The Price of STEM Success:
The Impact of Need-Based Financial Aid on STEM Production

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2021

Abstract

This study investigates whether financial grants, allocated based on need rather than major, improves odds that economically vulnerable students will pursue science, technology, engineering, and/or mathematics (STEM) degrees. We implemented a privately-funded financial aid program in Wisconsin and conducted a randomized experiment of its effects for low and moderate-income students at 10 two-year and four-year colleges and universities. One thousand beginning undergraduates were allocated $1,000 per year in additional support. Over the next three years their academic outcomes were compared to those of 565 comparable students who were not allocated grants due to insufficient resources. The additional financial support greatly increased the probability that students would persist in pursuing a STEM major and/or switch to a STEM major by the third year of school. However, it did not change the odds that students would remain enrolled. Implications for educational opportunity, practice, and policy are discussed.

Acknowledgements

This project was supported by the National Science Foundation (grant DUE-1317309) Ascendium. We are deeply grateful to the 10 institutions in the study, the students, and to ACT, Evaluation and Assessment Solutions for Education, Wisconsin Higher Education Aid Board, Peter Steiner at the University of Wisconsin, the Wisconsin Center for Education Research, and the University of Wisconsin Survey Center for assistance. We thank the staff of The Hope Center for College, Community, and Justice and former Wisconsin HOPE Lab staff members Jed Richardson, Sara Sanders, and Wanyi Chen. The views in this article are those of the authors and do not necessarily represent the views of the funders.

Introduction

Science, technology, engineering, and/or mathematics (STEM) occupations are among the fastest growing in the United States - eight out of ten depend on a knowledge base in science and mathematics (U.S. Bureau of Labor Statistics, 2019a). In light of COVID-19 pandemic, expanding skilled professionals in these fields is more important than ever. Yet, despite being better paying and more portable, on average, than other jobs available to college-educated individuals, American colleges and universities are not producing enough graduates with these skills (Lowell, Salzman, Bernstein & Henderson, 2009; National Science Board, 2015; Salzman & Lowell, 2007; U.S. Bureau of Labor Statistics, 2017, 2019b).

This is not due to a discernible lack of interest or commitment on the part of students. Surveys reveal that slightly over one-third of college freshmen are interested in STEM fields; however, a substantially lower share of these students will ultimately complete a STEM degree within four years of starting college (Higher Education Research Institute, 2010).[1]

A successful STEM pathway tends to be linear, uninterrupted, and largely unsympathetic to struggles like poor performance in introductory STEM courses, taking a semester or more away from college or starting at two-year institutions with the intent to transfer (National Academies of Sciences, Engineering, and Medicine, 2016).

Unfortunately, many students, especially lower-income students, female students, and students of color, encounter disruptions, distractions, and troubles due to financial constraints en route to a STEM degree (Goldrick-Rab, 2016; Roksa, 2009, 2012; Roksa & Velez, 2010; Staff & Mortimer, 2007). These interruptions are often incompatible with the structured and sequential path prescribed for students interested in STEM.

To keep students on the STEM path, policymakers and institutional leaders depend heavily on financial aid. But today's financial aid system falls well short of meeting students' true financial needs, and is administratively burdensome, reducing access (Goldrick-Rab, 2016). Additionally, the demands of STEM coursework increase the number of expenses students face, make it harder to meet the academic standards required by financial aid, and make it more difficult to work to cover expenses. STEM courses must often be taken—and passed—in sequence, and it is deliberately difficult to recover from failing introductory gatekeeping courses, such as Biology or Calculus (Wu, Deshler, & Fuller, 2018).

National longitudinal data show that 65 percent of first-time Pell Grant recipients who declared a STEM major leave the STEM field within two years of starting college. In contrast, roughly 56 percent of first-time college students in STEM who do not receive Pell Grants will leave the field (authors' calculations based on 2004/2009 data from the National Center for Education Statistics' Beginning Postsecondary Students Longitudinal

Study). Reducing this gap is paramount for satisfying current labor market demands for STEM graduates.

Is it worth investing in financial aid at all in pursuit of that goal? Only a handful of studies have rigorously considered the question (for examples see Anderson, Broton, Goldrick-Rab, & Kelchen, 2019; Broton & Monoghan, 2018; Castleman, Long, & Mabel, 2017). This study is the largest experimental study to test that relationship and builds on prior studies by examining the efficacy of financial aid for both low and moderate-income students at both two- and four-year colleges. [2,3]

Isolating the causal effects of financial aid for STEM outcomes is difficult because students differ in ways that affect both their chances of receiving financial aid and their STEM decisions (Broton & Monaghan, 2018; Goldrick-Rab, 2016; Goldrick-Rab, Harris, Kelchen, & Benson, 2016). For example, students who grow up in poverty are more likely to receive aid and to select majors that lead to high-paying jobs; therefore, they may be more likely to choose STEM, independent of financial aid. Yet, these students are also more likely to engage in many hours of employment during college, a factor that affects their chances of academic success and could potentially be altered by financial aid (Broton, Goldrick-Rab, & Benson 2017). Isolating the extent to which easing of financial constraints propels students to complete STEM programs or majors requires a clean

comparison between aid recipients and non-recipients, facilitated by a rigorous experimental design.

A prominent federal effort to provide financial aid to low-income STEM students, the Science and Mathematics Access to Retain Talent (SMART) program was phased out after the 2010-2011 academic year for a lack of evidence of effectiveness. This award was given specifically to low-income college juniors or seniors who were academically successful (i.e., had at least a 3.0 GPA) and interested in STEM (i.e., formally majored in STEM and completed preliminary coursework for STEM major). Some researchers suggest the problem was in large part to its eligibility criteria (Evans 2017). The SMART grant, which offered up to an additional $4,000 per year, was available only to Pell Grant recipients who managed to make it past their second year of college, chose a STEM major, and maintained a 3.0 grade point average (GPA). In contrast, the more widely utilized Pell Grant provides up to $5,550 per year at the time and is awarded solely for demonstrated financial need, requiring only satisfactory academic progress (e.g., a 2.0 GPA).

Two quasi-experimental studies using regression discontinuity designs of the SMART Grant program revealed mixed results. On one hand, Denning & Turley's (2017) study of SMART Grants in Texas found a three percentage-point difference between award-eligible and award-ineligible students who declared STEM majors in their junior or senior years. On the other hand, Evans (2017) examined the effectiveness of the SMART

Grant program in Ohio and found that it did not encourage selection of or persistence in STEM majors.

Other research examining the impact of other non-targeted, need- or merit-based grants on a broader population of college students shows mixed results when it comes to STEM outcomes. For instance, Broton & Monaghan (2018) used a randomized experiment in Wisconsin, where students at 13 public universities were randomly selected to receive a need-based Wisconsin Scholars Grant (WSG) to investigate the effect on students' majors. The authors found a seven-percentage point increase on students choosing a STEM major in their third year of college due to the WSG grant. In a related study, Anderson, Broton, Goldrick-Rab, & Kelchen (2019) found evidence of long-term positive impacts of the WSG grant on STEM outcomes. Specifically, they found that the WSG increased the share of students who completed STEM degrees within six years of starting college by approximately four percentage points; however, their results indicate that positive effects occurred primarily for early cohorts of the program and disproportionately advantaged men. In contrast to the findings from these studies, there appears to be growing evidence from non-causal studies suggesting that additional, merit-based grant aid has no effect on STEM majors (Cornwell, Lee, & Mustard, 2008; Zhang, 2011), or in some cases, a negative effect (Sjoquist & Winters, 2015).

Given this prior evidence, in this study we consider the following questions:

1. What are the causal impacts of need-based financial grants on students' continued enrollment in and commitment to a STEM major?
2. Do these impacts vary according to gender, race/ethnicity, financial need, initial level of academic preparation, or institutional type?
3. Do these impacts vary according to students' interests in three broad STEM categories of majors, relying on NCES's Classification of Instructional Programs: (1) science and engineering, (2) agricultural and biological sciences, and (3) health and psychology (Kienzl & Trent, 2009)?

