violent scenes display more violent behavior within their home environment than do children who do not watch violent shows. Furthermore, in a survey conducted by the* Observer, *over 90 percent of the respondents were parents who indicated that prime-time television programs between 7 and 9 p.m. should show less violence. Therefore, in order to lower the rate of teenage crime in Alta, television viewers should demand that television programmers reduce the amount of violence shown during prime time."*

Scoring of writing prompts is powered by *e-rater*, an automated scoring technology developed and patented by the Educational Testing Service and licensed to CAE.

APPENDIX B: Data and Methods

Determinants of College Learning (DCL) Dataset

Presented data analyses are based on the Determinants of College Learning (DCL) dataset, which was developed in partnership with the Council for Aid to Education (CAE). The CAE initiated the Collegiate Learning Assessment (CLA) Longitudinal Project in the Fall of 2005, administering a short survey and the CLA instrument to a sample of freshmen at four-year institutions. The same students were contacted for the sophomore-year follow-up in the Spring of 2007. The Social Science Research Council (SSRC) joined the project at this time, broadening the original CAE questionnaire to include a range of questions regarding students' family backgrounds, high school characteristics, and college experiences. SSRC obtained data from CAE for students who signed the SSRC consent form permitting the release of their information. This sample included 2,362 students across 24 four-year institutions. The analytic sample used in this report includes 2,332 students who had valid demographic information (race/ethnicity and gender) and test scores for both survey years (for descriptive statistics of the sample, see Table 1C).

Institutions participating in this project include a range of schools of varying sizes, selectivity, and missions. The sample includes liberal arts colleges and large research institutions, as well as a number of Historically Black Colleges and Universities (HSBU's) and Hispanic Serving Institutions (HSI's). Participating institutions have relied on their own sampling and retention strategies. Although CAE has provided overall advice and guidance, each institution has worked independently to recruit and retain students in the sample. The overall retention rate from freshman to sophomore year across the 24 institutions included in the DCL dataset was slightly under 50%, although this varied notably across institutions and groups of students.

Joining the ongoing CAE endeavor has facilitated a quick start-up of the project and substantially reduced research costs. However, this approach has also produced a unique sample of institutions and students. To illuminate the characteristics of the DCL sample, we have conducted two sets of comparisons with the Integrated Postsecondary Education Data System (IPEDS). First, we compared student characteristics in DCL and IPEDS for the 24 participating institutions (Table 1B). With respect to demographic characteristics, students in the DCL sample are remarkably similar to those attending DCL institutions, although the DCL sample includes more women. The 75th percentile of SAT/ACT for the DCL sample is similar to the overall score for participating institutions. The 25th percentile, however, is slightly lower indicating that the DCL sample includes better academically prepared students in the bottom quartile. Following, we compared institutions in the DCL dataset to the universe of four-year colleges and universities in IPEDS. The final set of columns in Table 1B indicates that the demographic and selectivity characteristics of the DCL institutions are virtually identical to the average for all four-year institutions.

Furthermore, we compared the characteristics of our sample to students in U.S. high schools as identified by data combined from two sources: the Common Core of Data and the Private School Universe Survey (Table 2B). Characteristics of both students and high schools represented in the DCL sample are quite similar to national statistics. The DCL sample includes a lower proportion of minority students as well as a lower proportion of students from racially segregated high schools or high schools with a high proportion of students receiving free/reduced lunch. This pattern is exactly what would be expected given the inequality in entry into higher education, and particularly four-year institutions. Thus, although the DCL sample was not obtained through random sampling procedures, students and institutions in this sample display a relatively close resemblance to students attending postsecondary institutions in the U.S.

TABLE 1B.

