Achievement gaps in a flipped, microeconomics principles course

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ABSTRACT

Faced with shrinking state funds, rising student demand, high failure rates, and racial and ethnic achievement gaps, the introductory microeconomics course became a bottleneck for business students at California State University, Northridge. The Economics Department responded with the creation of a flipped, introductory microeconomics course where students watch online lectures before attending face-to-face, active-learning, class sessions. Raw data suggests the course redesign was a success but large, racial and ethnic achievement gaps remain. However, regression analysis that controls for college preparedness indicates that race and ethnicity are insignificant determinants of student performance in the flipped, microeconomics principles course. Gender is a significant factor with female students earning marginally lower exam scores than male students. In satisfaction surveys, students with English as a second language believe the online lectures helped them learn the course material. Nearly one quarter of all students take two developmental English classes prior to enrollment into microeconomics principles. A flipped class has the potential to help students learn course material but it cannot erase skills deficits. The University must provide additional resources to ensure the success of every student.

Keywords: microeconomics principles, flipped course, racial and ethnic achievement gaps, underprepared students

BACKGROUND

Some 32 percent of American college students now take at least one online course. Of these students, 13 percent were at a for-profit institution, 18 percent were at a private, non-profit institution, and the vast majority (69 percent) were at a public institution. (Seaman et al., 2018). Widespread enrollment in online courses has been bolstered by several factors, including improved information technology, reduced budgets of public institutions, and rising demand for higher education (NASBO, 2013).

The mega-state of California offers a stark example of rising demand for higher education coupled with falling state expenditure. Since the 1980s, the state's college-age population increased by 57 percent while California's spending on higher education (as a fraction of personal income) fell by 40 percent (Bady and Konczal, 2012 and Douglass, 2011). A recent Public Policy Institute of California study predicts the state will fall 1.1 million college graduates short of economic demand by 2030 (Jackson and Johnson, 2018).

California Governor Jerry Brown has responded to this crisis (in part) by pushing more state schools to offer online courses. His 2018-19 budget provides $120 million to open a fully online public, community college by fall 2019 (Watanabe, 2018). His budget also sets aside $92.1 million for the California State University (CSU) System to make progress on its ambitious, Graduation Initiative 2025. This Initiative seeks to raise graduation rates and eliminate racial and ethnic opportunity and achievement gaps (in part) by expanding the number of online courses and eliminating all remedial coursework.

The CSU is a massive, broad-access institution with 484,297 enrolled students in 2017. More than half of CSU students are students of color; one-third of its undergraduates are the first in their families to attend college; and 49 percent of its undergraduates are Pell Grant recipients. In 2016, 18 percent of white, CSU students required some form of remediation compared with half of Hispanic students and 60 percent of black students who needed remediation in math or English. All developmental math and English classes will be eliminated in fall 2018 (Jackson, 2017). Currently, CSU students are required to complete any needed developmental math and English courses prior to enrolling in most college-level courses, including microeconomics principles.

COURSE DESIGN

This environment spurred a member of the economics faculty in California State University Northridge's College of Business to offer a flipped section of its required, microeconomics principles class. Historically, this class had the highest failure rates on the entire campus. For example, 54 percent of students enrolled in the 2010 spring semester earned a letter grade of D, W, or F in microeconomics principles. All class sections were taught in a traditional, large-lecture format. By contrast, the redesigned class (first offered in fall 2011) is a "flipped" hybrid. The class is ½ online and ½ "live." There are no in-class lectures and the class meets face-to-face once per week, for 1.25 hours. Students watch captured lectures online and class time is spent working on real-world problems and applications of the material. Class meetings frequently use "Brainstorming" and "Think-Pair-Share" as a means to promote active, student learning. Weekly, graded, online quizzes (in Aplia) encourage students to view the lectures before attending class meetings. Baumol and Blinder's (2016) textbook is required and paired with Aplia. The midterm and final exams are held in class.

