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Abstract

Serious and sustained improvement in student success requires a **culture of commitment** to institutional change, one that fosters **many** initiatives. Our first initiative at UC Santa Cruz last year was the creation of a broad-based Student Success Steering Committee that meets **biweekly** and is overseeing many campus efforts. Our diverse initiatives serve three broad goals: 1) Strengthen students' sense of community and belonging; 2) Improve successful completion of high-stakes gateway courses in STEM fields; 3) Establish data systems that will allow us to detect students who are at risk of not graduating and to provide coordinated and **early** interventions. Specific initiatives include a) participation in the College Transition Collaborative, a partnership with other universities (including the pioneering UT Austin) exploring scaled-up mindset interventions delivered to the entire frosh class; 2) creation of easy to use retention and time to degree reports by **major**, allowing academic departments to take responsibility for their students; 3) developing and evaluating enhanced community-based learning experiences within academic programs, with the goal of increasing academic engagement and a sense of belonging among underserved students; 4) creation of "flipped" versions of introductory courses in the sciences and math. Across our endeavors we are taking a **data-driven, evidence-based** approach to decision making.

Assurance

I assure that I have read and support this application for an award. I understand that if this application is chosen for an award, my institution will be required to submit, for approval by the Committee on Awards for Innovation in Higher Education, a report indicating proposed uses of the award funds and, as the fiscal agent, will be responsible for distributing funds to any other participating entities. I also understand that, if this application is selected for an award, my institution will be required to submit reports to the Director of Finance by January 1, 2018, and by January 1, 2020, evaluating the effectiveness of the changes described in this application.

George Blumenthal _____ 1/9/2015 _____

Signature Date

George Blumenthal
Chancellor
University of California, Santa Cruz

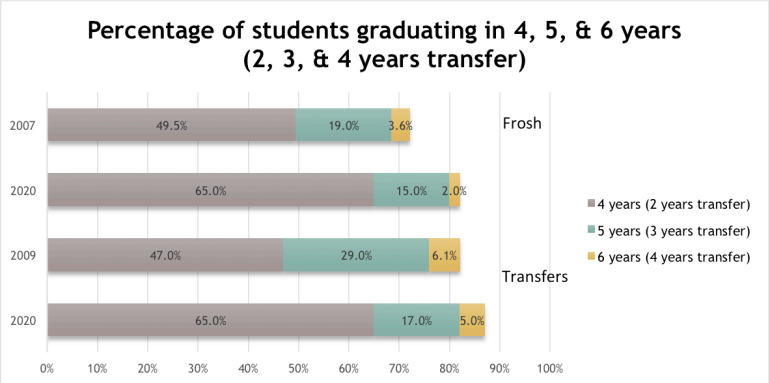
1 (Context): Goals

The University of California, Santa Cruz is the only UC campus whose founding principle was an uncommon commitment to undergraduate education. Even with our high research profile today, this commitment remains a guiding force, reflected in our residential college system and in the great dedication of our faculty to teaching and mentoring. UC Santa Cruz also stands out among UC campuses in the proportion of underserved students we enroll and educate. We are one of only three UC campuses that have established eligibility as a Hispanic Serving Institution, and in a new list of the top 50 colleges for Hispanic students by BestColleges.com, UC Santa Cruz ranked **first**.

Of the student-centered "Five for 2015" goals established by the Campus Provost and Executive Vice Chancellor (CP/EVC) in 2011, **two** deal directly with undergraduate student success: increase retention rates for undergraduate students, and enhance academic pathways to allow students to graduate in four years or less. A third goal, to prepare the campus to achieve Hispanic Serving Institution (HSI) status (now achieved), opens up student success grant opportunities accessible only to Hispanic Serving Institutions.

There is no quick fix to improve student success. Serious improvement in graduation rates and time to degree requires not one innovation, but a sustained and coordinated campus culture capable of fostering **many** initiatives. The initiatives described in this document are all designed to achieve our three highest-order goals by 2020, detailed below.

1) Improve graduation rates. The graph below shows the specific goals for 2020 set this year by UC Santa Cruz's Student Success Steering Committee. The 1st and 3rd bars show outcomes for frosh who enrolled in 2007 and transfers who enrolled in 2009, the most recent data available covering 4-6 year rates for one entire entering class. Our most recent 4-, 5-, and 6-year frosh graduation rates, necessarily based on **different** cohorts of 2009, 2008, 2007, are 55%, 74%, and 72%. The goals shown will move us from these to rates of 65%, 80%, and 82% by 2020. The corresponding 2-, 3-, and 4-year rates for transfers are 54%, 78%, and 82% (current) and 65%, 82%, and 87% by 2020. **2) Improve time to degree**. The increases assumed above for 4-year frosh rates (10 percentage points) and 2-year transfer rates (11 points) also require a shift toward **earlier** graduation.



3) Eliminate graduation gaps for Black/African American, Hispanic/Latino, and low-income students. Graduation gaps persist for these two racial/ethnic groups. Because graduation rates correlate with income as well, and because many underserved students are not within these two groups, we include a separate goal for low-income students. For the same frosh cohort in the graph, 4-year graduation rates for both Hispanic/Latino and Black/African American students lagged behind those of White students by 13 points. That of low-income students lagged 8 points with respect to students who were not low-income. For transfers, the corresponding gaps were 6 points for Latino/Hispanic students, and 8 points for Black/African American students, and 12 points for low-income students.

2 (Context): Profile of Students

With the highest proportion of undergraduate students (compared to graduate students) in the UC system, the University of California, Santa Cruz serves a broadly diverse group of students, as shown in Table 1 below. The largest groups by race/ethnicity are White (36.6%), Hispanic/Latino (30.3%), and Asian (20.5%). Female students make up 53.3% of the student body. Of the 9 UC campuses with undergraduate students, only two serve a greater proportion of Hispanic/Latino students and, along with UC Santa Cruz, have achieved eligibility as Hispanic Serving Institutions.[1]

Race / Ethnicity	Number	Percent
American Indian or Alaskan Native	24	0.2%
Asian	3,090	20.5%
Black or African American	308	2.0%
Hispanic or Latino	4,576	30.3%
Native Hawaiian or Pacific Islander	23	0.2%
White	5,525	36.6%
Other race	319	2.1%
More than one race	1,068	7.1%
International	155	1.0%
Total	15,088	100%

Table 1: Statistical Profile of the race/ethnicity of UC Santa Cruz undergraduate students. Three quarter averages for 2013-14.

Table 2 shows data for low-income students, veterans, current and former foster youth, and students with disabilities. Because official figures for the latter three categories require self-disclosure, they underestimate the true size of the relevant populations.

Student Characteristic	Number	Percent
Low-income students	7,322	45.8%
Veterans		
Veterans using educational benefits	38	0.3%
Dependents of veterans using educational benefits	83	0.6%
Foster Youth	53	0.3%
Students registered with Disability Resource Center	968	6.4%

Table 2: Statistical profile of veterans, foster youth, and students with disabilities. Figures for low-income students based on Pell Grant recipients Fall 2014. The remaining data provided by the campus offices that work with the relevant populations.

Between 2007 and 2013 the proportion of newly matriculated frosh who were Hispanic/Latino **doubled** from 17% to 34%, and that of Black/African American students increased from 3% to 5%.[2] Similarly, the proportion of students who were first generation increased from 32% to 44%; that of students from low API schools from 11% to 20%; and

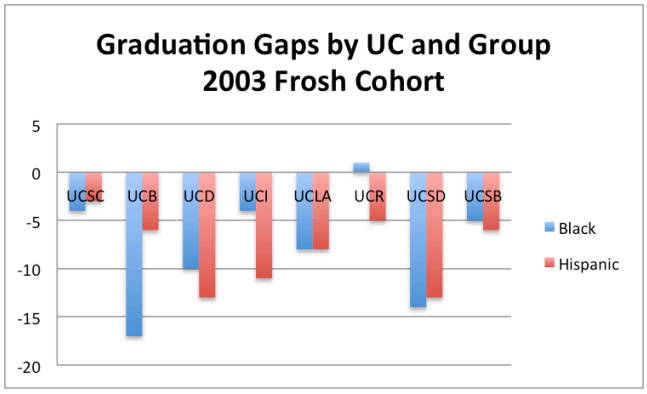
[1] The University of California Statistical Summary of Students and Staff. http://legacy-its.ucop.edu/uwnews/stat/statsum/fall2012/statsumm2012.pdf.
[2] The recent option to self-identify as "multi-racial" may have reduced growth in this category.

that of students whose first language was not English from 11% to 24%. These differences reflect the changing demographics of California. Particularly as an Hispanic Serving Institution, UC Santa Cruz is serving the state's mission of access. Nevertheless, student success gaps persist for some populations. Table 3 shows 4-year and 6-year graduation rate gaps for Black/African American and Hispanic/Latino students with respect to White students, averaged over three years. As stated in Section 1, one of our goals is to **eliminate** these graduation gaps by 2020 (doing so also for low-income students), even as we raise overall graduation rates. A comparison of the gaps for 4- vs. 6-year rates makes clear that there are gaps not only in graduation rates but in time to degree.[3] Many underserved students who have not graduated by 4 years do graduate, but they take longer to do so.

Frosh	4-year grad rate	Gap	6-year grad rate	Gap
Black / African American	43.8%	-13.7	65.6%	-8.5
Hispanic / Latino	43.2%	-14.3	69.1%	-5.0
White	57.5%		74.1%	
Transfer	2-year grad rate	Gap	4-year grad rate	Gap
Black / African American	49.6%	-3.6	77.5%	-5.7
Hispanic / Latino	44.5%	-8.7	80.2%	-3.0
White	53.2%		83.2%	

Table 3: Average graduation gaps w.r.t. White students, for Black/African American and Hispanic/Latino students, based on three most recent years of available data (2005-7 cohorts for 6-year frosh; 2007-9 cohorts for 4-year frosh and transfer; 2009-11 cohort for 2-year transfer).

Though overall graduation rates at UC Santa Cruz are in the lower third for UC campuses, a recent analysis found that graduation rate gaps by race/ethnicity are **smaller** at UC Santa Cruz than at most other UC campuses, as shown in the graph below. It also found that the gaps for both Hispanic/Latino and Black/African American students were smaller than predicted by over 10 percentage points, based on gaps found nationally .[4] Even so, our students and their families deserve much more.