Methodology

To address these questions, we designed and implemented a rigorous empirical experiment using a large, state-based, financial aid demonstration program that distributed a need-based grant to students via their colleges and universities. This program was funded by the Great Lakes Higher Education Guaranty Corporation, operated with the assistance of the Wisconsin Higher Education Aids Board and designed by the research team. The grant tested in the current study was roughly the same size as the SMART grant, but included far fewer requirements. This design allows for an approximate test of the effectiveness of a strictly need-based, SMART-type grant. Students did not have to apply for support or agree to participate in research; rather eligible students were identified

based on administrative data records and then recipients were randomly selected according to fund availability.

Grants Without Strings

Aiming to assess the impact of grant dollars in as pure and direct a form as possible, this demonstration program simply distributed unnamed grants to low-income students—it did not appeal to students with any other characteristics; advertise or seek to connect with them; impose other eligibility requirements; or endeavor to support them in any other way. Questions about the grant were answered by the students' financial aid officer, rather than by a state agency or an external entity. In this regard, the program was easy and inexpensive to operate, unlike most other financial aid programs (Goldrick-Rab, 2016).

The grants amounted to $1,000 and the intervention's rules made it highly likely that those dollars supplemented, rather than displaced, existing aid (Goldrick-Rab, Kelchen, Harris & Benson, 2016). Therefore, this is a test of a randomly-induced reduction in students' unmet financial need. The financial aid officer automatically awarded the grant in the start of students' term, prior to the add/drop period. Students did not even have to respond or acknowledge to accept. Very few students had loans reduced during packaging, and when they did, the financial aid officers sent them a simple, written notification crafted by the research team to provide explanation (see Appendix A for description of the notification).

Students could continue to receive the grant for up to three years if they attended a two-year college and up to five years if they attended a four-year university. Continued grant receipt was based on enrollment only; other typical requirements like "satisfactory academic progress (SAP)" or continued receipt of the federal Pell Grant were not imposed since prior research suggests these are barriers for students (Goldrick-Rab 2016). Because grant receipt is based only on enrollment, students that stop out remain eligible if and when they re-enroll at a later time during the study period.

Thus, this grant is a cross between a Pell Grant and a SMART grant. The Pell Grant provides substantially more money and is only awarded to low-income students. Continuation requires satisfactory academic progress (e.g., a 2.0 GPA). The SMART grant is similar in size—in terms of the number of awards, not amount—to the one we test, but it has numerous requirements (discussed above). Thus, we are testing a simplified, post-Pell, SMART-type grant.

Eligibility

We selected institutions for the grant program and then selected students. Based on the grant funder's preference, eligibility was restricted to public and private not-for-profit colleges and universities in Wisconsin. Recruitment included written and verbal communication and conference calls (see Appendix B for the Request for Proposals).[4] In total, 21 institutions applied, including 11 University of Wisconsin universities, five technical

colleges, and five private colleges. We winnowed the pool based on a projection of the number of students likely eligible for the grant, using the criteria described below, seeking to fund at least 100 students per institution. Ultimately, we selected 11 institutions and 10 decided to participate.

The participating institutions include two public technical colleges (Milwaukee Area Technical College and Northcentral Technical College), seven four-year public universities (University of Wisconsin at Eau Claire, La Crosse, Madison, Milwaukee, Platteville, Stevens Point, and Stout) and one private college (Milwaukee School of Engineering (MSOE)). See Table 1 for details about the institutions, their demographics, and their prices at the time the study began.

TABLE 1. CHARACTERISTICS OF PARTICIPATING INSTITUTIONS, 2012-13 ACADEMIC YEAR

Institution	Type	Region of State	Total Size	% Female	% Non-white	% Pell	Cost of Attendance	Net Price
Milwaukee Area Technical College	Public, 2 Year	Southeast	17,961	57	57	63	$16,953	$7,949
Milwaukee School of Engineering	Private, 4 Year	Southeast	2,658	23	26	27	$46,220	$15,667
Northcentral Technical College	Public, 2 Year	Northeast	4,384	60	17	67	$14,115	$8,859
UW-Eau Claire	Public, 4 Year	West Central	10,923	59	10	26	$18,505	$8,765

UW-La Crosse	Public, 4 Year	West Central	10.520	56	11	20	$17,993	$9,291
UW-Madison	Public, 4 Year	Southeast	42,677	51	24	13	$23,931	$8,306
UW-Milwaukee	Public, 4 Year	Southeast	27,416	51	28	38	$22,142	$12,644
UW-Platteville	Public, 4 Year	Southwest	8,712	35	8	30	$17,684	$9,213
UW-Stevens Point	Public, 4 Year	East Central	9,661	52	11	31	$16,716	$9,095
UW-Stout	Public, 4 Year	West Central	9,313	47	12	28	$18,718	$9,910

COA = Cost of attendance in 2013-14 academic year (in-state, on-campus costs are reported for all colleges except Milwaukee Area Technical College for which in-state, off-campus costs are reported.)
Net Price = COA less all grants for low-income students

Multiple criteria determined student eligibility. Students had to be Wisconsin residents and had to be enrolled in a STEM field during their first year of college, with the exception students at the two technical colleges, and UW-Milwaukee—in who could be enrolled in a STEM field within their first two years.[5] Also, students needed a calculated Expected Family Contribution (EFC) of up to 200% of the cutoff for Pell Grant eligibility (estimated at $5,157 in the 2014-15 academic year).

Additionally, students had to meet a set of academic preparation and self-assessed STEM interest requirements because we sought to focus the grant on students who would not require math remediation and were interested in STEM. Students at four-year institutions had to exhibit intentions to study STEM (according to a question about college major on their ACT College Profile), and an ACT score in math of at least 20. At every institution in this study, except for one, students obtaining at least a 20 in math on the ACT are not typically placed in developmental math. A score at 20 or above places the student in the top 50% of the distribution in math. At the two technical colleges, when registering for classes (long before this grant became available) students had to have selected a STEM program with requirements that precluded math remediation.

In contrast to another experimental study of need-based aid and STEM (Broton & Monaghan, 2018), grant eligibility did not require recent high school graduation or receipt of a Pell Grant, resulting in more age, income, and wealth variation in this sample. In contrast to the SMART grant, eligibility did not require strong academic preparation or a declared STEM major, though it did require students to have at least some interest in STEM.

From a pool of 1,565 eligible students across the 10 institutions, one thousand grant recipients were selected using randomization blocked by college, gender, and Expected Family Contribution.

Data and Measures

We obtained academic records for each student directly from their institution to assess enrollment status, credits attempted and completed, grades, and majors. That information is supplemented with data obtained from the National Student Clearinghouse. Administrative records, including information from collected from students' Free Application for Federal Student Aid (FAFSA), also provide a rich array of students' descriptive characteristics (e.g., gender, race, parental education, and family income), financial background (e.g., EFC), and high school academic performance (e.g., ACT exam scores).

Agreements reached with each institution allowed for the provision of administrative records, including financial aid information, for all eligible students regardless of whether they received the grant. There is no missing data for outcomes assessed using administrative records. There is some missing data on covariates used in our analyses, however. In particular, we have ACT scores for only some of the study participants; a large proportion of students attending two-year colleges were missing ACT information. As discussed in further detail below, we omit study participants from our analytic sample missing information on any of our covariates, including the ACT. In turn, results from this study disproportionately represent the outcomes for students who entered a four-year college.[6]

This working paper examine outcomes over a three-year period; a subsequent paper coming soon will provide a look at longer term outcomes.[7] Here we examine college persistence at two points in time. Persistence to year two is a dichotomous outcome (0/1), where '1' indicates that the student was enrolled in a study college in the 2014-15 academic year *and* fall of 2015.[8] We also examine persistence to year three, which is a dichotomous measure, where a value of '1' indicates that the student was continuously enrolled in a study college from the 2014-15 academic year to fall of 2016.[9]

The key outcomes in this study focus on *whether* and *when* students pursued STEM majors. Majors were identified as STEM majors if they could be categorized in the following areas: science and engineering, agricultural and biological sciences, and health and psychology.[10]

Using this definition of STEM, we constructed multiple sets of STEM-specific outcome variables. First, we created year-specific indictors of whether students pursued any type of STEM major (i.e. STEM in year 1, STEM in year 2, and STEM in year 3). Each of these year-specific outcomes is dichotomous, where a value of '1' indicates that the student was enrolled in college for at least one semester in a given academic year and pursued a STEM major that year; whereas a value of '0' indicates that either a student was not enrolled in college or was enrolled, but did not declare a STEM major in that year. These two outcomes essentially function as overall snapshots of the share of students who

pursued a STEM major in a particular year. In other words, they take into consideration the flow into and out of STEM majors and do not reflect persistence in STEM majors.