DCL AND IPEDS DESCRIPTIVE STATISTICS BY GENDER, RACE/ETHNICITY, AND TEST SCORE

	DCL Sample			IPEDS: DCL Schools ONLY		IPEDS: All Schools	
All Schools	Analysis Sample *Mean*	Freshman *Mean*	Spring 2007 *Mean*	Freshman[a] *Mean*	All Undergraduates *Mean*	Freshman[a] *Mean*	All Undergraduates *Mean*
STUDENT CHARACTERISTICS							
Male	0.37	0.40	0.37	0.46	0.46	0.45	0.43
White	0.59	0.61	0.61	0.61	0.61	0.59	0.60
African American	0.19	0.20	0.20	0.14	0.14	0.13	0.12
Hispanic	0.05	0.06	0.07	0.08	0.07	0.13	0.12
Asian	0.11	0.10	0.14	0.10	0.09	0.06	0.06
Other[b]	0.05	0.06	0.06	0.07	0.09	0.09	0.09
TEST SCORES							
SAT, 25th percentile	1052.83	N/A	N/A	995.15	N/A	993.14	N/A
SAT, 75th percentile	1212.83	N/A	N/A	1219.02	N/A	1219.23	N/A
ACT 25th percentile	22.05	N/A	N/A	20.86	N/A	20.33	N/A
ACT 75th percentile	26.29	N/A	N/A	25.77	N/A	25.31	N/A

Notes: IPEDS schools weighted by size.

[a]First time, degree seeking undergraduates.

[b]For the IPEDS sample, this includes American Indians, students of unknown backgrounds, and non-resident aliens. For the DCL sample, this includes American Indians and any students who self-identified as “other” race/ethnicity.

TABLE 2B.

HIGH SCHOOL DESCRIPTIVE STATISTICS FOR DCL SAMPLE COMPARED TO ALL HIGH SCHOOLS

Variable	DCL Sample *Mean*	All High Schools *Mean*
STUDENT CHARACTERISTICS		
White	0.69	0.63
African American	0.14	0.15
Hispanic	0.09	0.16
Asian	0.06	0.05
American Indian	0.01	0.01
Total Minority	0.30	0.37
SCHOOL CHARACTERISTICS		
Racially segregated high school (70% or more racial minority)	0.13	0.21
Charter School[a]	0.01	0.03
Magnet School[a]	0.09	0.07
Urban	0.31	0.31
Rural	0.20	0.23
Suburban	0.49	0.47
Northeast	0.18	0.18
Midwest	0.36	0.22
South	0.26	0.36
West	0.19	0.24
Free/Reduced Lunch[a]	0.23	0.32
Student-Teacher Ratio	17.30	18.55
School Size	1364.00	1382.77

Notes: [a] Only available for public high schools.

National data (based on the Common Core of Data and the Private School Universe Survey) weighted by school size.

COLLEGIATE LEARNING ASSESSMENT (CLA)
We used the Collegiate Learning Assessment (CLA) to assess student learning. The CLA measures student learning by asking students to write open-ended arguments in response to "real world" scenarios. Using these open-ended questions, the CLA aims to measure broad ability skills such as analytical reasoning, critical thinking, problem solving, and decision-making (Klein et al., 2008). Measures used to assess student learning consist of three sets of open-ended prompts which have been carefully constructed in consultation with experts on student assessment and tested in a pilot study. The three components include: performance task, make an argument, and break an argument (see Appendix A for examples). Analysis of the pilot CLA study indicates that these measures are highly reliable and can be obtained relatively economically and within a reasonable time frame. Moreover, preliminary results suggest that substantial learning occurs in higher education, and that the skills acquired by students vary across institutions. For more details on the CLA study design and measures as well as preliminary results, see reports by Klein and his colleagues (2003; 2005).

MEASURES OF DISADVANTAGE
After examining the overall patterns of learning in higher education, we investigated the development of critical thinking, analytical reasoning, and expository skills for different groups of students. We focused on what are typically considered measures of disadvantage in order to understand the extent to which broader patterns of stratification are manifested in learning outcomes in higher education. We began by considering race/ethnicity, by dividing students into the following categories: white, African American, Hispanic, Asian, and other racial/ethnic groups. Following, we considered family background, including both parental education and occupation. Since parental occupation did not show a significant relationship to growth net of education, we focus the discussion on parental education. This variable captures the highest level of education completed by either parent, grouped in the following categories: high school or less, some college, bachelor's degree, graduate or professional degrees.

In addition to these often discussed measures of disadvantage, we examined two other characteristics: whether a student attended a high school with predominately non-white students (high school composed of 70% or more racial minority students); and whether a student's home language is English (based on the following question: Was English the primary language spoken in your home when you were growing up?). For each measure discussed, we first examined descriptive statistics, considering the distribution of 2005 CLA scores, 2007 CLA scores, and growth in CLA scores across different groups of students (see Table 2C). Following this, we examined the relationship between these measures of disadvantage and growth in CLA scores in a multivariate framework.