In our view, the most important **general** factors affecting graduation and time to degree, ones that disproportionately affect underserved students, are three, which we argue for in Section 4: a student's sense of community and belonging; successful completion of high-stakes gateway courses in STEM fields; and the university's ability to detect students who are at risk and provide coordinated interventions **early** enough to make a difference. From an even larger perspective, we believe that a crucial component of student success efforts is a campus-wide **culture of commitment to student success initiatives**, and to **data-driven, evidence-based decision making**. We address all of these points in Sections 3-5.

[3] The number of Black/African American transfer students is very small, making those figures volatile.
[4] Who leaves UC Santa Cruz and When?
http://planning.ucsc.edu/irps/Enrollmt/retain/RetentionStudy(Dec2011).pdf.

3 (Innovations): Previously Established Programs and Initiatives

Educational Opportunity Programs (EOP). EOP has provided student success services for over 30 years to students who are low-income, first-generation, or people of color – currently **nearly 40% of the UC Santa Cruz student body**. From 2002 to 2012, the overall UC Santa Cruz population increased by 21% while that of EOP students **increased by 225%**. Programs currently run by EOP include the following:

- **Bridge First Year Experience**: for students at very high risk, an advising and community building program. Bridge Academy in math/writing prep before classes begin, team-building, advising, tutoring/workshops, priority course enrollment through the first year.
- **Early alert and intervention**: advising triggered when a student's grades or progress fall below a threshold at the end of any term.
- **iMap (Improving My Academic Progress):** intervention designed to reach and stabilize students on academic probation. Workshops that address common barriers, tutoring, follow-up advising.
- **Crossing the Finish Line**: Implemented in 2012, this program coaches of students who are very near to graduation but have stopped out or been denied graduation due to a missed requirement. Student peer mentors help students develop action plans toward re-applying for graduation.
- **Pathways to Research**: This program was developed in 2012 to introduce 50 EOP students to research beginning their sophomore year. Utilizes graduate student mentors to introduce and guide EOP students into research.

In the past two years, the first-year retention rate for EOP Bridge students, a group of students at very high risk, has exceeded that of the campus overall. In the past eighteen months, Crossing the Finish Line has intensively coached 97 students to graduation.

Learning Support Services (LSS): Runs campus-wide tutoring and supplemental instruction.

- **Modified Supplemental Instruction (MSI)**: Undergraduate Assistants lead sessions of 12 students, supporting their learning in specific courses. Supported 145 courses last year, and was used on average by 22% of the students in a course.
- **Small group tutoring**: tutoring sessions specific to classes, run by students who have done well in the course. Used last year by 11% of UC Santa Cruz students.
- **Weekly and drop-in writing tutoring; drop-in math tutoring**.

LSS programs were used by more than one third of students in 2013-14. While EOP students (see above) accounted for 37% of undergraduates, they used 53% of the contact hours for tutoring and MSI programs. An assessment carried out in 2012-13 showed that students who used MSI services showed higher course pass rates; a more detailed analysis of this program is currently underway.

Services for Transfer and Re-Entry Students (STARS):

- Advising by professional staff and peer advisors.
- "Successful Transfer to Research University" course, introducing students to university culture and effective academic reading, writing and research strategies.
- Coordination of study group communities; events connecting students to faculty.

- Support for **veterans**: priority enrollment, dedicated housing, and peer mentoring.
- Smith Renaissance Society: supports current and former **foster youth**, homeless and runaway youth, orphans, and wards of the court. Connects students to adult mentors and emotional support, provides financial aid, helps with navigating the university's systems, priority enrollment and year-round housing, social activities.

Resource Centers: Disability Resource Center; Career Center; African American Resource and Cultural Center; American Indian Resource Center; Asian American/Pacific Islander Resource Center; Chicano Latino Resource Center; Women's Center; Cantú Queer Center. The Ethnic Resource Centers provide a sense of community and belonging; connect students to resources, leadership, and professional development opportunities.

More recent initiatives

- **Hispanic Serving Institution status**. We have been granted Title III and Title V eligibility as an Hispanic Serving Institution. This puts UC Santa Cruz in an excellent position to apply for external funding for some of the initiatives discussed in Section 4, to better serve the state's mission of educational access.
- **Early major advising and declaration**. Students often enter the university with unclear ideas about what they will do, or committed to a pathway that may not reflect their abilities or interests. This becomes a retention and time to degree issue when students fail coursework or decide late in the game to switch majors. For these reasons, we **instituted mandatory major qualification** by the end of a student's second year (or second quarter in the case of transfer students), requiring students to demonstrate early an ability to succeed in a major, and we **eliminated** a practice of **disqualifying** students from majors for poor academic performance, which sometimes occurred late in a student's career. In addition, frosh students in many of our college core courses must now participate in major and career assessments sponsored by the Career Center.
- **Major preparation for transfers**. We now require more major preparation for transfer students in Economics, Psychology, and certain STEM fields, making it more likely that transfers will succeed in these majors and finish their degrees within 2 years.
- **Navigating the Research University course**. Established in 2013, this 2-credit course for first-year students explores first-year issues and success strategies and ways to participate in the institution's academic life. It guides students in clarifying educational goals (including deciding on a major) and devising a plan for success.
- **Undergraduate Research Office**. Established two years ago and staffed by a new Undergraduate Research Coordinator, the office is a resource to undergraduate students interested in or engaged in original research. Maintains a large database of research opportunities on campus.

The programs and practices above are supported by research on best practices, and we have indicated above where we have direct evidence of impact. Yet given the dramatic demographic changes underway on our campus, we are not likely to increase our current graduation rates given the status quo. Taking student success to the next level requires that we build on our unusual **culture of commitment to student success initiatives**, and focus on **data-driven, evidence-based decision making**.

4 (Innovations): Initiatives Underway since January 10, 2014

UC Santa Cruz is on a concerted drive to improve student success. Improving graduation rates and time to degree were two of the five "Five for 2015" campus goals established by the CP/EVC in 2011. And indeed, our 4-year graduation rates have increased from 51% to 55% since then. More recently, improving student success is one of the six broad goals of the Envision UCSC strategic plan articulated in **Summer 2014** and associated with UC Santa Cruz's 50th anniversary this year. The student success objectives of that plan are addressed by the initiatives discussed in this section.

The University of California, Santa Cruz, is the only UC campus whose founding principle was an uncommon commitment to undergraduate education. This commitment is reflected, for example, in our residential college system, discussed in Section 5. We are an unusual public university in California, and in the U.S., in achieving national distinction as a place of **both** high-impact research and distinguished undergraduate teaching and learning.

At the same time, UC Santa Cruz differs from most UC campuses in the proportion of underserved students that we enroll and educate. Educational equity requires not just that underserved students be admitted to and graduate from college; it requires that they share in the opportunity to attend and graduate from **research universities** and from institutions having the most **dedicated undergraduate programs**. Our campus is in a unique position to provide these opportunities.

In order to galvanize new action in the area of student success, the CP/EVC appointed an Undergraduate Student Success Team which issued recommendations in May of 2013. The first action taken (as of July 2013) was to appoint a Faculty Assistant to the CP/EVC charged with student success. Recognizing that there is no quick fix for improving graduation rates and time to degree and that many diverse people and offices must be involved in change, the CP/EVC charged this position with building constituencies needed for campus institutional change.

In Section 2 we identified three prominent challenges for student success, now reformulated as broad strategies: 1) Strengthen students' sense of community and belonging; 2) Improve successful completion of high-stakes gateway courses in STEM fields; 3) Establish systems that will allow us to detect students who are at risk of not progressing or graduating and to provide coordinated interventions **early** enough to make a difference. Most of our current initiatives, numbered below, address one or more of the these. Apart from these broad strategies, we believe that real change requires a campus-wide **culture of commitment to student success initiatives**, and to **data-driven, evidence-based decision making**. What this means will be clear in what follows.

Culture of Commitment

1. Student Success Steering Committee. One of the first acts of the Faculty Assistant to the CP/EVC, Student Success, was to form a **Student Success Steering Committee** (SSSC). Its first meeting was on January 31, 2014. The SSSC has about **20** members who represent all of the campus leadership and all constituencies concerned with student success:

Student Success Steering Committee[5]

Holly Gritsch de Cordova	Director, Learning Support Services
Olof Einarsdottir	Vice Chair, Academic Senate; Professor of Chemistry & Biochemistry
Julian Fernald	Director, Institutional Research, Assessment, and Policy Studies
Charis Herzon	Assistant Director, Learning Support Services
Richard Hughey	Vice Provost and Dean of Undergraduate Education
Galen Jarvinen	Special Assistant, Chancellor's Office
Stacey Gustofson	Associate Registrar, Systems and Development
Regina Langhout	Provost, Oakes College; Professor of Psychology
Rebecca London	Student Success Research Advisor
Kalin McGraw	Lead Academic Preceptor, Kresge College
Betty O'Donnell	Biological Sciences Advisor
Jaye Padgett (Chair)	Faculty Advisor to CP/EVC; Professor of Linguistics
Pablo Reguerin	Executive Director, Retention Services and Educational Opportunity Programs
Alma Sifuentes	Associate Vice Chancellor, Campus Life
Abel Rodriguez	Member, Academic Senate Committee on Planning and Budget, and Professor, Applied Mathematics and Statistics
Tchad Sanger	University Registrar
Stacey Sketo-Rosener	Assistant Vice Provost, Undergraduate Advising
John Tamkun	Chair, Committee on Educational Policy, and Professor, MCD Biology
Michelle Whittingham	Associate Vice Chancellor, Enrollment Management
Michael Yamauchi-Gleason	College Administrative Officer, Kresge & Porter Colleges

The SSSC embodies the **culture of commitment to student success initiatives** UC Santa Cruz strives for. The membership of this committee reflects our belief that institutional change can occur only when campus principal officers provide leadership **and** all crucial campus constituencies are part of the decision-making process. Since January 2014 the SSSC has met **biweekly**, and sometimes **weekly**. Many of the initiatives described in this section have arisen from or been championed by the SSSC.