The flipped course is designed to provide a more enriching and supportive learning environment for students. Recorded lectures allow students to pause, rewind, or repeat difficult aspects of any lecture. Weekly quizzes encourage students to keep up with course content and provide immediate feedback about where they are having difficulty. Class time is spent working on applications and analysis of interesting problems rather than introducing material. Seat time and commute time are cut in half as traditional, class sections typically meet twice per week for a total of 2.5 hours. The flipped course also provides a more rewarding working environment for faculty. Instructors are freed from repeating the same, old lecture. Students view lectures before attending class and thereby come prepared to ask meaningful, clarifying questions. Instructors spend class time facilitating lively classroom discussions and problem-solving sessions on interesting topics (e.g., gasoline taxes, minimum wage legislation, and antitrust laws).

Roughly 19 percent of all students taking microeconomics principles enroll into the flipped section each semester. The class is popular and has long wait lists. Enrolled students appear to be satisfied with the course design. For example, 89 percent of anonymously surveyed students (by Academic Technology in fall 2011) indicate the "ability to pause and rewind online lectures helped me learn the material." Online lectures appear to be especially helpful for students with English as a second language, as 97 percent indicate "online lectures helped me learn the material." Additionally, 70 percent of all students indicate that "using class time to solve problems rather than introduce material" was "very effective."

If the course design lowers failure rates, then more business students can complete required microeconomics principles and thereby progress toward their degrees. Between fall 2011 and spring 2016, 34 percent of 6,160 students enrolled in microeconomics principles earned a grade of D, W, or F. Parsing this statistic by race and ethnicity, shows 39 percent of Hispanic students and 53 percent of black students earn grades of D, W, or F compared with 25 percent of white students and 29 percent of Asian students. (See Table 1 of the Appendix.) D, W, and F grades are lower for all students in flipped sections of the course but racial and ethnic achievement gaps remain large. Campus administrators are pleased with the Department's course redesign and the subsequent drop in D, W, and F grades but are concerned by the persistent racial and ethnic achievement gaps. Regression techniques are used in this paper to determine whether race and ethnicity are significant determinants of student performance in the flipped, microeconomics course.

TERMINOLOGY

There are no set standards for defining various types of online, course delivery modes. Terms like online, hybrid, flipped, and blended mean different things to different people (Fuster, 2016). Thus, it is worth stating the definitions used in this paper. Online means all course activities are completed online. There are no required, face-to-face class meetings. Hybrid means most course activities are completed online. However, there are some required, face-to-face class activities like lectures, discussions, or labs. Flipped means course lectures are placed online, so face-to-face class meetings are used for active learning. Blended means online activity is mixed with classroom meetings. There is little or no reduction in the amount of required, face-to-face classtime.

LITERATURE REVIEW

Numerous studies have investigated the efficacy of online college courses. Most reach the conclusion that there are no significant differences between student success in online classes and in traditional classes. Russell's (1999) "No Significant Difference Phenomenon" was one of the earliest books to review research studies related to distance learning. He cites hundreds of studies that show no significant difference between student achievement in online and face-to-face classes. More recently, the U.S. Department of Education performed a meta-analysis of 28 rigorous studies of online courses, with random assignment or quasi-experimental design, and concluded that student learning outcomes in hybrid and fully online courses were equal to or better than those in traditional courses (Means et al., 2010).

However, Jaggars and Bailey (2010) offered an important caveat when they re-examined this meta-analysis and found that only seven of the 28 studies considered by the Department of Education compared semester-long, fully online courses with traditional courses taken by college students. More than half of the seven studies involved courses that explicitly taught technology and all of the studies seem to involve relatively well-prepared students who attended "selective" or "highly selective" universities. Jaggars and Bailey concluded that the online courses showed equivalent learning outcomes among the samples of students in the seven studies. They stressed that findings from these studies may not generalize to non-technology classes or to underprepared students.

The most recent and comprehensive study of online college courses examines the learning outcomes of over 100,000 undergraduates at DeVry University (Bettinger et al., 2017). Courses at DeVry are ideally suited for a comparison of student success in online versus traditional classes as every course is offered both online and face-to-face, by the same instructor. The study finds that taking an equivalent online course lowers student grades by 0.44 points. Parsing this data between students with the lowest and highest college GPA, shows that online classes reduce grades by 0.5 points among the lowest performing students versus having an insignificant impact on grades of the highest performing students. Bettinger et al. (2017) conclude that the least well-prepared students consistently perform worse in online classes than they do in traditional, face-to-face classes.