REGRESSION ANALYSES
Multivariate regression analyses predict the 2007 performance task score, while controlling for the 2005 performance task score. Presented results thus in effect estimate the relationship between specific variables of interest and change in test score performance between freshman and sophomore years. We focus on the performance task since that component of the CLA was administered most uniformly across institutions and has the largest completion rates. All analyses are adjusted for clustering at the institutional level. We used mean substitution for missing data, replacing missing values and including dummy variables (coded 1) when the substitution was made.

We began by estimating a baseline model, which includes our measures of disadvantage and a range of individual-level control variables (gender, two-parent household, number of siblings, and geographic location of students' high schools—urban/rural/suburban and region). We then examined specific high school and college experiences: high school academic preparation,

college engagement/involvement, employment, college institutional climate, and college major. Our analyses proceeded step by step, considering whether and how each set of experiences is related to students' performance on the CLA. The full model, which is reported herein, includes all of the variables of interest. Finally, we also conducted a fixed effect analysis by including a dummy variable for each of the institutions but one in the full model (the institution with no growth in CLA scores between 2005 and 2007 was chosen as a reference). Table 3C reports the results of these regression analyses.

ROBUSTNESS CHECKS: CEILING AND MOTIVATION EFFECTS

We checked our results to ensure that they were not an artifact of ceiling effects of the CLA instrument. We first divided the sample into quartiles by high school GPA and SAT. Students in the top quartiles on both measures made equal or larger gains than students in lower quartiles. Following, we conducted a more fine-grained analysis by dividing students into deciles based on their SAT scores. There is much variation in growth across deciles, but no clear indication that higher deciles gained less (indeed, students in the highest SAT decile showed the largest gains in the performance task score between the freshman and sophomore years). The same pattern is revealed if students are divided into deciles based on the 2005 performance task score. While there is much variation, students in higher deciles gain as much if not more than those in lower deciles, and students in the highest decile gain the most. Finally, we examined mean growth in CLA scores with and without the 10th decile. These analyses again confirm that students at the top of the SAT or 2005 CLA score distribution are experiencing growth over time.

Moreover, it is possible that reported test scores do not only reflect students' critical thinking, analytical reasoning, and written communication skills, but also a degree of motivation and effort invested in the test. This is a particularly important issue to consider given our focus on disadvantaged groups of students who may have underperformed not because of lower skills but because of lower levels of investment. After the completion of the CLA instrument, CAE asked students a range of questions regarding their experience of the test. Among these were questions about effort (e.g., whether students engaged in good effort throughout the test and gave it full attention) and importance (e.g., the extent to which doing well on the test was important to students). Based on these questions, we used factor analysis to create two scales, one measuring the degree of effort invested in the test and the other capturing the importance of performing well.

As would be expected, adding these scales to the full model indicates that students scored higher when they exerted more effort and cared more about performing well. However, what is crucial for our analysis is that there were only relatively small differences in reported effort and importance of the test between different groups of students (the respective standard deviations on these measures are 2.5 and 1.9; see Table 3B for means). Consequently, the addition of these scales to the full model did not alter any of the results for our measures of disadvantage nor did it help to explain any of the gaps between more and less advantaged groups of students. Thus, while effort and importance of performing well matter, they are equally distributed across groups and do not explain the observed gaps in the CLA performance across our identified groups of disadvantaged students. For brevity of presentation, this report includes only the baseline and final models, combining all of our variables of interest (see Table 3C). Estimates adjust for clustering at the institutional level.

TABLE 3B.

EFFORT AND IMPORTANCE SCALES BY MEASURES OF DISADVANTAGE

Variable	Effort *Mean*	Importance *Mean*
RACE/ETHNICITY		
White	10.45	6.62
African American	10.55	7.03
Hispanic	10.93	6.89
Asian	10.39	6.71
Other	10.59	6.91
PARENTAL EDUCATION		
Less than high school or high school diploma	10.53	6.93
Some college	10.65	6.68
Bachelor's degree	10.48	6.78
Graduate or professional degree	10.40	6.61
HIGH SCHOOL SEGREGATION		
High school not racially segregated (less than 70% racial minority)	10.90	6.90
Racially segregated high school (70% or more racial minority)	10.44	6.69
PRIMARY HOME LANGUAGE STATUS		
English home language	10.48	6.71
Non-English home language	10.61	6.80

APPENDIX C: Tables

TABLE 1C.