Strengthen Students' Sense of Community and Belonging

One of the most powerful factors affecting whether students stay and succeed is their engagement with the institution: their sense of community and belonging.[6] Underserved students are especially vulnerable to this risk. To quote the College Transition Collaborative, "Even with identical high school credentials, socially disadvantaged students

[5] The position for a student member is currently unfilled.
[6] See Tinto and Astin references in notes 8 and 9.

drop out of college at higher rates and earn worse grades than students from advantaged backgrounds. Research suggests that this disparity is partly attributable to students' concerns about fitting in at college."[7] A number of our current initiatives directly address this factor.

2. College Transition Collaborative. As discussed in an influential NY Times Magazine article last Spring, recent exciting research suggests that academic success can be improved through brief, crafted "mindset interventions" that address sense of belonging.[8] UC Santa Cruz has joined the College Transition Collaborative, a research collaborative of 12 universities established by David Yeager of UT Austin (profiled in the NY Times Magazine article) and colleagues at Stanford University, Indiana University, and Rennison University College, all working together to create, deliver, evaluate, and disseminate these interventions in the next three years. The interventions – **as brief as 45 minutes and given to new frosh students online** – are designed to prepare students to be more resilient given initial setbacks, such as failing a test. Studies done in psychology labs show significant positive effects on retention, GPA, and health outcomes, even four years later when students are near graduation. Working with the Collaborative, UC Santa Cruz is developing an intervention appropriate to our students. The first will be delivered to the **entire** Fall 2015 frosh class in a **randomized controlled experiment**.

This work is exciting for several reasons. First, it is a novel, creative approach to the problem of student success, one that capitalizes on research in educational psychology and behavioral economics and whose initial results look promising. Second, the interventions can be delivered to many students – including an entire frosh class – for relatively little cost. Third, they have been shown to be effective particularly for **underserved** students, who are most likely to feel they do not belong at a university. Fourth, the randomized controlled experimental design should allow us to directly evaluate the **impact** of the interventions, including impact on subpopulations that are known to be at higher risk of dropping out. Finally, should the interventions prove valuable, UC Santa Cruz and the Collaborative as a whole are committed to disseminating the results so that **any** college or university will benefit from the findings. More detail about the Collaborative can be found in Appendix C.

Independently of work within the Collaborative, UC Santa Cruz's Educational Opportunity Programs office, working with a doctoral student researcher in the Psychology Department, already piloted last Fall a mindset intervention for a large proportion of our incoming underserved EOP students, and they will be tracking the outcomes.

3. Campus-Community Engagement. Another impediment to the success of some underserved students is the cultural divide they feel between their home community on the one hand and their academic community on the other. In another partnership, with the researchers at the University of Minnesota, CUNY, and several other institutions, the Provost of UC Santa Cruz's Oakes College has received **First in the World grant funding** (applied for and received Summer/Fall 2014) to develop, implement, and evaluate enhanced community-based learning experiences within academic programs, with the goal of increasing academic engagement and a sense of belonging among underserved students. Here at UC Santa Cruz the effort will build on the existing Oakes College Service-Learning and Community Justice Program. Oakes College, one of 10 colleges at UC Santa Cruz, admits

[7] The College Transition Collaborative. https://p3.perts.net/ctc.
[8] Who gets to graduate? http://www.nytimes.com/2014/05/18/magazine/who-gets-to-graduate.html?_r=0.

about 450 students per year, largely students of color. Using a propensity score matching approach or similar technique to identify a comparison group will allow the researchers to assess outcomes. As a deliverable, the researchers will create a **guide** for universities to use in building sustainable community partnerships and embedding within them community-based learning initiatives that have been successful in improving educational outcomes of underserved students.

4. Santa Cruz County College Commitment 7th Grade College and Career Summit. Underserved students may feel they do not belong at a college or university because they have few family or friends with college experience, and so do not "see" themselves there. Outreach initiatives that counter this sense of exclusion in **school children** address the sense of belonging **before** students go to college, and so can also boost graduation rates.

On March 21, 2014, UC Santa Cruz hosted 1,126 seventh graders and their teachers in a day of college exploration and preparation. The event represented the first year of a new initiative, in partnership with CSU Monterey Bay, Cabrillo Community College, and the Santa Cruz County and City school districts, to ensure that **every student enrolled in one of the twelve main public middle schools** of Santa Cruz County takes part in a "college & career" day at either CSUMB or UC Santa Cruz. Students, teachers, and parent volunteers toured UC Santa Cruz, learned about admissions requirements and ways to prepare for college, and engaged with current college students. An analysis of matched pre- and post-surveys found that the experience had the desired outcome for the 7th grade participants. For example, they were more likely after the event to say they know they must take and pass A-G courses in order to attend a CA 4-year public university (by 10 percentage points), more likely to say they expect to attain a 4-year degree (by 9 points), and more likely to say they know the steps needed to accomplish their career goals (by 14 points).

Improve successful completion of high-stakes gateway courses in STEM fields

A major impediment to student success comes from high failure rates in the gateway courses to a degree in a STEM field. This impediment hits underprepared students hardest. For example, while the proportion of EOP students at UC Santa Cruz – students who are low-income, first-generation, or people of color – was 38% in Fall 2013, the proportion of EOP students during the 2012-13 year who took Math 2, into which the least prepared students are placed, was 75%. The Math 2 pass rate that year was 84% for non-EOP students, but 71% for EOP students. High failure rates in this course and other gateway STEM courses contributes to time to degree and, in some cases, drop-out.

5. Frosh Summer Academy. This year we committed to and are now planning a new Frosh Summer Academy, which will be launched this Summer 2015. This 7-week residential program will require 10-12 credits of work total in three areas: math preparation, writing for STEM fields, and Navigating the Research University, a university acculturation course described in Section 3. The Academy will also incorporate co-curricular social and cohort-building programming to strengthen the students' sense of community and belonging. The program will target students who place into pre-calculus courses. Students who place into Math 2 or Math 3 will be positioned to take Math 3 or Calculus in Fall 2015 and so are predicted to have improved time to degree. We have adopted a **randomized controlled trial** design to assess the impact of this program on quarter-by-quarter retention, grades, and other measures.

In addition, the UC Santa Cruz Math instructor who will teach at the Academy has committed, contingent on funding we are now seeking, to use the small-class Academy setting to pilot "flipped" active learning versions of Math 2 and 3, which would then be scaled up to the larger academic year offerings of those courses using the University of Colorado Learning Assistant model, analogous to what is described below.

6. "Flipping" Introductory Courses in Biology, Chemistry, and Physics. In May 2014 UC Santa Cruz was awarded $1.5 million from the Howard Hughes Medical Institute to create new "flipped" active learning versions of introductory courses in these STEM areas. The goals of this initiative are 1) to increase the number of science, technology, engineering and mathematics (STEM) graduates, with those graduates reflecting the diversity of UCSC's student population, 2) to increase the proportion of those diverse graduates who move on to STEM careers, and 3) to build an institutional culture that sustains learner-centered, inclusive, evidence-based STEM education. In the re-designed classes, students will go online to access course material traditionally delivered in a lecture, while class time will be devoted to active learning through experiments, problem solving, and group projects. Because active learning has been shown repeatedly to improve student success, we expect that these course re-designs will lead more students to pass and position them more strongly to progress further in STEM majors. More information is given in Appendix C.

7. Using Structured, Self-Paced, Online Instruction and Assessment. Students who do not place directly into higher level math need extra time to complete the prerequisite math courses for many popular majors, including STEM. However, some students may be close to meeting the knowledge requirements for the next level of math. Instead of having to take the course into which they placed, these students might benefit from structured, self-paced, online math instruction, allowing them to progress directly to the next course in the sequence. To pilot this idea, the Physical and Biological Sciences Division at UC Santa Cruz has purchased 1,000 access licenses of ALEKS-PPL, a web-based assessment and learning system. Students were invited to begin using it in November – their usage does not coincide with quarter terms – and we will track the results. We are excited to ALEKS-PPL with newly admitted students this summer, because placement in the Fall into Math 3 or Calculus instead of Math 2 or Math 3 increases the likelihood of 4-year graduation.

*Establish systems that will allow us to detect students who are at risk of not progressing or graduating and to provide coordinated interventions **early** enough to make a difference.*

Student success is hampered at UC Santa Cruz, as at most universities, by a familiar problem: campus advisors learn that a student is having academic problems at the end of a term, after the student has failed one or more courses. The Student Success Steering Committee has spent a great deal of time this past calendar year studying this question. The committee heard presentations from leading vendors, some of them pioneers in this area, to learn what is possible, and finally determined that a solution at UC Santa Cruz will require a two- or possibly three-pronged approach. As of December 2014, we have entered the Request for Proposal stage of purchasing. We intend to have 8 and 9 below in place for Fall of 2015.

8. Case Management System for Advisors. Student advisors are dispersed over many campus units, including the colleges, the academic departments, the Educational Opportunity Programs office, Financial Aid, Residential Life, and the Disability Resource

Center. An improvement in our ability to effectively intervene or respond on students' behalf will require investment in case management system software. All advisors will be linked in such a system, allowing for fast and coordinated response to student issues.

9. Early Alert. These systems (Starfish and MAP-Works are example products) draw on data about a student's pre-admissions profile, survey results, and crucially, performance in **ongoing courses**, in order to flag students at risk so that the campus can intervene. They provide a user-friendly interface through which faculty can report degrees of concern about a student to the campus **early** in the quarter. Some campuses struggle to ensure adoption, but advocacy by the broad-based Student Success Steering Committee, and UC Santa Cruz's culture of commitment to undergraduate instruction, will be instrumental.

10. Predictive Analytics. Predictive analytics ("big data") systems analyze pre-admissions data, data from the student information system, and other data sources to compute for every student the risk of dropping out. Students are then flagged for intervention. These systems go beyond Early Alert in their reach, for example, flagging students who are not making progress to qualify for a major or to graduate. (Example products include the Student Success Collaborative and Civitas.) These systems can be costly, and the features of products in 8-10 overlap. Responses to our Request for Proposals will help us decide whether acquiring a predictive analytics system is right for us.