However, we are also interested in knowing whether the supplemental grant had an effect on retaining students in STEM majors. To address students' persistence in STEM, we constructed an additional set of measures intended to capture when students pursued STEM majors early in their college careers and stayed in those majors. Like our persistence in college outcomes, we assessed persistence in STEM majors at two time points. The variable 'Persisted in a STEM major to year 2' is a dichotomous measure where a value of '1' indicates that the student was enrolled in college for at least one semester in each year and pursued a STEM major for both years (i.e., in 2014-15 and 2015-16); whereas '0' indicates the alternative—students did not persist in a STEM major either because they were not enrolled in the first or second year of college OR because they were enrolled in college pursuing a non-STEM major in their first or second year of college. Similarly, the measure 'Persisted in a STEM major to year 3' is also dichotomous where a value of '1' indicates that the student was enrolled for at least one semester in each academic year and had a STEM major for all three years; whereas '0' indicates the alternative—students did not persist in a STEM major either because they were not enrolled in the first, second, or third year of college or because they were enrolled in college pursuing a non-STEM major in their first, second, or third year of college.

Finally, building off the analyses of whether students pursued any type of STEM major, we examine whether the treatment had an effect on students pursuing particular fields of STEM by creating a set of categorical variables that captures STEM field for each academic year. Namely, each of these outcome measures has four categories, where '1' indicates the student pursued a STEM major in the area of science or engineering for that year, '2' indicates the student pursued STEM major in the area of agricultural or biological science, '3' indicates the student pursued a STEM major in the area of health and psychology, and '4' indicates the student was either not enrolled in college or was in enrolled, but pursued a non-STEM major. The last group, not enrolled in a STEM major, serves as the reference group for the statistical models outlined below.

Analytic Approach

We use an intent-to-treat framework to estimate the experimental effects of the need-based grant on student outcomes. The first stage of analysis includes tests for baseline equivalence across student characteristics before the program began. For continuous covariates, we use an adjusted Hedges' *g*, which corrects for upward bias when the sample size is small (Hedges, 1981). For dichotomous covariates, we use the Cox index (Cox, 1970). The second stage of analysis estimates the impact of the supplementary grant on dichotomous student postsecondary outcomes using logistic regression models represented by the following equation:

$$ln\left(\frac{\hat{\rho}(Y)_{ij}}{1-\hat{\rho}(Y)_{ij}}\right) = \alpha_j + \beta\, TREAT_{ij} + X\gamma \qquad (1)$$

where *i* indexes student and *j* indexes the groups within which we randomized students to the interventions. $\hat{\rho}(Y)_i$ represents the predicted probability that student will experience the postsecondary outcome examined, $TREAT_{ij}$ is an indicator (0/1) of receipt of the study's supplementary grant (the key predictor), and X represents a vector of individual-level baseline controls. To account for the structure of randomization, college fixed effects were included in the model, α_j.

Individual-level baseline control variables were added to all models to increase estimate precision. More specifically, we include a set of covariates in all analyses that control for individual demographic and academic characteristics prior to treatment. We control for gender, age, first-generation status (neither of the student's parents had a college degree), underrepresented minority, financial dependency, score on the ACT mathematics exam, score on the ACT English exam, Pell grant eligibility, and expected family contribution. Students with missing information on any of these covariates were omitted from the analytic sample. Models also included college fixed effects to account for unobserved institutional factors that could bias estimates.

We also estimate heterogeneous treatment effects on student postsecondary outcomes by student characteristics (Pell grant eligibility, race/ethnicity, gender, ACT performance) and type of institution initially attended using the following equation:

$$ln\left(\frac{\hat{\rho}(Y)_{ij}}{1-\hat{\rho}(Y)_{ij}}\right) = \alpha_j + \beta\, TREAT_{ij} + \delta\, G_{ij} + \eta\, TREAT_{ij} * G_{ij} + X\gamma \qquad (2)$$

where $\hat{\rho}(Y)_{ij}$ represents the predicted probability that student *i* will experience the postsecondary outcome examined, $TREAT_{ij}$ is an indicator of the grant, G_{ij} represents the student or institutional characteristic of interest, $(TREAT_{ij} \times G_{ij})$ represents the interaction effect, and X is a vector of all other individual-level baseline controls. To account for the structure of randomization, college fixed effects were included in the model, α_j. However, when measuring the potential differences in treatment impacts by type of institution, we exclude fixed effects for colleges.

When estimating the impact of the grant on student postsecondary outcomes that are categorical (e.g., field of STEM major), we use multinomial regression models where the predicted probability that a student will not pursue a STEM major in a given year (either because they were not enrolled in college or because they were enrolled in college, but pursuing a non-STEM major) is the reference category and is compared to pursuing a particular area of STEM (a science and engineering, agricultural and biological sciences, or health and psychology). Like the logistic regression models, we include the key predictor (i.e., random award of supplementary grant), all of the individual-level baseline controls where not equivalent, and college fixed effects.

For estimates of overall treatment effects on dichotomous outcomes, magnitudes of estimated impacts are reported in two ways: percentage point differences and effect

sizes. The former is based on differences in adjusted marginal means of the treated and control groups determined by the logistic model. The latter is constructed using an adjusted Cox index approach (1970), as all of outcomes are dichotomous. Interventions with effect sizes above 0.25 are often considered to have a substantively important effect (What Works Clearinghouse, 2014); however, it is worth noting that effect sizes for educational interventions rarely reach 0.20 (Harris, 2013). Parameter estimates from models with interaction effects and models with multinomial outcomes are reported in logits.

Analytic Sample and Descriptive Statistics

In total 1,565 students were eligible for grants and 1,000 were selected. For this analysis we restrict the sample to students in their first year of college who were enrolled when the grant was distributed and for whom complete baseline data are available (N=987, 63% assigned to receive grants).[11] While this is a significant restriction on the sample, it remains balanced at baseline, meeting typical statistical standards (WWC, 2014). Thus, students allocated the grant and students who did not receive it were similar from the start, and we can be confident that differences in outcomes between the treatment and control group are attributable to the demonstration grant (Table 2).

TABLE 2: BASELINE CHARACTERISTICS OF ANALYTIC SAMPLE BY TREATMENT STATUS

Characteristic	Treatment Group	Control Group	Standardized Difference	*p* value
Average age (years)	18.6	18.8	-0.13	0.06
Female (%)	43.2	45.6	-0.06	0.44
First generation college student (%)	37.2	36.6	0.02	0.85
Racial/ethnic minority (%)	14.2	14.5	-0.01	0.88
Financially independent (%)	4.4	5.6	-0.17	0.42
Average ACT mathematics score	24.8	24.8	-0.01	0.92
Average ACT English score	23.2	22.9	0.06	0.37
Pell grant eligible (%)	60.2	61.5	-0.03	0.70
Average Expected Family Contribution ($)	3,962	3,804	0.05	0.48
Zero expected family contribution (%)	21.8	22.4	-0.02	0.83
Sample size	*626*	*361*		

SOURCES: College student record, 2014/15 FAFSA, 2014/15 Baseline Survey

Notes:

(1) Analytic sample includes students who were enrolled in either fall or spring semester of 2014-15 academic year, were in their first year of college, and did not have missing values for the variables listed above.