DESCRIPTIVE STATISTICS (N=2,322)

	Variable	*Mean*	*S.D.*
MEASURES OF DISADVANTAGE	**RACE/ETHNICITY**		
	White	0.64	0.48
	African American	0.15	0.36
	Hispanic	0.05	0.23
	Asian	0.10	0.31
	Other	0.05	0.22
	PARENTAL EDUCATION		
	Less than high school or high school diploma	0.14	0.35
	Some college	0.21	0.41
	Bachelor's degree	0.29	0.45
	Graduate or professional degree	0.35	0.48
	PARENTAL CLASS		
	Professional	0.58	0.49
	Routine non manual	0.11	0.32
	Petty Bourgeoisie	0.08	0.27
	Laborer	0.14	0.34
	Service	0.09	0.29
	Racially segregated high school (70% or more racial minority)	0.14	0.35
	Non-English home language	0.13	0.33
CONTROL VARIABLES	**INDIVIDUAL**		
	Male	0.37	0.48
	Lived in two parent household at 16	0.83	0.38
	Number of siblings	1.73	1.06
	HIGH SCHOOL CHARACTERISTICS		
	Urban	0.33	0.47
	Rural	0.19	0.39
	Midwest	0.35	0.48
	South	0.30	0.46
	West	0.19	0.40
COLLEGE EXPERIENCES	GPA	3.56	0.51
	Took 0 AP courses	0.27	0.44
	Took 1 AP course	0.16	0.37
	Took 2 AP courses	0.17	0.37
	Took 3 AP courses	0.12	0.33
	Took 4 AP courses	0.09	0.29
	Took 5 or more AP courses	0.18	0.39
	ENGAGEMENT/INVOLVEMENT		
	Hours spent studying alone	8.72	6.01
	Hours spent studying with peers	3.43	3.39
	Hours spent in a fraternity/sorority	1.64	4.57
	EMPLOYMENT		
	Hours worked on campus	4.17	6.17
	Hours worked off campus	4.14	7.36
	INSTITUTIONAL CLIMATE		
	Faculty members have high expectations	5.87	1.12
	FIELD OF STUDY		
	Business	0.13	0.34
	Education and human services	0.07	0.26
	Engineering, agriculture, and computer science	0.11	0.32
	Communications	0.05	0.21
	Health services	0.09	0.29
	Social sciences and humanities	0.28	0.45
	Science and math	0.16	0.36
	Undecided, other, and N/A	0.11	0.31
TEST SCORES	2005 performance task score	1131.94	187.76
	2007 performance task score	1166.26	211.06

TABLE 2C.

CLA PERFORMANCE TASK SCORES BY DIFFERENT MEASURES OF DISADVANTAGE

Variable	2005 Performance Task Score	2007 Performance Task Score	Difference between 2007 and 2005 Performance Task Score
RACE/ETHNICITY			
White	1170.39	1211.47	41.08
African American	994.59	1001.35	6.76
Hispanic	1102.67	1151.77	49.10
Asian	1118.67	1145.68	27.02
Other	1108.05	1137.23	29.18
PARENTAL EDUCATION			
Less than high school or high school diploma	1063.34	1102.01	38.67
Some college	1083.18	1116.50	33.32
Bachelor's degree	1139.61	1171.11	31.50
Graduate or professional degree	1183.36	1218.42	35.06
HIGH SCHOOL SEGREGATION			
High school not racially segregated (less than 70% racial minority)	1145.82	1183.51	37.69
Racially segregated high school (70% or more racial minority)	1047.07	1068.58	21.51
PRIMARY HOME LANGUAGE STATUS			
English home language	1136.36	1172.30	35.94
Non-English home language	1101.22	1124.30	23.09

TABLE 3C.