Several studies have investigated the efficacy of online microeconomics principles courses and most confirm "no significant difference" in student learning across class formats. For example, Gratton-Lavoie and Stanley (2009) compare the efficacy of traditional and online microeconomics principles classes by comparing student scores on a comprehensive final exam. After including controls for age, gender, hours worked, and cumulative GPA, they find students enrolled in online courses earn similar final exam scores as students enrolled in traditional courses. Similarly, Horspool and Lange (2012) find students in online and traditional sections of microeconomic principles are equally successful. By contrast, Figlio et al. (2013) find that Hispanic students, male students, and lower-achieving students earn somewhat higher exam scores in a traditional, microeconomics principles course compared to an online course.

Far fewer studies investigate the impact of blended microeconomics principles classes on student learning. For example, Cosgrove and Olitsky (2015) compare student performance in blended and traditional sections of micro and macroeconomics principles classes. Blended sections cancelled ¼ of face-to-face class meetings so that students could complete online message boards and assignments. Student performance is measured by the difference in average

pre and post test scores on 10 multiple-choice questions. After controlling for gender, cumulative GPA, college credits, and SAT scores, they find students in traditional classes have average score gains of one multiple-choice question compared with students in blended classes. They conclude that students in traditional sections have greater knowledge retention. Their findings are interpreted in two ways: (1) students in traditional classes may need to take notes and thereby be more attentive during class; and (2) blended classes require students to work independently and interact less frequently with the instructor.

The study reported in this paper does not compare student performance across microeconomics principles classes with different formats. Instead, it considers whether student learning within a flipped, hybrid class differs by race and ethnicity. Such research is relevant given the increased adoption of hybrid and flipped classes on college campuses and growing concern over racial and ethnic achievement gaps. More pragmatically, the Economics Department at CSU Northridge does not have random assignment of students to classes, nor a common final exam across class sections. While selection bias cannot be addressed, this study has a large sample size of 1,051 students and holds pedagogical factors constant (e.g., instructor, class size, time/schedule of class, exam format, and topic coverage). Additionally, this paper adds to the scant research that investigates how race and ethnicity impact student performance in introductory economics (e.g., Borg and Stranahan (2002) and Stockly (2009)).

METHODOLOGY

This project samples students from a large, public university in Southern California, California State University Northridge (CSUN). CSUN has close to 37,000 undergraduates and nearly 7,000 business majors. It is a racially and ethnically diverse campus with less than 25 percent of students who identify as white. This project analyzes course outcomes for students enrolled in a flipped, hybrid microeconomics principles course (ECON 160) over a five-year period.

ECON 160 is a three-unit semester course that is required for all business majors. It is designed to increase students' understanding of how consumers and firms make decisions and how those decisions are impacted by market structure. The content of the flipped, hybrid course is equivalent to the traditional, face-to-face course. CSUN began offering this class in fall 2011. It has only been taught by one, white, female instructor who designed it. The class meets late-morning, once per week, in a large-lecture hall that seats 150 students. Most students are unaware that it is a flipped, hybrid class until the first meeting as the University registration system does not distinguish it from traditional sections of ECON 160.

The analysis sample contains 1,051 students who completed the redesigned ECON 160 course between fall 2011 and spring 2016. Data was collected on student characteristics prior to entering the course, while midterm and final exam scores in ECON 160 were collected during the semester. An ordinary least squares model is estimated to determine whether students' exam performance differs by race and ethnicity. It is assumed that student performance on ECON 160 exams is influenced by personal characteristics, past achievement in high school courses, and preparation for college. Information regarding the student's age, gender, and race or ethnicity is included in the regression. High school GPA describes past achievement in high school courses. Number of developmental math and English courses taken, or math and verbal SAT scores account for college preparation. Variable definitions and descriptive statistics are summarized in Tables 2 and 3.