Data-driven, evidence-based decision making

The best initiatives are driven by data, and are designed to give us **more** data, to be fed into a continuous improvement feedback loop. That we are highly committed to an evidence-based approach should be clear from the above. We are mindful, for example, of the increasing expectation of rigorous assessment, including randomized controlled trial studies where possible, as argued for by the DOE's Institute of Education Sciences. Other initiatives this year related to data and evidence, apart from what is seen above:

11. Student Success Research Advisor. We hired (effective November 2014) a Student Success Research Advisor, who, working with the Faculty Assistant to the CP/EVC, Student Success, is overseeing the assessment of programs. This currently includes undertaking a rigorous assessment of the campus Learning Support Services (described in Section 3) and guiding the randomized controlled trial design for the Frosh Summer Academy.

12. Major-Level Reports. Effective this year, UC Santa Cruz is producing reports on graduation rates and time to degree by **major**. (They also give information about movement between majors.) Of the students who do not complete their degree at UC Santa Cruz, as many leave after the second year as after the first year, and nearly as many again depart after the third year. This is the period when students are choosing and pursing majors. In order to improve these numbers, we must engage **academic departments** in what is happening to their majors. This is possible only if departments have current, clear, and actionable information. With this is in hand, we will now be raising expectations of departments to consider student success issues specific to their programs and to respond creatively, as discussed in section 4. An example report is included in Appendix C.

13. Student Exit Surveys. As of this Fall 2014, we have created the first **campus-wide** exit surveys that must be completed by all students who apply for a leave of absence or to withdraw. This survey will allow us to collect nuanced data on why students leave UC Santa Cruz. The survey is being implemented now.

5 (Innovations): Future Initiatives

Most of our **planned** initiatives fall into two categories: those that build on our residential college system and those that engage academic departments.

Colleges. A hallmark of UC Santa Cruz is its residential college system. All students are affiliated with one of our 10 colleges, each having its own character and academic theme, overseen by a faculty Provost. Advising, unless specific to a major, is done within the college. Co-curricular activities and social events are college-based. Perhaps most important, all students take a college-based Core Course during their first year. These courses reflect the colleges' themes. They are small section (capped at 22 students) and emphasize writing skills, satisfying university writing requirements. They address "big ideas" and introduce students to university-level discourse and thinking skills.

The colleges were from the start a student success initiative. They provide a smaller living-learning community within a large research university setting. Learning communities are known to increase retention, GPA, credit hours earned, and student satisfaction.[9] The colleges may help explain why our graduation rates outperform comparison institutions with similar student demographic profiles (see Section 2). We are proud of our colleges and want to build on their success, with two planned initiatives:

1. Block Scheduling of STEM Students by College. To further create learning communities, we will implement block scheduling of students. Block scheduling means that a group of students is scheduled together not just in one course but over a sequence of courses, for example spanning the entire first year. Students taking the same classes together form a community, and this predicts the benefits for student success discussed above. Block scheduling is feasible in the STEM fields because they have very structured and predictable first-year curricula. It will also be very **beneficial** in STEM fields, where student success issues are most pressing. In order to fully bring the power of the living-learning community to first year STEM courses, to the extent feasible, we will block together students from the **same college**. **Timeline**: implementation by Fall 2016.

2. Interdisciplinary Topical Clusters (ITCs). ITCs are clusters of two or more general education courses defined by attention to a specific issue of importance to society. Individual courses reflect discipline-specific concepts, but the ITC is **interdisciplinary**, unified by its **theme**. ITCs are another way to create learning communities. In a well-known cross-institutional study of college learning outcomes, Astin (1993:425) concluded that a "true-core interdisciplinary approach to general education, in which all students are required to take precisely the same set of courses" was the **only** design feature of general education that stood out in positively affecting many of the learning outcomes.[10]

ITCs provide an exciting opportunity to strengthen the academic component of our residential colleges beyond the Core Course. ITCs would impose no new costs or requirements. Rather, they are built out of general education courses that departments must teach anyway. We have one precedent to build on: UC Santa Cruz's College 8, with its

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[9] Learning Community Research and Assessment: What We Know Now. Taylor 2003, available at http://evergreen.edu/washingtoncenter/about/monographs/researchassessment.html. See also Tinto, Vincent. 1993. *Leaving college: rethinking the causes and cures of student attrition.* Chicago University Press.

[10] Astin, Alexander W. 1993. *What matters in college: four critical years revisited.* San Francisco: Jossey-Bass.

theme of Sustainability, created a three-quarter ITC as its **Core Course**, combining courses in environmental policy, environmental science, and engineering solutions for sustainability, taught by tenured faculty. **Evidence of commitment**: the impetus for the College 8 ITC came from the College 8 Provost and from the then chair of the Committee on Educational Policy, who is currently chair of the Student Success Steering Committee. **Timeline**: Next academic year we will begin a campaign of reaching out to departments and college Provosts, providing course development funding, to promote ITC partnerships.

Departments. As noted in Section 4, many students leave UC Santa Cruz after the second or third year, when they should have integrated into an academic major. To improve these numbers, we must engage **academic departments** to consider student success issues specific to their programs and to respond creatively. Here are currently planned initiatives.

3. Fast-Track Majors Using Summer Session. Beginning with five large departments whose outcomes affect a large number of students – Ecology & Evolutionary Biology, Economics, Environmental Studies, Molecular, Cellular, and Developmental Biology, and Psychology – we will ask departments to devise curricular plans that would allow students to finish the degree in **three** years instead of four, by capitalizing on summer session. A recent survey on campus found that 44% of students who entered as freshmen said they would be interested in such a fast-track track version of their major. **Commitment and Timeline**: has been under active discussion by the Student Success Steering Committee since Spring 2014; discussions with departments begin Winter quarter 2015, with 3-year plans in place for the first five departments by Fall 2015.

4. Alternative Degree Choices. Some students falter in very challenging majors after having progressed a good deal toward their degrees. We will work with departments to create alternative majors that capitalize on the requirements such students have satisfied, allowing them a path to a degree without severe back-tracking. **Commitment and Timeline**: also under active discussion by the Student Success Steering Committee since Spring 2014; will begin Winter quarter 2015, with alternative majors in place by Fall 2016.

Other.

5. Establish a Student Success Research Center. We have faculty and graduate students in many departments – for example, Psychology, Economics, Computer Science, Education – who are active researchers in factors the affect student success. Dispersed in different departments, these researchers operate mostly in isolation from each other and from the university administration. Furthermore, there are structural impediments for faculty who want to do research using UC Santa Cruz student data, including concerns about privacy and data security. These are impediments that can be overcome responsibly. We envision a Student Success Research Center that would bring this academic community, **and** relevant administrators, together to share research and ideas bearing on student success at UC Santa Cruz. That is, this Center would be engaged in action-oriented research, and its visibility would focus the attention of the administration and the campus on this research. Because our faculty already involve undergraduate students in their research, the Center would also foster a community of students participating directly in action-oriented research on student success. Finally, it would embody and foster a rigorous, research-based culture of assessment on campus. **Timeline**: Stage 1, Spring 2015, create the community by establishing monthly presentations of active research. Stage 2, open-ended and assuming wide interest, seek grant funding to seed-fund a Faculty Director, one or more Researchers, and support staff; negotiate physical space.

6 (Innovations): Cost of a Degree

We assume that the per-student average expenditure for undergraduate education is $18,060, the 2014-15 figure from the UC Budget for Current Operations (*Sources of University Funds*, Display II-7, p. 55).[11] Of this total, $7,090 comes from annual California State support, $2,610 from institutional support, and $8,360 from student tuition and fees. We also assume frosh and transfer cohort sizes of 3,700 and 1,250, based on estimates of future enrollments from our Long Range Development Plan.

Actual retention and graduation rates are based on those of the 2007 incoming cohort of Frosh and and Transfers; this is the most recent year for whom we have 6-year Frosh graduation rates. These are compared to our goal figures from Sections 1 and 12. This is a simple model, but it gives a reasonable apples-to-apples comparison of cost savings resulting from increasing overall graduation rates and decreasing average time to degree. (For calculations see Appendix E.)

The hypothetical total current cost to graduate both frosh within six years and transfers within four years, given actual 2007 graduation rates, is $279M. Assuming we meet our targets for 2020, this cost increases to $288.8M. This increase occurs because under our revised goals we are educating more students and producing more bachelor's degrees each year. The increase does not impose further costs on the State, because under the Governor's funding model to UC, State support does not increase when enrollments exceed the campus's budgeted enrollments. Instead the increased cost falls to institutional and tuition sources. However, though overall costs increase, the average cost per student graduating with a degree **decreases** by $5,400. Of this the largest portions are savings in State support ($2,900, really as a greater efficiency of State dollars) and in tuition ($1,900).

Turning to financial aid: based on the actual 2013-14 average award amount and the proportion of students receiving aid (41.5% of enrolled undergraduate students received an average of $12,189 in aid from the State; 61.5% received an average of $6,760 in aid from UC sources), we estimate total State-based financial aid increases overall by $4.5M. This is again because we are producing more degrees. However, financial aid dollars **per degree** go **down** by $1,200, again a greater efficiency.

From these numbers, we estimate that overall, the State achieves cost avoidance of $49M due to UCSC educating and awarding degrees to a greater number of students. Similarly, the state would see cost avoidance of about $20M in the Cal Grant program as more financial aid recipients receive degrees. Both estimates are based on our hypothetical cohort of 3,700 freshman and 1,250 transfer students. While overall costs increase due to more degrees being produced (and hence, a greater number of students being educated at one time), efficiency is improved dramatically as the average cost of a degree declines.

Most important, achieving our goals means that over 400 **more** students from each entering cohort graduate with a degree. Students and families save on average $1,200/year because of improved time to degree, for a total savings to of $5M for each cohort, assuming current tuition at $13,398/year. Reduced time to degree also means increased savings in room and board, and a chance to enter the job market sooner. Finally, increased degree production has incalculable benefits for the economy of the State and for the financial well-being of our graduates.

[11] http://www.ucop.edu/operating-budget/_files/rbudget/2015-16budgetforcurrentoperations_.pdf

7 (Innovations): Risks / Trade-offs

Many of our initiatives are intended to improve graduation rates and time to degree for underserved students in particular, and they are grounded in best-practice research.