MODELS PREDICTING THE 2007 CLA PERFORMANCE TASK SCORE

Variable	Baseline Model	Full Model	Full Model with Fixed Effects
MEASURES OF DISADVANTAGE			
RACE/ETHNICITY			
African American	–105.523*** (19.965)	–98.437*** (18.387)	–70.297*** (16.853)
Asian	–31.397* (12.965)	–36.284** (11.128)	–34.113** (11.805)
Hispanic	–8.400 (22.794)	–13.033 (19.401)	–11.504 (20.912)
Other	–41.905* (19.724)	–41.472* (17.795)	–37.597* (17.427)
PARENTAL EDUCATION			
Some college	5.306 (12.128)	9.202 (11.511)	11.536 (10.387)
Bachelor's degree	18.293 (13.119)	11.425 (12.332)	9.343 (11.181)
Graduate or professional degree	42.101** (15.208)	23.945 (13.680)	14.910 (11.930)
PARENTAL CLASS[A]			
Professional	7.400 (13.257)	8.111 (11.915)	–0.580 (11.699)
Routine non manual	10.713 (13.296)	12.965 (11.704)	8.174 (10.501)
Petty Bourgeoisie	–14.560 (25.629)	–10.356 (23.128)	–11.647 (22.782)
Service	17.724 (22.950)	14.758 (22.088)	11.549 (22.377)
Racially segregated high school (70% or more racial minority)	–29.186* (14.025)	–32.901* (12.558)	–37.299** (13.877)
Non–English home language	–28.915* (13.839)	–26.123 (14.839)	–37.569** (13.027)

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TABLE 3C.