(2) Underrepresented racial/ethnic minority includes African American, Hispanic, Southeast Asian, Native American, and multiracial.

(3) First-generation college student is based on student's FAFSA, and is defined as both parents' highest level of education is high school or less.

(4) Standardized differences were calculated according to What Works Clearinghouse (2014).

On average, these students were almost 19 years of age at the start of the study. The share of female students is just under half and about one-third had parents with a college degree. Only 14 percent were from an underrepresented racial/ethnic minority group and only four percent were financially independent. On average, students had a score of 24.8 on the ACT mathematics exam and a 23.1 on the ACT English exam. These scores are above the average scores for the 2014 high school graduates in Wisconsin who took the ACT (Math: 22.0 and English: 21.6; taken from ACT, 2014) and are a result of limiting eligibility to those who did not need math remediation. The majority of students

(60%) were Pell-eligible, while rest were from moderate-income families up to twice the Pell eligibility standard. On average, students had an EFC of almost $4,000 and about one in five students had an EFC of zero (Table 3).

TABLE 3: BASELINE CHARACTERISTICS OF ANALYTIC SAMPLE

Characteristic	Mean	SD
Assigned to treatment (%)	63.4	48.2
Average age (years)	18.6	1.4
Female (%)	44.1	49.7
First-generation college student (%)	37.0	48.3
Underrepresented racial/ethnic minority (%)	14.3	35.0
Financially independent (%)	4.1	20.0
Average ACT mathematics score	24.8	3.7
Average ACT English score	23.1	4.3
Pell grant eligible (%)	60.7	48.9
Average Expected Family Contribution ($)	3,904.2	3,386.1
Zero expected family contribution (%)	22.0	41.4
Enrolled in a two-year college (%)	5.9	23.5
Sample size	*987*	

SOURCES: College student record, 2014/15 FAFSA, 2014/15 Baseline Survey

Notes:

(1) Analytic sample includes students who were enrolled in either fall or spring semester of 2014-15 academic year, were in their first year of college, and did not have missing values for the variables listed above.

(2) Underrepresented racial/ethnic minority includes African American, Hispanic, Southeast Asian, Native American, and multiracial.

(3) First-generation college student status is based on student's FAFSA, and is defined as both parents' highest level of education is high school or less.

Advancing STEM Production

This program aimed to encourage STEM production without conditioning financial support on college major. Among students who did not begin in a STEM major, by the third year of college students receiving the grant were far more likely to have opted for

STEM. About 48 percent of students allocated grants were pursuing a STEM major in the third year of college compared to about 39 percent of students not receiving grants ($p<.01$). That effect appears to have taken time to build over the first and second years of school (Table 4).

Among students who started in STEM, we also find a substantial impact (6 percentage points, $p < 0.10$) of the grant on persisting in STEM to the third year of college. The difference in the magnitude of the two estimates suggests that the grant was primarily helpful in pushing non-STEM students to pursue STEM majors later in their college careers—even though the funding provided was unconditional on major. It was secondarily helpful in supporting students who had already chosen that major.

In this sense, the program achieved its goals. However, on average there was no discernable effect of the grant on students' probability of persisting from one year to the next. About 80% persisted from year 1 to 2, and about 67% persisted to year 3.

TABLE 4: AVERAGE EFFECTS OF GRANT ON ACADEMIC OUTCOMES

Outcome	Treatment Group	Control Group	Estimated impact		*p* value for estimated impact	Effect size
Pursued STEM Major						
In year 1	59.6	58.9	0.8		0.815	0.020
In year 2	52.4	46.5	6.3	~	0.064	0.153
In year 3	48.2	38.7	10.2	**	0.003	0.250
Persisted in STEM Major						
To year 2	46.1	41.1	5.3		0.122	0.129
To year 3	38.7	32.6	6.4	~	0.052	0.170
Overall college persistence						
To year 2	80.4	78.1	2.2		0.396	0.086
To year 3	67.5	67.6	-0.1		0.971	-0.003
Sample size	*626*	*361*				

Notes:
(1) The following covariates are included in the models: age, sex, first-generation status, racial/ethnic minority status, U.S. citizen, dependency status, ACT mathematics score, ACT English score, Pell grant eligible, expected family contribution, zero expected family contribution, and college of enrollment.
(2) Effect sizes calculated according to What Works Clearinghouse (2014).
(3) ~ - p-value < 0.10, * - p-value < 0.05, & ** - p-value< 0.01

Next, we explored whether the grant was more influential for specific STEM fields (science and engineering, agriculture and biological sciences, or health and psychology). We find some evidence that the grant may have had more positive impacts on the pursuit of Health or Psychology for students' second year. In their third year, those impacts continued but we also saw positive results for Agricultural and Biological Sciences (Table 5).

TABLE 5: AVERAGE EFFECTS OF GRANT ON STEM FIELD

Postsecondary Outcomes	Coef	SE	
Year 1			
Science & Engineering	-0.062	0.204	
Agriculture & Biological Sciences	-0.093	0.189	
Health & Psychology	0.269	0.227	
Year 2			
Science & Engineering	0.183	0.200	
Agriculture & Biological Sciences	0.114	0.193	
Health & Psychology	0.506	0.225	*
Year 3			
Science & Engineering	0.269	0.210	
Agriculture & Biological Sciences	0.430	0.208	*
Health & Psychology	0.550	0.221	*

Notes:
(1) N=987
(2) Table reports logit coefficients and standard errors (SE) for the treatment effect.
(3) The following covariates are included in the models: age, sex, first-generation status, racial/ethnic minority status, U.S. citizen, dependency status, ACT mathematics score, ACT English score, Pell grant eligible, expected family contribution, zero expected family contribution, and college of enrollment.
(4) ~ - p-value < 0.10, * - p-value < 0.05, & ** - p-value< 0.01
(5) Reference group: Not enrolled in a STEM Major or Not enrolled in college.

Finally, we explored whether the grant had different impacts for different students (Table 6). We found little evidence that effects differed based on gender, race/ethnicity, Pell eligibility, or students' ACT test scores. Students appeared to benefit equally.

TABLE 6: VARIATION IN GRANT EFFECTS BY STUDENT CHARACTERISTICS

	Overall Persistence to		Pursued STEM Major in			Persistence in STEM Major to	
	YR2	YR3	YR1	YR2	YR3	YR2	YR3
Variation by Gender							

Grant x Female	-0.027	0.268		0.036	0.094	0.207	0.017	0.154
Variation by Race/ Ethnicity								
Grant x Underrepresented by Minority	-0.461	-0.370		-0.204	0.080	-0.153	0.084	-0.339
Variation by Pell Grant Eligibility								
Grant x Pell	0.390	0.610	*	-0.363	-0.319	-0.047	-0.297	-0.140
Variation by ACT Math Performance								
Grant x Top ACT	0.191	0.093		-0.304	-0.442	-0.230	-0.552 *	-0.349

Notes:
(1) N=987
(2) Table reports logit coefficients.
(3) The following covariates are included in the models: age, sex, first-generation status, racial/ethnic minority status, U.S. citizen, dependency status, ACT English score, Pell grant eligible, expected family contribution, zero expected family contribution, and college of enrollment. ACT math scores was included in all models with exception of the model that includes interaction effects of ACT performance.
(4) ~ - p-value < 0.10, * - p-value < 0.05, & ** - p-value<0 .01

Conclusion

There is an economic imperative to support greater production of and equity in STEM majors. Many programs attempt to support this goal by investing in financial aid. This study rigorously examined the efficacy of modest financial support ($1,000 grants) for low and moderate-income students *unconditional* on major. The results clearly indicate that this approach improves the probability that students will opt for a STEM major and persist in a STEM major, at least by the third year of college. The grants did not improve overall persistence rates, nor did they have outsized impacts for specific groups of students, benefitting all equally.