One potential concern relates to initiatives 9-10 of Section 4 involving the goal of **early alert and intervention**. Though early alert and intervention is in principle very well motivated for student success, a successful system presupposes that there will be a sufficient number of advisors and other responders to deal with the increase in referrals that will come. As we implement systems we will be mindful of whether more advising personnel are needed or whether, in fact, our ability to detect at-risk students more intelligently makes advising more **efficient**.

Another possible concern involves the use of ALEKS-PPL for online self-study and advancement in Math (initiative 7 in Section 4). This may work well for highly self-motivated students and for students very near placement into the next Math course up, but in other cases it could backfire, leaving students to flounder too long on their own and possibly fail to advance when they could instead take the relevant course with all of its structure and support. Careful thought to who is granted this option, and under what circumstances, will be needed.

8 (Sustainability): Strengths and Assets

Improving graduation rates and time to degree have been sustained campus priorities for several years already. They were two of the five "Five for 2015" campus goals established by the CP/EVC in 2011. More recently, improving student success is one of the six broad goals of the Envision UCSC strategic plan articulated in Summer 2014. That plan, associated with the 50th anniversary of the campus, requires that we "[e]stablish campus-wide student success measures for 2020 that can be clearly articulated, assessed, and promoted", and the goals presented here do just that. We are taking the campus anniversary as an opportunity to reaffirm our historical commitment to undergraduate education while moving forward with cutting-edge initiatives. The CP/EVC and the campus leadership in general have not wavered in their commitment to improving student success.

Commitment at the top is not enough, of course. Change requires, first, a consistent focus on the goals and the initiatives meant to achieve them, and an ability to coordinate many disparate units toward those goals. This is why the CP/EVC appointed a Faculty Assistant charged only with student success. The Faculty Assistant has already proven capable of fostering institutional change, having chaired the faculty Committee on Educational Policy during the three years when that committee successfully revised the entire general education requirement system. This was an endeavor that required leadership and broad, continual, campus-wide consultation. Change also requires the buy-in and activism of all relevant campus constituents. This is why the Faculty Assistant, Student Success, formed the Student Success Steering Committee in January 2014. The results are reflected in the initiatives seen in this submission.

We believe that this degree of commitment is due in part to a more general culture of commitment to undergraduate education that distinguishes UC Santa Cruz.

9 (Sustainability): Engaging Stakeholders

Even with its culture of commitment to undergraduate education, UC Santa Cruz faces challenges to change similar to that of other institutions. While there is no question at this point that there is commitment and momentum among the campus leadership and the Student Success Steering Committee, success also depends crucially on good outreach and communication with stakeholders – in particular, faculty and advisors. Students are also an important stakeholder group, and here we have an advantage: they are naturally in favor of student success, and their culture of activism will ensure that many students will be eager to get involved in change.

In a sense the challenge with faculty and advisors is the same – getting their attention and time. Faculty work hard to manage their teaching, research, graduate advising, and administrative lives, and advisors are continually challenged to find time to meet the needs of students and their administrative tasks. We strongly believe that effecting change requires a visible willingness to listen and to take views into account, and there is no substitute for face-to-face meetings, to obtain input, incorporate feedback, and ensure buy-in to the process. This will be our approach. We anticipate consulting personally with **every** department on campus, as well as **every** division. We will meet regularly with representative groups of students and advisors, and will communicate our progress regularly to meetings of the Academic Senate. We have learned from the experience of the Committee on Educational Policy (see section 8) that these efforts are essential for meaningfully engaging the faculty and administration.

A second, important, strategy, is to provide a simple and consistent message. This message must be about our **ultimate** goals of improving graduation rates and time to degree. Individual initiatives will naturally be broadly discussed as well, but they must be unified and made coherent by the larger, simple message. The student success steering committee is charged with the task of looking both within and across interventions, as well as assessments of those interventions, to promote the work in ways that are consistent with our larger goals and keep them highly visible.

As described in previous sections, our commitment to these student success goals has been made conspicuous in our goal statements and strategic plans. They are prominently public, appearing on our web site in several places, most notably on the CP/EVC's web page. This has given the goals a force that will necessarily outlast any changes in leadership that might come in the near future.

10 (Sustainability): Sustaining Changes

Of the 18 initiatives presented above (numbered here by section-number), the first five listed below require no new funding at all. All have been accomplished, or will be accomplished, using existing campus resources and the processes appropriate to them. Those in 6-10 require modest funding, at a level that will not have implications for state or student costs. Initiative 4.2 is a 4-year project to which we are contributing $35K/year. After that time we will own the intervention, which can be maintained and used within our existing resources. The online work described by 4.7, using ALEKS-PPL, costs $25 per user (for 6-month usage). The campus bought 1,000 licenses ($25,000) for its current experiments with the program. Should use of ALEKS-PPL prove effective, we may ask students to bear the relatively low cost of $25 or we will continue to fund it. Implementing block scheduling (5.1) will require one-time IT personnel resources to modify our Student Information System to make it possible. To create Interdisciplinary Topical Clusters (5.3) we may provide modest seed funding for new course development. ITCs will replace currently taught general education courses and so will add no new costs after they are created. The initiative in 10, apart from staff time, costs about $8,000. The initiatives in 11-13 are funded or will be funded by external grants. Initiative 4.6 requires only one-time costs to re-design the courses. Initiatives 4.3 and 5.5, to be sustained, would actively seek continual funding. Item 14, The Frosh Summer Academy will be largely funded from tuition revenue in a return-to-aid model and using existing Summer Session resources. Students who succeed in placing into a higher Math course in Fall will reduce their time to degree by one quarter or more. The systems in 15-17 will cost between $50K and $250K/year, depending on the array of solutions chosen. Item 18 is currently a one-time expenditure for this year, but could receive continued funding. These last items are the most significant in cost and staff resources. UC Santa Cruz will take responsibility for funding them.

1. Steering Committee (4.1)
2. Major Level Reports (4.12)
3. Student Exit Surveys (4.13)
4. Fast-Track Majors Using Summer Session (5.2)
5. Alternative Degree Choices (5.4)
6. College Transition Collaborative (4.2)
7. Using Structured, Self-Paced, Online Instruction and Assessment (4.7)
8. Block Scheduling of STEM Students by College (5.1)
9. Interdisciplinary Topical Clusters (5.3)
10. 7th Grade College and Career Summit (4.4)
11. Campus-Community Engagement (4.3)
12. "Flipping" Introductory Courses in Biology, Chemistry, and Physics (4.6)
13. Establish a Student Success Research Center (5.5)
14. Frosh Summer Academy (4.5)
15. Case Management System for Advisors (4.8)
16. Early Alert (4.9)
17. Predictive Analytics (4.10)
18. Student Success Research Advisor (4.11)

11 (Evaluation): Evaluation Measures

Assessment of efforts to improve graduation rates and time to degree is an important aspect of our planning. The campus has long-established regular reporting of retention and graduation rates and time to degree, disaggregated by race/ethnicity, financial aid status, first-generation status, and other familiar categories. At the highest level, we will continue to monitor 1) 4/5/6-year (frosh) and 2/3/4-year (transfer) graduation rates; 2) time to degree; and 3) graduation gaps affecting underserved students, consistent with our goals in Section 1. Short term measures will be 1st-, 2nd-, and 3rd-year retention rates.

However, actionable information requires that we rigorously assess at the level of **program** and **initiative**. To assist the Student Success Steering Committee with planning for assessment, we have hired a Student Success Research Advisor who has expertise and experience in studying K-12 and postsecondary interventions (Initiative 11, Section 4). For example, as part of the planning for the Frosh Summer Academy in 2015 (Initiative 5 in Section 4), we have designed a randomized control trial to study the impact of the program on student outcomes. The study will track students who were randomly selected for participation and those who applied but were not selected, comparing outcomes, including quarter-by-quarter GPA and retention, performance in further Math courses, and major declaration. This will allow us to gauge the **impact** of the program overall, and simultaneous qualitative data gathering will inform hypotheses about what works or does not work, informing change, with further assessment.

Two more examples: First, in joining the College Transition Collaborative (CTC) (Initiative 2, Section 4), we have agreed to a research-based approach (also randomized control trial) to understanding how students' social and emotional predispositions play a mediating role in their retention, graduation, and time to degree. Both the intervention and the associated research study will allow the campus to look beyond what can be found in our administrative data systems to better understand the challenges faced by our own student population in charting their college careers. Second, an assessment of the 7th-grade College and Career Summit program (Initiative 4, Section 4) was designed and executed by Professor of Education Catherine Cooper, and shows that the program is increasing students' knowledge of the University of California course requirements, their views of themselves as four-year college students, and their desire to attend college when they graduate high school. These outcomes are highly aligned with the goal of the program and the study will continue with the program in years to come.

We believe that future success depends on fostering a **culture** of rigorous, research-based assessment. This is the reason for our planned Student Success Research Center (Initiative 5, Section 5), drawing together the administration, faculty, graduate students, and undergraduate students with relevant interests and expertise in the area.

The results of all assessments and data trends are continually shared with the Student Success Steering Committee, which is composed of decision-makers and representatives of all campus units and constituencies invested in student success.

Finally, as discussed in Section 4 (Initiatives 8-10), UC Santa Cruz is investing in several new data systems that will allow us to improve student case management and coordination across campus, improve knowledge of reasons for students' exits, and allow for more sophisticated exploration of hypotheses about why students do not succeed.

12 (Evaluation): Outcomes

Goals 1&2: Overall Graduation Rates and Time to Degree

Table 4 provides target outcomes for 1st-, 2nd-, and 3rd-year retention rates, near time measures of institutional success, and 4-, 5-, and 6-year graduation rates, the more distant, "bottom line" measures discussed in section 1. The first column shows our most recent figures for each measure; these are from 2012-13, though we will revise them with 2013-14 measures when they become available later this month. The last column shows our targets for the 2019-20 academic year.