RESULTS

The average midterm score is 65.9 points (out of 100) and it varies by race and ethnicity. White and Asian students earn higher midterm scores (69.4 and 67.2 respectively) than Hispanic or black students (64.2 and 60.4 respectively). The nine-point difference in scores between white and black students is fairly large. The average final score (of 60.4) is 5.5 points lower than the average midterm score (of 65.9) for all students. Differences between racial and ethnic groups remain, although the gap between white and black students falls from 9.0 points to 5.9 points on the final.

Achievement gaps on the midterm and final exams are intertwined with differences in students' math and English skills. Table 3 indicates that Hispanic and black students have lower math and verbal SAT scores, and they are more likely to take developmental math and English courses at CSUN. For example, 49 percent of black students take developmental math classes compared with 22 percent of white students. And 55 percent of black students take developmental English courses compared with 26 percent of white students. Any deficiencies in math or English (for any racial or ethnic group) is likely to reduce success in microeconomics principles. Almost every concept is illustrated with complex graphs or equations. The required textbook (Baumol and Blinder, 2016) uses sophisticated language and requires college-level vocabulary and reading comprehension.

Linear regression is used to determine whether race and ethnicity are significant determinants of student performance, after accounting for differences in students' math and English skills. Regressions (1) and (3) in Tables 4 and 5 present the analysis for midterm and final exam scores respectively. Regression (1) in each table uses the number of developmental math and English courses taken at CSUN, while regression (3) uses math and verbal SAT scores as proxies for student skills. SAT scores may be a better measure of college readiness and developed reasoning than the number of developmental courses. However, both measures are used as the sample size falls by roughly 20 percent when including SAT scores as an explanatory variable. CSUN does not require submission of SAT scores for students who place in the top 10 percent of their high school graduating class, or transfer from local community colleges.

Table 4 indicates that black (Hispanic) students earn midterm scores that are 5.8 (2.9) points lower than white students, after controlling for the number of developmental courses taken at CSUN. However, the inclusion of SAT scores suggests that the small differences (of 3.7 points for black students and 1.3 points for Hispanic students) in midterm scores are not statistically significant. Similarly, Table 5 indicates that black (Hispanic) students earn final scores that are 3.9 (4.0) points lower than white students, when controlling for the number of developmental courses taken. However, the inclusion of SAT scores suggests that the small differences (of 2.5 points for black students and 2.5 points for Hispanic students) in final scores are only statistically significant for Hispanic students.

Regressions (2) and (4) in Tables 4 and 5 disaggregate these results by gender. Regression (2) indicates that all students (with Asian females being the exception) earn somewhat lower midterm scores than white males, after controlling for the number of developmental courses taken. All male students of color earn scores that are five to seven points lower than white males. Similarly, white and Hispanic females earn scores that are six or seven points lower than white males. Black females earn 10 points less than white males on the midterm. The inclusion of SAT scores, in regression (4), indicates no significant difference between the midterm scores of male students of color (with Asians being the exception) and

white males. Yet, all female students (with Asians being the exception) earn scores that are six to eight points less than white males. Similarly, Table 5 suggests that most students (with Asian females and black males being the exception) earn final scores that are marginally lower than white males, when controlling for the number of developmental courses taken. Further, the inclusion of SAT scores suggests that all females groups and Hispanic males earn final exam scores that are four to six points lower than white males. These results suggest a gender gap in student performance in microeconomic principles. Numerous studies have investigated gender gaps in undergraduate economics courses with no consensous emerging from their findings (Johnson et al., 2014).

FUTURE RESEARCH

The flipped classroom holds promise to help struggling students. Placing lectures online appears particularly helpful to students with English as a second language. This paper examines whether student learning within a flipped class differs by race and ethnicity. Further research is needed to assess the impact of the flipped class format on student performance and achievement gaps. Ideally, students would be randomly assigned to a blended section or a flipped section of microeconomics principles. Both sections should be nearly identical to isolate the impact of replacing lectures with active learning in class meetings. That requires the same instructor teaching back-to-back sections (on the same days of the week with the same number of students) using the same syllabus, textbook, Aplia quizzes, and exams.