MODELS PREDICTING THE 2007 CLA PERFORMANCE TASK SCORE

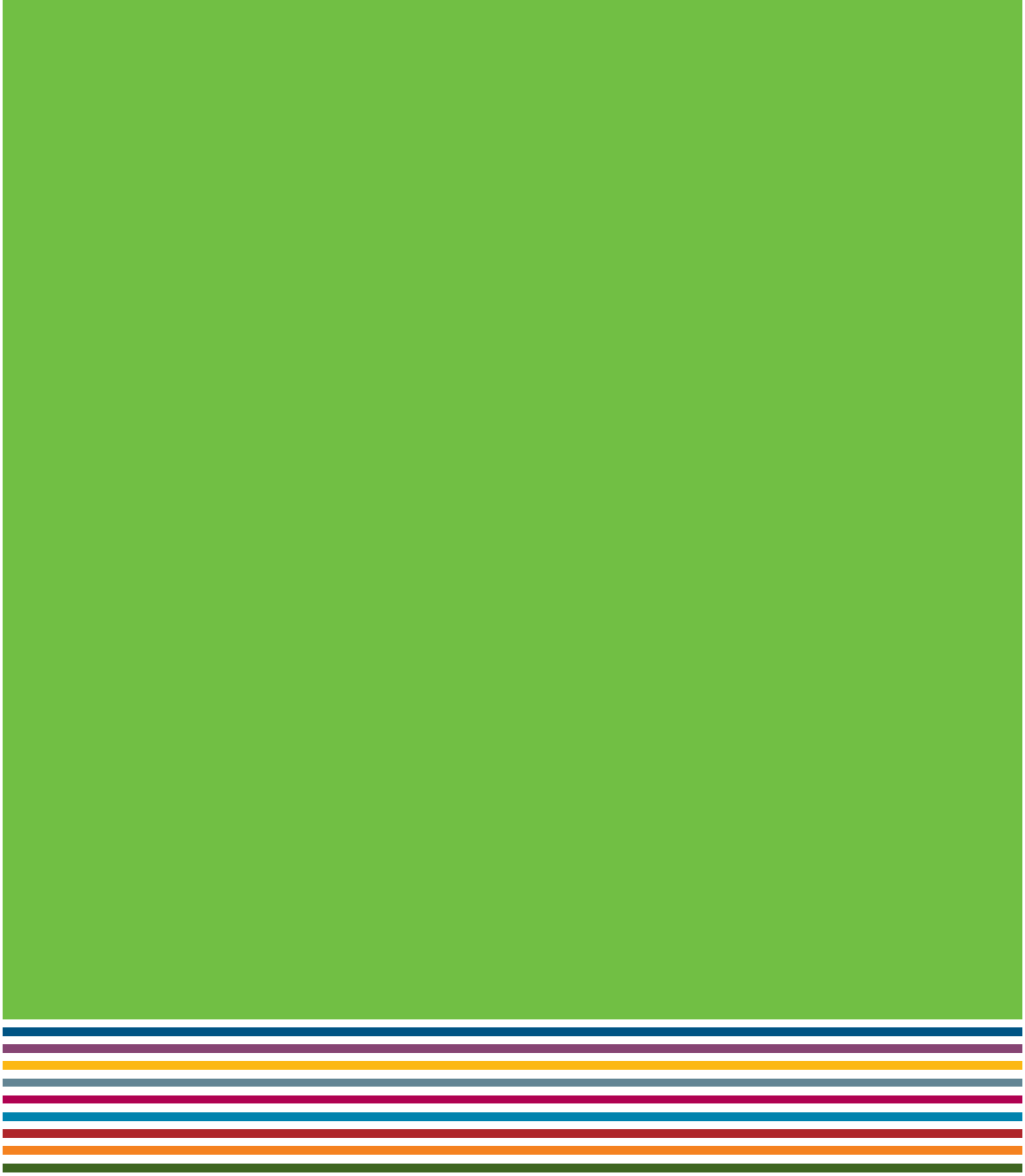
Variable	Baseline Model	Full Model	Full Model with Fixed Effects
CONTROL VARIABLES			
INDIVIDUAL			
2005 test score	0.387*** (0.035)	0.294*** (0.027)	0.249*** (0.025)
Male	–0.749 (8.717)	6.092 (9.364)	3.612 (9.309)
Lived in two parent household at 16	0.743 (11.261)	–2.148 (10.633)	–0.169 (11.194)
Number of siblings	–0.857 (4.713)	2.329 (4.124)	2.945 (4.011
HIGH SCHOOL CHARACTERISTICS			
Urban	13.726 (11.083)	5.795 (10.629)	2.722 (9.522)
Rural	–2.076 (11.931)	–2.359 (12.249)	–5.443 (12.122)
Midwest	17.096 (25.924)	12.747 (22.588)	7.193 (15.267)
South	–34.181 (25.296)	–33.302 (22.392)	6.398 (19.001)
West	19.311 (22.841)	19.664 (23.808)	47.967** (17.932)
HIGH SCHOOL ACADEMIC PREPARATION			
GPA		25.975** (8.288)	29.719** (9.242)
Took 1 AP course		5.602 (10.674)	4.340 (10.676)
Took 2 AP courses		5.993 (12.083)	3.525 (11.798)
Took 3 AP courses		8.192 (11.780)	8.585 (12.306)
Took 4 AP courses		36.171* (14.172)	27.974 (14.704)
Took 5 or more AP courses		62.338*** (11.419)	53.241*** (11.005)
COLLEGE EXPERIENCES			
ENGAGEMENT/INVOLVEMENT			
Hours spent studying alone		2.018** (0.615)	0.861 (0.600)
Hours spent studying with peers		–4.130** (1.275)	–4.712** (1.352)
Hours spent in a fraternity/sorority		–3.550*** (0.843)	–2.888*** (0.691)
EMPLOYMENT			
Hours worked on campus		4.910* (2.315)	1.538 (1.902)
Hours worked on campus, squared		–0.285* (0.137)	–0.103 (0.108)
Hours worked off campus		–4.408* (1.700)	–1.967 (1.305)
Hours worked off campus, squared		0.175* (0.084)	0.085 (0.068)
INSTITUTIONAL CLIMATE			
Faculty members have high expectations		11.836* (4.493)	9.911* (3.747)
FIELD OF STUDY[b]			
Education and human services		0.775 (12.762)	–1.854 (12.908)
Engineering, agriculture, and computer science		30.006 (15.378)	23.071 (16.506)
Communications		20.776 (15.449)	18.207 (15.084)
Health services		24.222 (12.382)	27.996 (10.723)
Social sciences and humanities		46.984*** (12.456)	32.716** (10.155)
Science and math		52.990** (18.430)	30.540* (13.584)
Undecided, other, and N/A		24.441 (16.245)	18.151 (14.304)
SCHOOL FIXED EFFECTS	**NO**	**NO**	**YES**
Intercept	727.414*** (44.946)	630.166*** (60.182)	677.790*** (43.584)
R2	0.270	0.329	0.376

*p<.05, **p<.01, ***p<.001.

Note: Robust standard errors in parentheses. Analyses are adjusted for clustering of students within schools. Missing covariates (with the exception of gender and race) are mean substituted; dummy variables flagging missing covariates are included in the analyses but not shown. N = 2322.

[a] Laborer is omitted category.

[b] Business is the omitted category.



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