The 2019-20 targets for the retention measures were derived as follows. Our 3rd-year retention rate has held at roughly 1 percentage point above our 6-year graduation rates for many years; a target graduation rate of 82% therefore suggests a target 3rd-year retention rate of 83%. The 1st- and 2nd-year targets are then derived from this figure by examination of the historical relationship among 1st-, 2nd-, and 3rd-year retention rates.

Intervening measures are based on a simple linear interpolation between the Recent and 2019-20 measures, with values evenly spaced. Note that time to degree improvements are present in the increased proportion of 4- and 5-year graduates assumed (2- and 3-year for transfers).

We assume increases in measures starting 2015-16, rather than 2014-15 (or 2013-14), because it will take time for our current and planned initiatives to be implemented and tested, and for their effects to show up.

Frosh Retention Rates	Recent	2015-16	2016-17	2017-18	2018-19	2019-20
1st-year	88.8%	89.6%	90.5%	91.3%	92.2%	93%
2nd-year	82.6%	83.7%	84.8%	85.8%	86.9%	88%
3rd-year	78.4%	79.3%	80.2%	81.2%	82.1%	83%
Frosh Graduation Rates						
4-year	55.2%	57.2%	59.1%	61.0%	63.0%	65%
5-year	73.9%	75.1%	76.3%	77.6%	78.8%	80%
6-year	72.1%	74.0%	76.1%	78.0%	80.0%	82%
Transfer Graduation Rates						
2-year	54.4%	56.5%	58.6%	60.8%	62.9%	65%
3-year	77.5%	78.4%	79.3%	80.2%	81.1%	82%
4-year	82.1%	83.1%	84.1%	85.0%	86.0%	87%

Table 4: Target outcomes for retention and graduation rates for academic years 2015-16 – 2019-20.

Goal 3: Graduation Gaps

Table 5 and Table 6 show target outcomes for graduation gaps for students entering as frosh and transfer (respectively), for Black/African American students, Hispanic/Latino students, and low-income students. Our goal is to eliminate these graduation gaps by academic year 2019-20. The assumptions behind these tables are otherwise analogous to those for Table 4.

Graduation Gaps in Percentage Points (Frosh)

4-Year Graduation Gaps	Recent	2015-16	2016-17	2017-18	2018-19	2019-20
Black/African American	16.1	12.9	9.7	6.4	3.2	0
Hispanic/Latino	13.7	11.0	8.2	5.5	2.7	0
Low-income	11.8	9.4	7.1	4.7	2.4	0
5-Year Graduation Gaps						
Black/African American	8.1	6.5	4.9	3.2	1.6	0
Hispanic/Latino	8.5	6.8	5.1	3.4	1.7	0
Low-income	0.0	0.0	0.0	0.0	0.0	0
6-Year graduation Gaps						
Black/African American	9.0	7.2	5.4	3.6	1.8	0
Hispanic/Latino	6.2	5.0	3.7	2.5	1.2	0
Low-income	0.0	0.0	0.0	0.0	0.0	0

Table 5: Target outcomes for graduation gaps for academic years 2015-16 – 2019-20, entering frosh. Gaps for Black/African American and Hispanic/Latino groups defined with respect to White students. Low-income students are defined as recipients of federal Pell Grants, and gaps for low-income students are defined with respect to students who receive neither Pell Grants nor Stafford loans.

Graduation Gaps in Percentage Points (Transfer)

2-Year Graduation Gaps	Recent	2015-16	2016-17	2017-18	2018-19	2019-20
Black/African American	0.0	0.0	0.0	0.0	0.0	0.0
Hispanic/Latino	7.3	5.8	4.4	2.9	1.5	0.0
Low-income	9.2	7.4	5.5	3.7	1.8	0.0
3-Year Graduation Gaps						
Black/African American	6.8	5.4	4.1	2.7	1.4	0.0
Hispanic/Latino	3.6	2.9	2.2	1.4	0.7	0.0
Low-income	3.7	3.0	2.2	1.5	0.7	0.0
4-Year graduation Gaps						
Black/African American	0.1	0.1	0.1	0.0	0.0	0.0
Hispanic/Latino	3.0	2.4	1.8	1.2	0.6	0.0
Low-income	2.2	1.8	1.3	0.9	0.4	0.0

Table 6: Target outcomes for graduation gaps for academic years 2015-16 – 2019-20, entering transfers. Gaps defined as above.

COLLEGE TRANSITION COLLABORATIVE

At a glance

The CTC vision

Our goal is to promote college persistence and achievement, especially among students from disadvantaged backgrounds, using highly scalable mindset interventions; and to forge collaborative relationships among researchers and higher education leaders.

The team

Our team consists of leading researchers who have developed mindset interventions. The four PIs are:

Dr. Christine Logel (University of Waterloo)
Dr. Mary Murphy (Indiana University)
Dr. Greg Walton (Stanford University)
Dr. David Yeager (University of Texas, Austin)

The PIs are supported by a technical expert, Dr. Dave Paunesku, the Co-Founder and Executive Director of the Project for Educational Research That Scales (PERTS; www.perts.net) and a project manager, Dr. Omid Fotuhi, PhD., and a team of research assistants, graduate students, and postdocs.

Mindsets about belonging in the transition to college

To succeed in college, students need access to high-quality secondary education and adequate financial aid. But students also need adaptive mindsets to understand challenges they will experience in college and how they can overcome these challenges with time.

All students face challenges in the transition to college, from developing new friends, to navigating college courses, to building relationships with professors. But students from disadvantaged social backgrounds may wonder whether a "person like me" will belong or be able to succeed in college. The consequence is that, when disadvantaged students encounter common difficulties in the critical first weeks and months of college—like feelings of loneliness or receiving critical feedback—these difficulties can seem like proof that they don't belong or can't succeed on campus. That inference can become self-fulfilling.

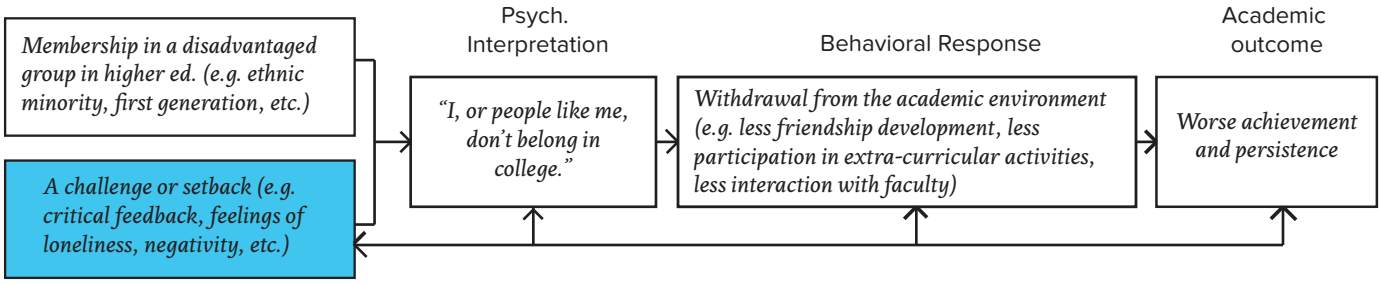
Worries about social belonging are evident in the stories told by many ethnic-minority and first-generation college students. Justice Sonia Sotomayor has said that she felt like, "**a visitor landing in an alien country**" in college[1]. A low-income student from rural South Dakota said of her transition to a liberal arts college, "**I kind of feel like I've been dropped on Mars...I mean, it's so different.**"[2]

When college feels like a foreign cultural and social place, even minor inconveniences can take on a threatening meaning[3]. Consider this reflection from Michelle Obama:

> *When I first arrived at school as a first-generation college student, I didn't know anyone on campus except my brother. I didn't know how to pick the right classes or find the right buildings. I didn't even bring the right size sheets for my dorm room bed. I didn't realize those beds were so long. So I was a little overwhelmed and a little isolated.*[4]

When students infer that they do not belong in college, they are less likely to reach out to faculty (e.g., to attend office hours), to join student groups, and to seek out friends. **Feelings of belonging are thus one of the most robust predictors of college success**. One study with a large group of urban secondary-school students found that pre-college worries about belonging in college (e.g., "Sometimes I worry that I will not belong in college") predicted full-time college enrollment the next year, even when controlling for high school GPA, SAT-score, fluid intelligence, gender, and other personality differences. Worries about belonging were more predictive than every other "noncognitive" measure assessed (e.g., Big 5, test anxiety, grit, self-control).[5]

Figure 1. How worries about social belonging undermine college outcomes



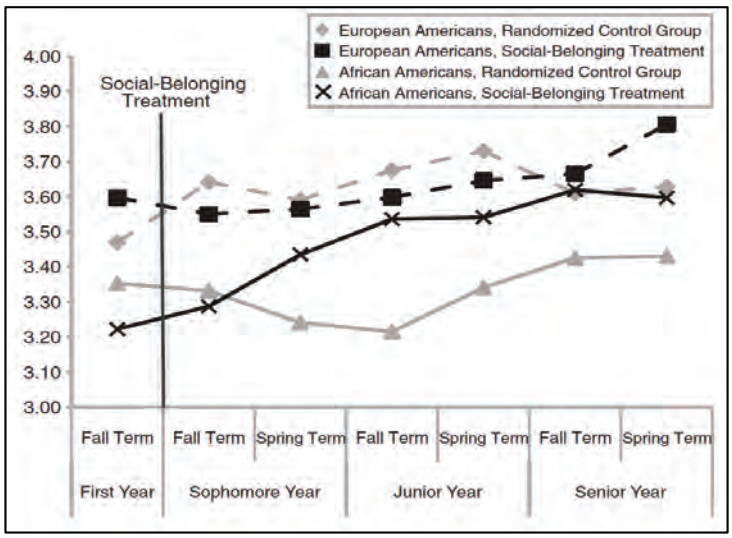
Interventions that address students' worries about belonging and potential

Recent randomized controlled trials show that brief, well-tailored messages during key transitions can address students' worries about belonging and potential and cause lasting improvements in the transition to college for disadvantaged students. These interventions use stories from older students to help incoming freshmen anticipate challenges they will face in college and plan ways to overcome them. For instance, **the social-belonging intervention** conveys that everyone worries at first about whether they belong in college, but these worries dissipate with time. This belief helps students stay in the game when they feel isolated or excluded early in college. For instance:

- One 1-hour social-belonging intervention, delivered in person toward the end of students' freshman year, raised grades among African American students at a selective private university over the next three years, reducing the racial achievement gap by 50%.[6] See Fig. 2.