CONCLUSION

The California State University System adopted a “Graduation Initiative 2025” which seeks to raise graduation rates and eliminate racial and ethnic opportunity and achievement gaps. A flipped, microeconomics principles course was implemented at the Northridge campus to address both goals for business students. Raw data suggests the course succeeded in lowering the percentage of students who earn grades of D, W, or F from 36 percent to 27 percent which will raise graduation rates. However, large, ethnic and racial achievement gaps remain as black and Hispanic students (compared with white and Asian students) are more likely to earn grades of D, W, or F in the flipped, microeconomics course.

A comparison of exam scores indicates a relatively large difference between white and black students: 9.0 points on the midterm and 5.9 points on the final. However, this difference falls to 3.7 points on the midterm and 2.5 points on the final, and is no longer statistically significant, after controlling for math and verbal SAT scores. These results suggest that racial and ethnic achievement gaps are being driven by gaps in college preparation. Black and Hispanic students earn lower SAT scores and are more likely to take developmental math and English courses than white or Asian students. Disaggregating the results by gender suggests that all females and Hispanic males earn marginally lower final exam scores than white males.

Nearly one quarter of all students take two developmental English classes prior to their enrollment into the flipped, microeconomics course. This indicates a severe skills deficit upon admission to the University and a challenge to comprehend the required Baumol and Blinder (2016) textbook. These students need more guidance and support in the classroom. Students should feel the economics faculty member knows their name, notices when the student is absent or misses an assignment, cares about their performance, and is available for individual help.

However, all sections of microeconomics principles (i.e., flipped or traditional) contain 150 students. This makes it nearly impossible for a single faculty member to connect with, monitor, or tutor individual students.

If the University admits students with basic skills deficits and is genuinely committed to their success, then administrators must devote additional resources to support student learning. Best practices include tutoring by faculty, staff, or peer mentors; computer-assisted instruction; supplemental instruction; intensive and early-alert advising; and co-requisite, college-level courses (e.g., Barshay, 2018; McCann, 2017; and Rutschow and Schneider, 2011). Comprehensive, integrated support strategies are critical in courses with high failure rates. Microeconomics principles has the highest failure rate on the Northridge campus.

This demands an overhaul of the entire system, and not just a course redesign. Students should be placed into smaller classes; and instructors should have access to an early-alert system to provide immediate feedback about missed classes or assignments. Students experiencing difficulties should be directed to additional resources (e.g., office hours, individual tutoring, and advising appointments). Underprepared students should be co-enrolled into developmental classes that teach reading, writing, and math in the context of reading, writing, and math students encounter in microeconomics principles. Instead, the CSU system will eliminate all developmental math and English courses in fall 2018 without enacting any additional support strategies for remedial students. This policy is likely to raise D, W, F rates and exacerbate racial and ethnic achievement gaps in microeconomics principles.

REFERENCES

Seaman, J., Allen, I., & Seaman, J. (2018). *Grade increase: Tracking distance education in the United States.* Babson Park, MA: Babson Survey Research Group.

Bady, A., & Konczal, M. (2012). From master plan to no plan: The slow death of public higher education. *Dissent, 59*(4), 10-16.

Barshay, J. (2018, February 19). How to help students avoid the remedial ed trap. *Hechinger Report*, Proof Points Section.

Baumol, W., & Blinder, A. (2016). *Microeconomics: Principles and policy*. Boston, MA: Cengage.

Bettinger, E., Fox, L., Loeb, S., & Taylor, E. (2017). Virtual classrooms: How online college courses affect student success. *American Economic Review,* 107(9), 2855-2875.

Borg, M., & Stranahan, H. (2002). The effect of gender and race on student performance in principles of economics: The importance of personality type. *Applied Economics*, *34*(1), 589-598.

Cosgrove, S., & Olitsky, N. (2015). Knowledge retention, student learning, and blended course work: Evidence from principles of economics courses. *Southern Economic Journal*, *82*(2), 556–579.

Douglass, J. (2011). Can we save the college dream? *Boom: A Journal of California*, *1*(2), 25-42.