Whether these gains persist to degree completion remains to be seen. In an upcoming report we will examine longer-term outcomes, and explore whether the purchasing power of the grants (i.e. how much unmet need they addressed) affected those results.

References

ACT (2014). ACT Profile Report – State: Graduating Class 2014, Wisconsin. Retrieved from: http://www.act.org/content/act/en/research/pdfs/act-profile-reportstategraduatingclass2014wisconsin.html

Anderson, D. M., Broton, K. M., Goldrick-Rab, S., & Kelchen, R. (2019). Experimental evidence on the impacts of need-based financial aid: Longitudinal assessment of the Wisconsin Scholars Grant. Journal of Policy Analysis and Management, 39(3), 720-739.

Anderson, E. L., & Kim, D. (2006). Increasing the success of minority students in science and technology. American Council on Education.

Arum, R., & Roksa, J. (2011). Academically adrift: Limited learning on college campuses University of Chicago Press.

Astin, A. W. (1993). What matters in college? Four critical years revisited. Jossey-Bass higher and adult education series.

Bottia, M. C., Stearns, E., Mickelson, R. A., Moller, S., & Parker, A. D. (2015). The relationships among high school STEM learning experiences and students' intent to declare and declaration of a STEM major in college. Teachers College Record, 117(3),

Broton, K. M., Goldrick-Rab, S., & Benson, J. (2016). Working for college: The causal impacts of financial grants on undergraduate employment. Educational Evaluation and Policy Analysis, 38(3), 477-494.

Broton, K. M., & Monaghan, D. B. (2018). No title. Seeking STEM: The Causal Impact of Needbased Grant Aid on Undergraduates' Field of Study,

Carnevale, A. P., Smith, N., & Melton, M. (2011). STEM: Science technology engineering mathematics. Georgetown University Center on Education and the Workforce.

Castleman, B. L., Long, B. T., & Mabel, Z. (2018). Can financial aid help to address the growing need for STEM education? The effects of Need-Based grants on the completion of science, technology, engineering, and math courses and degrees. Journal of Policy Analysis and Management, 37(1), 136-166.

Chen, H. L., Lattuca, L. R., & Hamilton, E. R. (2008). Conceptualizing engagement: Contributions of faculty to student engagement in engineering. Journal of Engineering Education, 97(3), 339-353.

Chen, X. (2013). STEM Attrition: College students' paths into and out of STEM fields. Statistical analysis report. NCES 2014-001. *National Center for Education Statistics*.

Clewell, B. C., & Campbell, P. B. (2002). Taking stock: Where we've been, where we are, where we're going. Journal of Women and Minorities in Science and Engineering, 8(3&4)

Cornwell, C., Lee, K., & Mustard, D. (2006). The effects of state-sponsored merit scholarships on course selection and major choice in college.

Cox, D. R. (2018). Analysis of binary data. Routledge.

Denning, J. T., & Turley, P. (2017). Was that SMART? Institutional financial incentives and field of study. Journal of Human Resources, 52(1), 152-186.

Dooley, M., Payne, A., Steffler, M., & Wagner, J. (2017). Understanding the STEM path through high school and into university programs. Canadian Public Policy, 43(1), 1-16.

Eris, O., Chachra, D., Chen, H. L., Sheppard, S., Ludlow, L., Rosca, C., & Toye, G. (2010). Outcomes of a longitudinal administration of the persistence in engineering survey. Journal of Engineering Education, 99(4), 371-395.

Espinosa, L. (2011). Pipelines and pathways: Women of color in undergraduate STEM majors and the college experiences that contribute to persistence. Harvard Educational Review, 81(2), 209-241.

Evans, B. J. (2012). SMART money: Do financial incentives encourage college students to study science? Society for Research on Educational Effectiveness,

Gayles, J. G., & Ampaw, F. (2014). The impact of college experiences on degree completion in STEM fields at four-year institutions: Does gender matter? The Journal of Higher Education, 85(4), 439-468.

George-Jackson, C. E., Rincon, B., & Martinez, M. G. (2012) Low-income engineering students: Considering financial aid and differential tuition. Journal of Student Financial Aid, 42(2), 1-24

Goldrick-Rab, S. (2016). Paying the price: College costs, financial aid, and the betrayal of the American dream University of Chicago Press.

Goldrick-Rab, S., Kelchen, R., Harris, D. N., & Benson, J. (2016). Reducing income inequality in educational attainment: Experimental evidence on the impact of financial aid on college completion. American Journal of Sociology, 121(6), 1762-1817.

Harris, D. N., Kelly, A., & Carey, K. (2013). Applying cost-effectiveness analysis to higher education. Stretching the Higher Education Dollar, , 45-66.

Hazari, Z., Sadler, P. M., & Sonnert, G. (2013). The science identity of college students: Exploring the intersection of gender, race, and ethnicity. Journal of College Science Teaching, 42(5), 82-91.

Hedges, L. V. (1981). Distribution theory for glass's estimator of effect size and related estimators. Journal of Educational Statistics, 6(2), 107-128.

Hill, C., Corbett, C., & St Rose, A. (2010). Why so few? Women in science, technology, engineering, and mathematics. ERIC.

Higher Education Research Institute. (2010). Degrees of success: Bachelor's degree completion rates among initial STEM majors. Higher Education Research Institute at UCLA, Los Angeles, CA: Higher Education Research Institute, UCLA.

Kienzl, G., & Trent, W. (2009). Underrepresented undergraduates in STEM: From matriculation to degree completion at large, research-intensive public universities. Report to the Alfred P. Sloan Foundation, New York, NY,

Lichtenstein, G., McCormick, A. C., Sheppard, S. D., & Puma, J. (2010). Comparing the undergraduate experience of engineers to all other majors: Significant differences are programmatic. Journal of Engineering Education, 99(4), 305-317.

Lowell, B. L., Salzman, H., & Bernstein, H. (2009). Steady as she goes? Three generations of students through the science and engineering pipeline.

National Academies of Sciences, Engineering, and Medicine. (2016). *Barriers and opportunities for 2-year and 4-year STEM degrees: Systemic change to support students' diverse pathways*. Washington, DC: The National Academies Press.

National Science Board. (2015). *Revisiting the STEM workforce: A companion to science and engineering indicators 2014*. Arlington, VA: National Science Foundation.

National Science Board. (2003). *The science and engineering workforce: Realizing America's potential.* Committee on Education and Human Resources, Task Force on National Workforce Policies for Science and Engineering, Washington D.C.

Nicholls, G. M., Wolfe, H., Besterfield-Sacre, M., Shuman, L. J., & Larpkiattaworn, S. (2007). A method for identifying variables for predicting STEM enrollment. Journal of Engineering Education, 96(1), 33-44.

Ost, B. (2010). The role of peers and grades in determining major persistence in the sciences,
Economics of Education Review. 29(6), 923-934.

Rask,K. (2010). Attrition in STEM fields at a liberal arts college: The importance of grades and pre-collegiate preferences. Economics of Education Review. 29(6), 892-900.

Reyes, M. (2011). Unique challenges for women of color in STEM transferring from community colleges to universities. Harvard Educational Review, 81(2), 241-263.

Roksa, J. (2009). Building bridges for student success: Are higher education articulation policies effective? Teachers College Record, 111(10), 2444-2478.

Roksa, J., & Velez, M. (2010). When studying schooling is not enough: Incorporating employment in models of educational transitions. Research in Social Stratification and Mobility, 28(1), 5-21.

Salzman, H., & Lowell, B. L. (2007). *Into the eye of the storm: Assessing the evidence on science and engineering education, quality, and workforce demand*. Washington, DC: The Urban Institute.

Sjoquist, D. L., & Winters, J. V. (2015). The effect of Georgia's HOPE scholarship on college major: A focus on STEM. IZA Journal of Labor Economics, 4(1), 15.

Staff, J., & Mortimer, J. T. (2007). Educational and work strategies from adolescence to early adulthood: Consequences for educational attainment. Social Forces, 85(3), 1169-1194.