- Three trials evaluated social-belonging and related mindset interventions **delivered in online modules prior to college matriculation with full cohorts of students** (total N>9,500). Each intervention increased college persistence and achievement among disadvantaged students. See Fig. 3 (at the end of the document). In one trial of 584 college-admitted charter-school students, a 45-minute social-belonging intervention at the end of students' senior year of high school increased the percentage of students who stayed full-time enrolled in college over the next year from 32% to 43%. The interventions reduced the persistence and achievement gaps between advantaged and disadvantaged students by 35-50%.

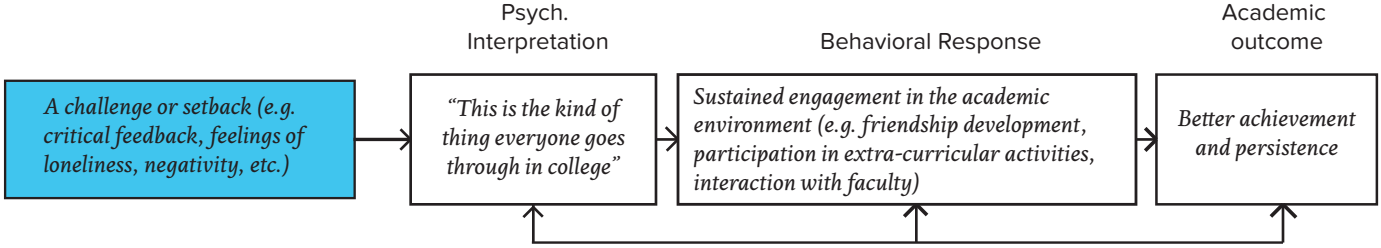
Figure 2. A brief social-belonging intervention increases the grades of African American college students over 3-years (Walton & Cohen, 2011 Science)



How do brief mindset interventions improve student success?

They help students develop social capital on campus—such as close friendships, involvement in student groups, engagement with professors, and the development of mentor relationships. These are essential resources for college student success. Worries about belonging and potential—arising from previous social or economic disadvantage—can prevent students from pursuing these opportunities. Addressing these worries can help students take active steps to acquire social capital. See Fig. 4.

Figure 4. How the social belonging intervention promotes college success



Next steps: The College Transition Collaborative (CTC)

Mindset interventions have a special promise for remedying inequality in higher education. These interventions can be delivered effectively before students come to campus as part of online pre-matriculation programming (e.g., alongside roommate preference forms, etc.). As such:

- They can help students form reasonable expectations for what college will be like and what challenges they will encounter, facilitating a better transition from day one.

- They are **brief**, **low-cost**, and **highly scalable**—during pre-matriculation, colleges and universities can reach the entire incoming class with online exercises at little cost per student.

Given their potential, it is essential to learn how effective mindset interventions are in diverse post-secondary settings. Brief mindset interventions are not magic[7]. They are powerful only when they directly speak to students' worries about the transition to college and help them respond to challenges they face. As a consequence, mindset exercises may be more or less effective in different contexts. They may also need to adapted or customized for new settings to be most effective.

To address the need for widespread dissemination and evaluation, **we are creating a partnership between researchers and colleges and universities**. This partnership will allow us to test prematriculation mindset interventions with a diverse group of colleges and universities.

Working in collaboration with interested faculty and administrators at each partner school, we will test two different implementations of mindset interventions:

- A standardized intervention that is held common across contexts. This will allow us to evaluate how effective a standardized mindset intervention is overall in improving outcomes among disadvantaged students in diverse settings in the transition to college.

- A customized intervention that is revised for each school partner using best practices in user-centered design (e.g., specially designed student focus groups). This will allow us to assess whether customized implementations are more effective.

We will test these interventions with full cohorts of incoming students at partner schools in online, pre-matriculation programming. A third, randomized group of students will receive standard information about the transition to college.

After this evaluation, partner universities will be able to use interventions shown to be effective for future incoming students in perpetuity for internal improvement purposes. Effective interventions will also be made available to other colleges, universities, and secondary schools that wish to use them.

Timeline

The project would go forward on a four year timeline as follows:

Year 1

• CTC team comes to campus to meet with faculty or faculty/student research teams to discuss the project, priorities, and to conduct interviews and focus groups with students.
• Information from each participating institution provided to the researchers, e.g., to identify groups of students at higher risk, prior campus research on retention or academic performance, descriptions of current retention or success programs.
• The CTC team and campus representatives develop the customized intervention.

Year 2

• Summer:
    * CTC provides partner with a web link to the interventions for incoming students to use.
    * Partner insures that most entering students complete the intervention.
• Data processing and initial data analyses and reports to participating colleges
• Revise interventions as needed
• Spring-term survey to assess effects on students' school-relevant feelings, attitudes, and behaviors.

Year 3

• Repeat 2015-16

Year 4

• Interventions could be delivered to no students, to all students, or on a randomized basis depending on results from randomized years.
• Final analyses and reports
• Final recommendations provided to participating colleges
• Final versions of interventions provided to partner for their future use.

FAQs

What are CTC Mindset Interventions?
They are online reading and writing activities in which students learn from stories from older students about common challenges in the transition to college and how they can overcome these challenges. The New York Times (May 15, 2014) describes them:

> *"First-year students read brief essays by upperclassmen recalling their own experiences as freshmen. The upperclassmen conveyed in their own words a simple message about belonging: "When I got here, I thought I was the only one who felt left out. But then I found out that everyone feels that way at first, and everyone gets over it. I got over it, too." After reading the essays, the students in the experiment then wrote their own essays...echoing the same message. The whole intervention took no more than an hour..."*

When and how are CTC mindset interventions delivered?
Interventions are delivered before students come to campus as part of online prematriculation programming (e.g., alongside roommate preference forms, etc.). As such, they are brief, low-cost, and highly scalable. During prematriculation, colleges and universities can reach the entire incoming class with online exercises at little cost per student.

FAQs

Who are CTC partner schools?
Current partners include selective private institutions, large public universities, and liberal arts colleges. Partners are excited to take innovative, evidence-based steps to improve college outcomes for disadvantaged students. We will work with no more than 12 schools in 2014-2015.

Can we give the treatment to all students?
Prematriculation messages can be powerful. However, their effects depend on the context. It would be inappropriate to give all students a new treatment without first evaluating the results compared to a group of students exposed to standard messaging. After evaluating an intervention, partner schools will be able to continue to use effective interventions with all incoming students in perpetuity for internal improvement purposes.

What opportunities are there for on-campus experts to collaborate?
We are excited to collaborate with faculty at partner colleges and universities with relevant interests and expertise. This collaboration may include the facilitation of data collection, development of the customized intervention, collection and preparation of focus group data, and identification of novel, important outcome measures, moderator variables, or statistical analyses. We are also hopeful that our collaboration will give rise to future projects at partner colleges and universities, such as how to improve STEM gateway courses, how to send welcome messages to incoming students, questions that arise in advising and mentoring, issues in residential education, etc. We have expertise in all these areas through collaborations at Stanford, UT-Austin, and elsewhere.

How is CTC funded?
To kickstart the collaboration, CTC will be funded initially through contributions from partner colleges and universities. We are also applying for federal and foundation grant support.

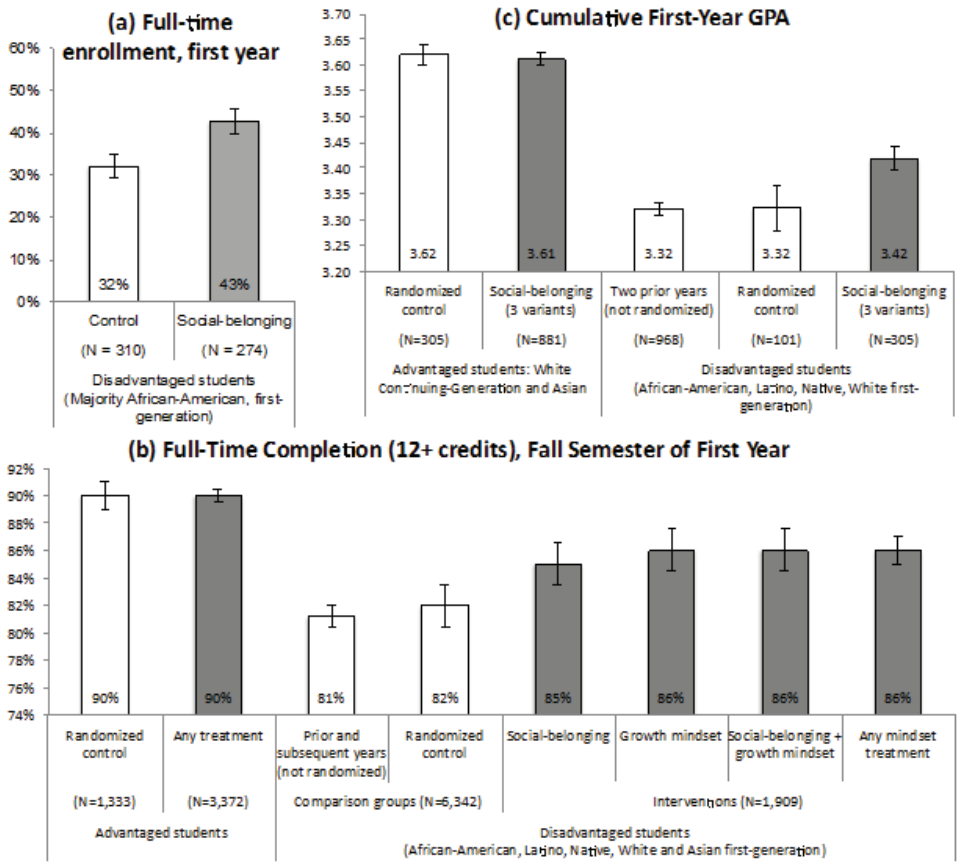
How are project funds spent?
CTC is a research collaboration. The funds support project expenses, especially project managers, post-docs, and graduate students who carry out the work to design, implement, and evaluate intervention results. The PIs receive none of the kick-start funds. Their contribution is cost-shared by their home institutions.