Figlio, D., Rush, M., & Yin, L. (2013). Is it live or is it Internet? Experimental estimates of the effects of online instruction on student learning. *Journal of Labor Economics, 31*(4), 763-784.

Fuster, B. (2016, January 15). Negotiating the many definitions of hybrid, online classes. *U.S. News & World Report*, Higher Education Section.

Gratton-Lavoie, C., & Stanley, D. (2009). Teaching and learning principles of microeconomics online: An empirical assessment. *The Journal of Economic Education, 40*(1), 3–25.

Horspool, A., & Lange, C. (2012). Applying the scholarship of teaching and learning: student perceptions, behaviours and success online and face-to-face. *Assessment & Evaluation in Higher Education*, *37*(1), 73-88.

Jaggars, S., & Bailey, T. (2010). *Effectiveness of fully online courses for college students: Response to a Department of Education meta-analysis.* New York, NY: Columbia University Community College Research Center.

Jackson, J. (2017, August 10). CSU ends remedial courses. *Public Policy Institute of California*, Education Blog.

Jackson, J., & Johnson, H. (2018). *California's future: Higher education*. San Francisco, CA: Public Policy Institute of California.

Johnson, M., Denise, R., & Taengnoi, S. (2014) A meta-analysis of the gender gap in performance in collegiate economics courses. *Review of Social Economy,* 72(4), 436-459.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* Washington, D.C.: U.S. Department of Education.

McCann, C. (2017). *Developmental Education Challenges and Strategies for Reform*. Washington, D.C.: U.S. Department of Education.

NASBO. (2013). *Improving postsecondary education through the budget process: Challenges & opportunities.* Washington, D.C.: The National Association of State Budget Offices.

Russell, T. (1999). *The no significant difference phenomenon.* Chapel Hill, N.C.: Office of Instructional Telecommunications.

Rutschow, E., & Schneider, E. (2011). *Unlocking the gate: What we know about improving developmental education*. New York, NY: MDRC.

Stockly, S. (2009). Is Race a Determinant of Student Performance in Economics? *Review of Black Political Economy*, *36*(1), 181–195.

Watanabe, T. (2018, January 10). Governor Brown proposes California's first fully online public community college. *Los Angeles Times*, Education Section.

APPENDIX

Table 1. Percentage of D, W, and F Grades for Microeconomics Principles Students by Race, Ethnicity, and Section Format

Ethnic Group	Flipped	Not Flipped	All Sections	Sample size
White	18	26	25	1,680
Asian	24	30	29	1,292
Black	45	55	53	393
Hispanic	30	41	39	2,795
Total Percent	27	36	34	100
Sample size	1,180	4,980	6,160	6,160

Table 2. Variable Definitions and Descriptive Statistics

Variable	Definition	Mean	Std. Dev.
Midterm	Score (out of 100) on midterm exam	65.9	(16.2)
Final	Score (out of 100) on final exam	60.4	(14.5)
Withdrawal	Student did not take final exam	4.6%	
Age	Student's age when enrolled in ECON 160	20.0	(1.8)
Female	Student is a female	48.2%	
White	Student identifies as white	25.4%	
Asian	Student identifies as Asian	20.6%	
Black	Student identifies as Black or African American	5.9%	
Hispanic	Student identifies as Hispanic or Latino	48.1%	
HSGPA	Student’s grade point average in high school	2.90	(0.99)
DEVMATH	Number of developmental math courses	0.37	(0.65)
DEVENG	Number of developmental English courses	0.63	(0.84)
SATMATH	Student’s math SAT score	498.1	(80.3)
SATVERB	Student’s verbal SAT score	470.6	(77.3)
		Sample size	1,051

Notes: Standard deviation is in parentheses next to the mean. Otherwise, the statistics are percentages. Sample size is 1,026 for midterm, 1,003 for final, and 842 for SAT scores.