Stange, K. (2015). Differential pricing in undergraduate education: Effects on degree production by field. Journal of Policy Analysis and Management, 34(1), 107-135.

Tsui, L. (2007). Effective strategies to increase diversity in STEM fields: A review of the research literature. The Journal of Negro Education, 76(4), 555-581.

Tyson, W. (2012). Negative impact of employment on engineering student time management, time to degree, and retention: Faculty, administrator, and staff perspectives. Journal of College Student Retention: Research, Theory & Practice, 13(4), 479-498.

U.S. Bureau of Labor Statistics. (2019a). *Occupational outlook handbook*. Washington, DC: U.S. Bureau of Labor Statistics. https://www.bls.gov/ooh/fastest-growing.htm?view_full

U.S. Bureau of Labor Statistics. (2019b). *Employment in STEM occupations*. Washington, DC: U.S. Bureau of Labor Statistics. https://www.bls.gov/emp/tables/stem-employment.htm

U.S. Bureau of Labor Statistics. (2017). *Career outlook: Projections of occupational employment, 2016-26*. Washington, DC: U.S. Bureau of Labor Statistics. https://www.bls.gov/careeroutlook/2017/article/occupational-projections-charts.htm

Whalen, D. F., & Shelley, M. C. (2010). Academic success for STEM and non-STEM majors. Journal of STEM Education: Innovations and Research, 11(1-2), 45-60.

What Works Clearinghouse. (2014). Procedures and Standards Handbook (Version 3.0). Washington, DC: U.S. Institute of Education Sciences.

Wu, X., Deshler, J., & Fuller, E. (2018). The effects of different versions of a gateway STEM course on student attitudes and beliefs. International journal of STEM education, 5(1), 1-12.

Zhang, L. (2011). Does merit-based aid affect degree production in STEM fields? Evidence from Georgia and Florida. The Journal of Higher Education, 82(4), 389-415.

APPENDICES

Appendix A

WISCONSIN FINANCIAL AID STUDY

LOAN DISPLACEMENT LETTER

Letter to provide grant recipients following loan displacement in aid repacking

[Institutional letterhead]

Dear [student name],

[Standard introductory financial aid letter text may be added here]

We are writing to notify you that this fall our institution has received some additional resources that allow us to provide you with an additional $1,000 grant ($500 per semester) for this upcoming academic year. During the next five years, if you are enrolled here at [school name], you will continue to receive this grant.

We have added this supplementary grant to your financial aid package. We had to remove $[amount] from your student loans in order to do this. What that means is that the new grant dollars were used to reduce your debt. In the long run, that will hopefully contributeto your ability to complete your degree with less debt.

Before officially repacking your financial aid award, we ask that you both accept this change and return this notice to your financial aid office. Please check one of the followingboxes:

☐ Yes, I agree to receive this supplementary grant in place of a previously awarded loan.

☐ No, I decline this opportunity and prefer to receive the originally awarded loan.

Name_____ Date _____

Please return this letter with the enclosed, prepaid envelope at your earliest convenience. We will not act until we receive confirmation from you.

If you have questions about this award, please let us

know.Sincerely,

[Financial Aid Office Official Name]

Appendix B

After incorporating feedback from eligible higher education institutions around the state of Wisconsin, the following WiscAid grant application hasbeen revised as follows:

- Calculated unmet should **exclude** federal work-study allocations and unaccepted PLUS loans. All other forms of aid (i.e. all grants and scholarships, subsidized and unsubsidized loans, and all accepted PLUSand private loans) should be included in this calculation.

- Eligible students must have filed a FAFSA by July 1, 2014, rather thanSeptember 1, 2014 as earlier stated.

- The list of eligible students should be transferred to the Wisconsin Higher Educational Aids Board on July 1, 2014 rather than during themonth of September 2014 as earlier stated.

- Only federal work-study allocations and unaccepted PLUS loans maybe displaced by this grant without explicit student consent. All other forms of aid require student consent.

All applicants should use the revised form. Only completed applicationson the revised form submitted to info@wiscaid.org will be accepted.
In order to accommodate this request, we will accept applications throughFebruary 7, 2014.

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Grant Application

Apply Now!

DEADLINE EXTENDED!
FEBRUARY 7, 2014

Join WiscAid, Great Lakes & the National Science Foundation

Program Details

Through a competitive grant opportunity with Great Lakes Higher Education Guaranty Corporation, the Wisconsin Higher Educational Aids Board, and the National Science Foundation, we are inviting all of Wisconsin's public and private institutionsof higher education to participate in an effort to increase college success among students from moderate and low-income families.

Selected institutions will receive **up to $300,000 of grant aid** between 2014-2018, plus compensation for their time and participation in the program and the associated evaluation. Renewable grants of $1,000 per year for up to 5 years will be distributed among students meeting eligibility criteria, using a lottery. The grants have no performance requirements in terms of number of credits enrolled, major, or academic progress. In addition, a selected group of students will receive information and encouragement to continue filing their financial aid applications as they pursue their college degrees. Additional sponsoredresearch opportunities intended to increase the impact of need-based financial aid will also be available to the institution. The University of Wisconsin-Madison Institutional Review Board will approve all activities.

Institutional Eligibility Criteria

1. Applications will be accepted from public and private, two- and four-year institutions of higher education in Wisconsin.
2. Fall 2014 enrollment projections must indicate that **at least 500** entering students (new students to the institution) willmeet the grant's eligibility criteria by July 1, 2014. Confirmation of this expectation should come from the institution's office of financial aid.

Student Eligibility Criteria

1. Wisconsin resident
2. Enrolled in college for the first time
3. Filed a FAFSA
4. Have an expected family contribution up to 150% of the cutoff for Pell eligibility (e.g., $7,622)
5. In order to maximize the potential impact of the grant, we seek to generate an increase in the dollars available to studentsin the short-term. Accomplishing this requires avoiding displacement of aid as much as possible. Research indicates that students are less responsive to displaced loans than to increased grant aid. If the grant were to primarily serve to reduce loans already accepted by students, its impacts on STEM-related behaviors during college would likely be minimized. Therefore, students must also meet the following unmet need criteria:

- Calculated unmet need must be at least $1,000 for the first year of college, as of July 1, 2014. The unmet needcalculation must include all grants and scholarships, subsidized and unsubsidized loans, and all accepted PLUS andprivate loans. It should exclude federal work-study allocations and unaccepted PLUS loans. If the grant is received,only federal work-study allocations and unaccepted PLUS loans may be displaced.

6. There are no eligibility criteria regarding students' academic qualifications that institutions should be concerned with forpurposes of this application.

How to Apply

1. The attached application form must be used.
2. The application should be submitted by the institution's senior leadership and endorsed by a chancellor, president, orprovost as well as the institution's lead financial aid officer.
3. The institution must commit to providing documented confirmation that the grant provided by Great Lakes is not used todisplace any form of financial aid other than federal work-study or unaccepted PLUS loans.
4. The institution must agree to (a) provide the list of eligible students to the Wisconsin Higher Educational Aids Board andthe University of Wisconsin Survey Center on July 1, 2014 for selection of grantees and initial baseline data collection for the evaluation; (b) package the new grant on the specified timeline in mid-September; (c) comply with grant rules, (d) helpgain WiscAid participation in student surveys beginning in August 2014 and (e) provide de-identified data on students' financial aid and academic records to the research team as outlined in a data agreement to be signed with each institution. Complete data must be provided on time in order to receive compensation.
5. The institution must also agree to facilitate Institutional Review Board approval from the home Human Subjects ReviewBoard or accept UW-Madison approval.

DEADLINE EXTENDED: A complete application must be submitted via email to info@wiscaid.org by February 7, 2014.

Late or incomplete applications will not be considered for funding.

We will select schools for inclusion and notify them no later than March 1, 2014. In the spring we will meet with each participating institution to go over the processes for implementation and data collection. Timelines may be adjusted via mutualagreement between WiscAid and participating schools.

Application Instructions

The grant application must be completed using the following PDF form.

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Grant Application

Section 1: General Information

Provide institutional information, including name, type, mailing address, region of Wisconsin, and fall 2014 semester start andfinal drop/add course dates. Indicate student information as requested illustrating at least 500 eligible students will attend yourinstitution in fall 2014, and how you arrived at that figure. If your institution has less than 500 eligible students, detail why your application should be considered.

Section 2: Aid Management

Provide the names of the aid and enrollment software packages employed by your institution. Provide position and contactinformation for the financial aid officer who will be administering this grant.

Section 3: Study Collaboration

Affirm senior leadership endorses this application. Provide confirmation that aid from this grant will not displace any otheraid (with the exception of federal work-study allocations and unaccepted PLUS loans) without explicit student consent.
Verify cooperation in data transfer to the Wisconsin Higher Educational Aids Board and packaging of the data by the specifiedtimeline. Ensure compliance with all grant rules to be outlined in this application and a forthcoming agreement with your institution. Indicate willingness to facilitate a student survey and other aspects of the study. Verify access to administrative
data by the research team and affirmation this data will be fully provided by the scheduled deadlines. Indicate interest insupplemental studies, and whether IRB approval at the home institution will be required.

Section 4: Signatures

The application should be signed by the institution's chancellor, president, or provost, as well as the institution's lead financialaid officer. Applications must have both signatures to be considered. One of these parties may submit the application and should note his/herself as the submitting applicant.

Contact Information

Alison Bowman
Associate Director, Wisconsin Financial Aid Study (WiscAid)
University of Wisconsin-
Madison
ambowman@wisc.edu
608-890-3481

wiscaid helping make financial aid count Grant Application

SECTION 1 | General Information

1A | Institution Information	
Official Institution Name	
Institution Type (check one)	□ Public two-year Wisconsin higher education institution □ Private two-year Wisconsin higher education institution □ Public four-year Wisconsin higher education institution □ Private four-year Wisconsin higher education institution
Official Mailing Address	
Region of State (check one)	□ Northeast □ West Central □ Northwest □ Southeast □ East Central □ Southwest
Start Date of Fall 2014 Semester	
Final Date to Drop Courses	
Final Date to Add Courses	

1B | Student Information	
I. Total number of first-time students (i.e. freshman) projected to enroll by July 1, 2014	
II. Total number of students in Section I above who are Wisconsin residents	
III. Total number of students in Section II above who are expected to file a FAFSA	
IV. Total number of students in Section III above who are expected to have an EFC <= 150% of Pell eligibility	
V. Total number of students in Section IV above who are expected to have unmet financial need as of July 1, 2014 exceeding $1,000 using the calculations described in the eligibility criteria	
Is the total of Section V larger than 499 students?	□ Yes □ No

1B | Student Information (continued)
Please detail how you arrived at the figure in Section V, including which cohort(s) were used in that projection.
If the figure in Section V does not exceed 499, please provide an explanation as to why you seek for the research team to consider your application.

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SECTION 2 | Aid Management

2A | Management Details
Provide the name of the aid management software employed by your institution.
Provide the name of the enrollment management software employed by your institution.

2B | Financial Aid Office Contact Information	
Officer Name Managing Grant*	
Officer Title	
Officer Mailing Address	
Officer Email Address	
Officer Phone Number	

** All future communications about this grant application will be sent to the program contact listed in this application.*

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SECTION 3 | Study Collaboration

Please check the associated box to confirm the following statements.	
□	This application is being submitted by our institution's senior leadership and endorsed by a chancellor, president, or provost as well as our institution's lead financial aid officer.
□	Our institution commits to provide documented confirmation that the grant provided by Great Lakes will not be used to displace any form of financial aid without explicit student consent.
□	Our institution agrees to provide the list of eligible students to the Wisconsin Higher Educational Aids Board on July 1, 2014 for selection of grantees.
□	Our institution agrees to package the new grant on the specified timeline in mid-September 2014.
□	Our institution agrees to comply with all grant rules.
□	Our institution agrees to help gain WiscAid participation in student surveys beginning in August 2014.
□	Our institution agrees to provide de-identified data on students' financial aid and academic records to the research team as outlined in a data agreement to be signed with each institution. Complete data must be provided on time in order to receive compensation.
□	Our institution may be interested in participating in supplemental research activities with the research team, at no cost to our institution.
Please choose one of the following statements.	
□	Our institution will facilitate Institutional Review Board approval from our institution's Human Subjects Review Board.
□	Our institution will accept University of Wisconsin-Madison Institutional Review Board approval.

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SECTION 4 | Signatures

I have reviewed the submission materials and fully endorse this application.			
Chancellor/President/ Provost Name		Title	
Chancellor/President/ Provost Signature		Date	
Lead Financial Aid Officer Name		Title	
Lead Financial Aid Officer Signature		Date	
Submitting Applicant Name		Title	
Submitting Applicant Signature		Date	

wiscaid helping make financial aid count

Grant Application

Program Information

What is the involvement of the National Science Foundation and Great Lakes Higher Education Guaranty Corporation?
This opportunity was created by the National Science Foundation's decision to provide Dr. Sara Goldrick-Rab of the Universityof Wisconsin-Madison with $1.5 million to fund a study examining whether providing undergraduates from moderate and low-income families with more money, in the form of grant aid, can enable them to maintain their commitment to STEM majors and graduate with degrees in those fields.

Great Lakes Higher Education Guaranty Corporation is providing up to $4 million in funding for the aforementioned grants.

Who is administering the grant program?
The Wisconsin Higher Educational Aids Board (HEAB) will administer the program, disbursing the funds to institutions. HEAB is a state agency that has long been responsible for the management of financial aid awards to schools across Wisconsin.Their expertise, infrastructure, and existing relationships with numerous financial aid offices will help make this program as easy and effective as possible.

What is included in the "up to $300,000 in grant aid" promised to schools?
We are seeking to award, on average, $300,000 in grants to each participating school, and to include ten schools in total. The actual amount of money each school receives depends on how long students stay enrolled. For example, if 100 studentsare each awarded $1,000 a year for up to five years and all 100 students get the $5,000, then that school will have received
$500,000 in grants. We don't think that is likely given attrition patterns, so the estimate is $300,000 averaged across theschools.

This figure does not include the data payments participating schools will receive each year after successfully submitting data tothe research team (addressed in the following question).

What type of monetary compensation is involved for participating institutions?
Two types of compensation are provided to each institution involved in this effort.

First, each institution will be compensated for providing data per the research agreement, amounting to $1,000 per school peryear.

In addition, each institution will also receive up to $300,000 in student grant funds, depending on how long the chosen students remain enrolled in school. For example, if 100 students remain enrolled for an average of 3 years, the institution willreceive $300,000. If 100 students remain enrolled for an average of 2 years, the institution will receive $200,000. The total number of grants per school will be around 100, possibly larger if the school has sufficient numbers.

How long will this grant program run? Is this for one cohort of students or will there be additional cohorts in subsequent year?
The grant program covers one cohort of students beginning school in fall 2014. Students may receive the grant up to three years if their institution is a two-year college and up to five years if their initial institution is a four-year university.
No additional cohorts will be included.

Institution Eligibility

Why are you requesting each school have 500 eligible students? Will you consider a school with less than 500 eligible students?
We have requested a certain number of students at each institution to allow for the study to include a sufficient number of grant recipients and non-recipients per school so that differences in their outcomes may be detected. A school with less than 500 eligible students may be considered, however they should come close to that figure. A school with, for example, only 500 total incoming first-year students would be ineligible. While not every invited school will have sufficient numbers necessary forparticipation, other research opportunities will be available if requested. If schools cannot meet that figure but are interested inpursuing other research opportunities on their campus, they are advised to be in touch with the research team.