Table 3. Exam Scores and Measures of College Preparation by Race and Ethnicity					
Variable		White	Asian	Black	Hispanic
Midterm		69.4	67.2	60.4*	64.2*
Final		63.9	61.7	58.0*	58.2*
Withdrawal		2.6	4.6	8.1	5.1
Missing Final		2.2	3.2	1.6	3.5
DEVMATH	0	78	83	52	67
	1	14	12	34	23
	2	8	6	15	11
DEVENG	0	74	61	45	55
	1	12	13	26	19
	2	14	26	29	27
HSGPA		2.8	3.0	2.7	3.0*
SATMATH		523.1	532.2	449.6*	479.5*
SATVERB		496.0	481.3	447.1*	457.9*
Completed SAT		70.4	79.2	82.3	85.4
Sample size		267	216	62	506

Statistics are percentages for withdrawal, missing final, number of developmental courses, and completed SAT. Otherwise, statistics are means. Missing final indicates the percentage of students who do not take the final exam after completing the midterm. Sample size is lower for midterm, final, and SAT scores. *Indicates p value is less than 0.05.

Table 4. Least Squares Analysis of Midterm Exam								
Dependent variable = Midterm exam score								
Regression	(1)		(2)		(3)		(4)	
Variable	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
Constant	45.4*	7.6	47.2*	7.6	-8.8	12.0	-6.0	12.1
Age	1.2*	0.3	1.2*	0.3	0.9*	0.5	0.9*	0.5
Female	-2.5*	0.9			-2.2*	1.0		
Asian	-1.6	1.4			-1.6	1.5		
Black	-5.8*	2.2			-3.7	2.4		
Hispanic	-2.9*	1.2			-1.3	1.3		
White female			-6.2*	1.8			-5.9*	2.1
Asian male			-5.4*	1.9			-5.9*	2.1
Asian female			-3.2	1.9			-2.2	2.2
Black male			-7.4*	3.2			-4.4	3.6
Black female			-10.1*	2.9			-8.3*	3.1
Hispanic male			-4.6*	1.6			-2.8	1.8
Hispanic female			-7.2*	1.6			-5.5*	1.8
HSGPA	1.5*	0.6	1.5*	0.6	4.7*	1.1	4.6*	1.1
DEVMATH	-4.9*	0.8	-5.1*	0.8				
DEVENG	-4.0*	0.6	-3.9*	0.6				
SATMATH					0.04*	0.01	0.04*	0.01
SATVERB					0.05*	0.01	0.05*	0.01
Sample size	1,026				824			
F-statistic	20.9*		18.0*		24.9*		19.3*	
R-square	0.15		0.16		0.20		0.21	
*Indicates p value is less than 0.05.								

Table 5. Least Squares Analysis of Final Exam								
Dependent variable = Final exam score								
Regression	(1)		(2)		(3)		(4)	
Variable	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
Constant	31.8*	7.0	32.9*	7.1	-18.5	11.2	-16.9	11.2
Age	1.4*	0.3	1.4*	0.3	1.6*	0.5	1.6*	0.5
Female	-0.7	0.9			-0.9	0.9		
Asian	-1.5	1.3			-1.6	1.4		
Black	-3.9*	2.0			-2.5	2.2		
Hispanic	-4.0*	1.1			-2.5*	1.2		
White female			-3.4*	1.7			-5.0*	1.9
Asian male			-3.3*	1.7			-2.9	1.9
Asian female			-2.7	1.8			-5.0*	2.0
Black male			-4.3	2.9			-4.6	3.4
Black female			-6.6*	2.7			-5.3*	2.8
Hispanic male			-5.8*	1.5			-5.5*	1.6
Hispanic female			-5.3*	1.5			-4.2*	1.7
HSGPA	1.9*	0.5	1.9*	0.5	4.8*	1.0	4.9*	1.0
DEVMATH	-2.1*	0.8	-2.2*	0.8				
DEVENG	-3.4*	0.6	-3.4*	0.6				
SATMATH					0.02*	0.01	0.02*	0.01
SATVERB					0.05*	0.01	0.05*	0.01
Sample size	1,003				808			
F-statistic	15.0*		11.3*		20.9*		16.0*	
R-square	0.11		0.11		0.17		0.18	
*Indicates p value is less than 0.05.								