Is there a specific approach or formula we should use in determining the total number of eligible students?
We do not specify a method out of a desire to minimize the burden on your offices. Please choose an approach and simply tell us what you did to produce the estimate, if necessary, whether you think it will be different next year. For example, you can usethe number of students who met the eligibility criteria as of July 1, 2013, or based on longer-term historical data (e.g., across three prior years).

Student Eligibility

What constitutes a first-time student? Are there any enrollment requirements?
First-time students are typically incoming freshman. However, students who took courses while in high school, for continuingeducation or adult basic education in non-degree bearing programs are included as well.

No enrollment intensity is requested; these students can be enrolled at full-time, half-time, or less than half-time.

What does "Less than or equal to 150% Pell eligibility" mean? Must a student maintain this eligibility during their entire time in school?
Students must have an expected family contribution less than or equal to 150% of the Pell eligibility EFC threshold. For the2013-14 academic year, this figure was $5,081, meaning the student should have an EFC of less than $7,622.

This requirement only stands for the student's first year. They will remain eligible for the grant even if their EFC changes.

Must students file a FAFSA in order to participate?
Yes, a student must file a FAFSA each year to participate. In the first year, students must file their FAFSA by July 1, 2014 inorder to give schools sufficient time to develop the list of eligible students and transmit that data to HEAB in July 2014.

To renew the grant the student must simply remain enrolled (or re-enroll) at the initial institution and file a FAFSA.

Since they are above the Pell Grant eligibility cutoff, they do **not** need to be receiving any other kind of aid in order to receivethis grant. Students may have an EFC **up to** 150%, but not all will.

What are the academic or performance requirements associated with the grant?
There are no academic or performance requirements associated with the grant. The student will continue to receive the grant regardless of enrollment intensity or GPA (e.g., they are not required to make SAP and can keep the grant even if other aid is lost).

Aid officers are asked to avoid telling potential STEM majors about this grant opportunity or providing any indication that this grant is intended to affect STEM outcomes. We seek to examine the impact of the additional funds alone, not the impactof attaching specific academic requirements to funds.

Is the student eligible to receive the grant at another institution if they transfer?
No, the grant is not transferrable.

Aid Packaging

Is there any flexibility in the September timeline for packaging the aid?
It is critically important that students are awarded the gift funds by the end of September so that they have the funds they needto succeed in their courses during the term.

Study Collaboration

The application asks that schools "comply with grant rules." Are those rules available for review prior to application submission?
Since this is an application—not an agreement—the rules are not yet available. They will be available before the agreements must be signed. The grant rules will simply specify to whom the grant should be distributed and the conditions of the grant (which are very simple—they do not require continued aid receipt or SAP), and no mention of STEM should be made to the students.

What data is the research team requesting, and on what timeline?
The data will include the students' financial aid application and aid package information (aid offered, accepted and received), admissions application, and college transcripts from the enrollment manager. It is possible for the institution to simply allow UWSA to provide some of this data to us to alleviate the work at the campus. We will request data once in fall 2014 and then once again per academic year and ask that it be submitted no more than six weeks following the end of the spring term.

Is it possible to see the basic process and data collection requirements before applying to ensure we can accommodate these requirements?
The steps are described in the prior question, and will be kept to a minimum with the vast majority of the work occurring

between July-September 2014. These steps will include: (1) identifying and advancing the student names to HEAB, (2) facilitating the survey, (3) receiving the list of selected students and awarding the grant, and (4) providing data.

What will school involvement with the August 2014 survey include?

The survey will be conducted in August 2014 and will include all students who have filed a FAFSA by July 1, 2014 and have an EFC less than or equal to 150% of the Pell eligibility threshold. The University of Wisconsin Survey Center will conduct the survey. The institution needs to (a) provide student contact information to UWSC (b) allow the institution's logo and name to appear on the survey, and (c) send at least two emails to students letting them know about the survey and encouragingtheir participation. Student organizations should also be allowed to work with UWSC to encourage participation, and staff of WiscAid should be allowed to flyer on campus in accordance with institutional guidelines.

What type of additional research opportunities are involved?

There will be several projects with which your school may wish to become involved. For example, with support from the William T. Grant Foundation, beginning in August 2014 we will conduct an in-depth ethnographic study of how low-incomestudents experience their first year of college. This will provide schools with a chance to learn about how students interact withcampus services, navigate their courses and work schedules and think about their decision to remain enrolled or leave school. Also, beginning in January 2015, we plan to examine the impact of a low-intensity effort to increase rates of on-time FAFSA renewal. That project is a direct response to concerns raised by financial aid officers about students who are leaving money on the table by filing late or not at all.

Additional Application Information

Why are you interested in the type of aid management software employed?

We simply want to be able to assess in the application stage how many systems are involved, and ensure future communicationand data transfer instructions are appropriate for all participating schools. No one software system is requested or required to participate.

Can you share more information about the selection process?

After receiving the applications we will utilize the data provided by the institution along with data we have obtained from a partnership with ACT and data from our prior financial aid study in order to estimate whether the institution will have at least200 students entering college next fall who meet a set of additional academic requirements and will be likely to participate in the survey. These include having a minimum ACT score on composite and math and science measures, and any interest in STEM. We are pairing this additional data with the information you provide in order to minimize the application burden on your institutions. Institutions expected to have at least 200 students meeting the criteria will advance to the next stage of the selection process.

In that stage, we will examine the institutional history in providing data to our study in the past, to ensure that we feel confident that the data will meet the study's needs. We may contact the institution with questions at that stage. We will also take into consideration the institutional review board process at the school, as well as the student demographic characteristicsand the geographic location of the campus. We aim to ensure a broad range of diverse institutions are involved

[1] Between one-quarter and one-third of White and Asian American students, respectively, who started as STEM majors completed a STEM degree within four years. The four-year STEM degree completion rates for Black, Latino, and Native American students ranged between 13 and 16 percent.
[2] Unlike most other student financial aid studies, the focus of the treatment in this study is not exclusively low-income students but instead expands to students from moderate-income backgrounds.
[3] There are other eligibility criteria to receive additional financial aid besides family income. They are discussed in more detail below.
[4] There were four additional schools that did not have public emails, but were also were included in the total final number of schools recruited.
[4] There is little evidence suggesting differential impacts of financial aid according to whether students are in their first or second year of college. The declaration of a college major very frequently occurs in the third rather than second year of college, especially for low-income students. The pace of progress in programs and majors is notably slower for students at nonselective institutions and many students who are termed "first year" at their college actually have some prior college enrollment, according to the National Student Clearinghouse. Therefore, in order to maximize the number of eligible students, we allowed participation for students in their second year at a select number of institutions.
[6] We also conducted an analysis limited to only four-year students and the results were consistent with those reported in this paper.
[7] Not shown here, we also measured enrollment in the first year of the study, which is a dichotomous outcome where '0' indicates that the student was not enrolled in a participating study school in the 2014-15 academic year and '1' indicates that the student was enrolled in a study school in the fall or spring semesters of the 2014-15 academic year. The overwhelming majority of students in our study were enrolled in the 2014-15 academic year (i.e., 93%) and there were no discernable differences in enrollment by treatment status. Results available on request.
[8] This measure of enrollment in the 2014-15 academic year includes students who may have started college in the spring of 2015. However, students who started college in the fall of 2014, but were not enrolled in the spring of 2015 were not considered 'continuously' enrolled.
[9] Two-year students, however, were recoded as persisting in college if they had received an Associate's degree and were not enrolled in the third-year of college.
[10] To identify STEM majors, we collaborated with researchers from RTI International to examine administrative data from participating study schools. Specifically, RTI staff coded school majors using the National Center for Education Statistics' College Course Map and the 2010 Classification of Instructional Programs taxonomies based on information on students' intended/declared major, the school department (if applicable) in which the major is offered, and the institution offering the major. When the school major was not easily identifiable, RTI staff referred to online course catalogues for more detailed descriptions.
[11] While enrollment could be endogenous to our treatment, in a subsequent analysis (not shown), we find no effect of the treatment, the supplementary grant, on enrollment in the first year of the study. Results available on request.