Are CTC Mindset interventions guaranteed to work at my school?
No. Mindset interventions are not guaranteed to work at every school, just as an exciting new medication is not guaranteed to work for every patient. Our existing trials show that CTC mindset interventions have significant promise to improve the transition to college for disadvantaged students. However, it is likely that the interventions will be more effective at some schools than others; and with some groups more than others. Understanding this variability is essential to deploying these interventions effectively and to improving them for the next generation of students.

1 Ludden & Weeks, 2009
2 Aries & Berman, 2012, p.1
3 Mendoza - Denton et al., 2002; Walton & Cohen, 2007
4 http://www.whitehouse.gov/the-press-office/2014/01/16/remarks-president-and-first-lady-college-opportunity-summit
5 Yeager et al., under review
6 Walton & Cohen (2011)
7 Yeager & Walton (2011)

Figure 3. Brief prematriculation interventions improve college outcomes among disadvantaged students (Yeager et al., under review).

(A) Percentage of urban public high school students (predominantly African American and first-generation college students) who stayed full-time enrolled in college in the first-year (N=584) (Experiment 1). (B) Percentage of students who completed the first semester full-time enrolled (12+ credits earned) at a flagship public university (N=7,342) (Experiment 2). (C) Cumulative first-year GPA at a selective private university (N=1,592) (Experiment 3). Bars represent raw mean or percentages.

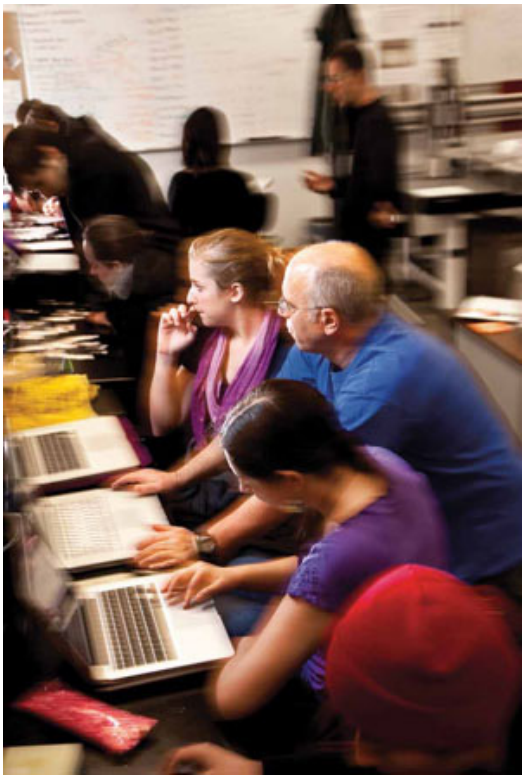


UCSC receives major grant to revamp introductory science courses

$1.5 million grant from the Howard Hughes Medical Institute will support an ambitious program aimed at increasing the number of students graduating with science degrees

May 29, 2014
By Tim Stephens

UC Santa Cruz will undertake an ambitious program to revamp its introductory courses in biology, chemistry, and physics, replacing lectures with a more active learning approach. Funded by a $1.5 million grant from the Howard Hughes Medical Institute (HHMI), the effort is intended to ensure that more of the students who enter UCSC planning to study science persist through the required courses to earn a science degree.



Professor Manuel Ares works with students in a phage genomics course funded by an earlier HHMI grant. (Photo by Jim MacKenzie)

Paul Koch, dean of physical and biological sciences at UCSC, will oversee the program and develop faculty teams to work on the different introductory course series.

"This grant gives us the resources we need to make the transition to new ways of teaching introductory science courses. It's a big step forward for the campus," Koch said. "Our goal is to use a more active learning approach--instead of lecturing, we will have students learn by doing. These curricular innovations can have an impact in increasing the number of students who get degrees in science."

In an approach known as "flipping the classroom," students will go online to access course material traditionally delivered in a lecture, while class time will be devoted to active learning through experiments, problem solving, and group projects.

UC Santa Cruz was among 37 institutions to receive HHMI science education awards this year, out of 203 research universities invited to submit proposals (of which 170 submitted proposals). In announcing the awards, HHMI noted that most of the attrition from science majors occurs in the first two years of college, when students are taking introductory "gateway" courses.

Above the national average

UC Santa Cruz is in a strong position to address the problem of student persistence in science and engineering, because the campus has an unusually good record of ensuring that its students earn degrees in the sciences. Nationally, only 40 percent of all undergraduates who begin college

intending to major in science, technology, engineering, or mathematics (STEM) complete a STEM degree. The persistence rate is even worse, only 20 percent, for students from underrepresented racial and ethnic groups. At UCSC, however, the persistence rate is 57 percent overall and 51 percent for underrepresented minority students, well above the national average.

"I see this grant as external verification that UCSC is a place that can have an impact on this pressing national problem," Koch said.

The faculty who will lead the development of the new introductory courses at UCSC are all experienced teachers with a commitment to innovative teaching methods. Seasoned faculty from four departments will be involved: Molecular, Cell and Developmental Biology; Ecology and Evolutionary Biology; Chemistry and Biochemistry; and Physics.

A new classroom will be needed that can accommodate as many as 125 students in an active learning environment, Koch said. Lecture halls with fixed seating won't work for classes in which students need to work together in groups and share their work with the rest of the class. The campus is exploring a location for the new classroom in the Science & Engineering Library. "Classrooms like this are being built all over the country. We have a small one in McHenry Library, but it's not large enough for a big introductory science class," Koch said.

HHMI has supported other innovative science education programs at UCSC, including a Phage Genomics course for freshman biology students and an undergraduate research laboratory developed by Manuel Ares, professor of molecular, cell, and developmental biology, who received a $1 million grant as an HHMI professor in 2002. Compared to the earlier programs, the revamped introductory science courses will reach a much larger number of students, Koch said. The goal is to reach about 25 percent of the students taking these introductory science classes. The new courses will be launched over the next two years, with the first pilot courses planned for the 2015-16 academic year.

The new grant complements recent gifts to UCSC in support of the Student Experience Initiative of the $300-million Campaign for UC Santa Cruz. A $2 million gift from the David and Lucile Packard Foundation supports field-based active learning programs in environmental studies, and a $1 million gift from alumna Julie Packard supports programs that help underrepresented minority students excel in the sciences and mathematics.

"The HHMI grant supports active learning in the classroom, which is known to level the playing field for all students," Koch said.

About HHMI

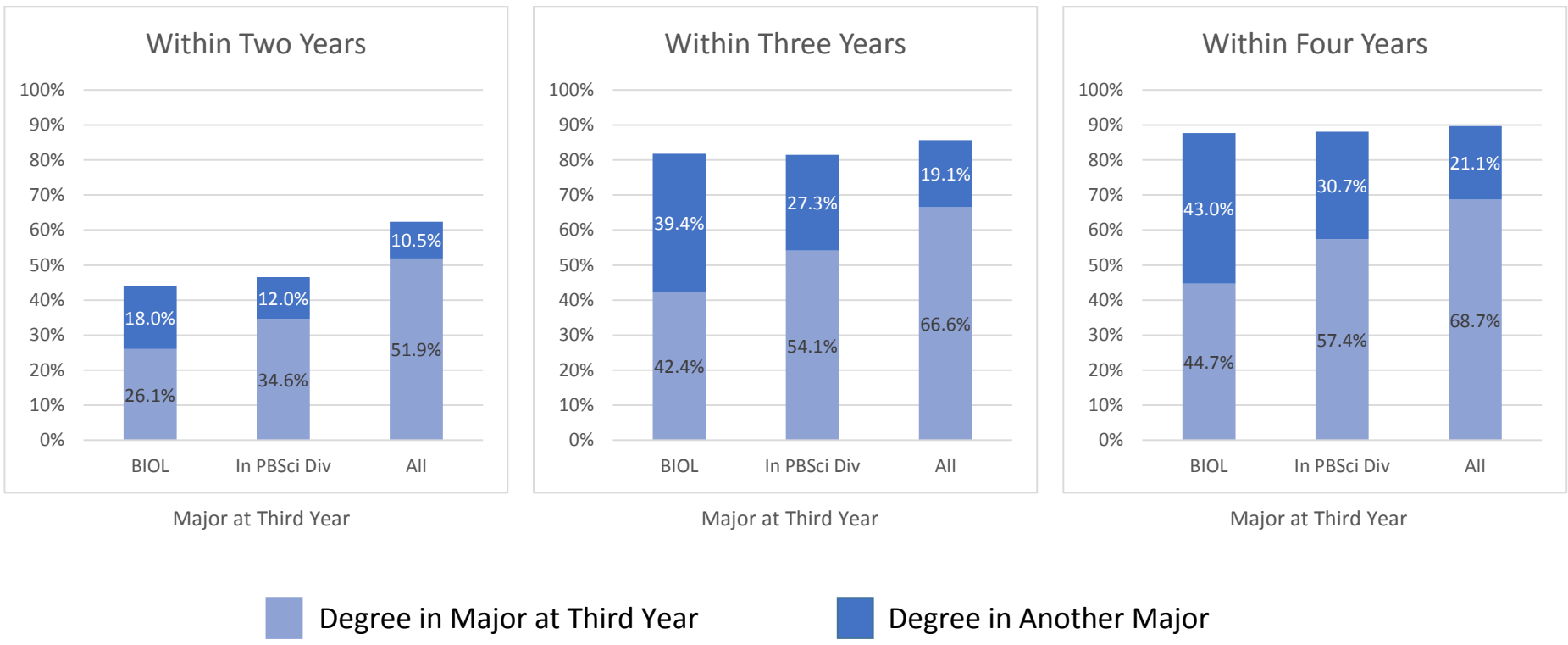
The Howard Hughes Medical Institute plays an influential role in advancing scientific research and education in the United States. For more than a quarter of a century, HHMI has provided grants to support undergraduate education at colleges and universities. These grants have focused on transforming science education in the United States by encouraging science teaching that is hands-on, research-oriented, and interdisciplinary.

See Also

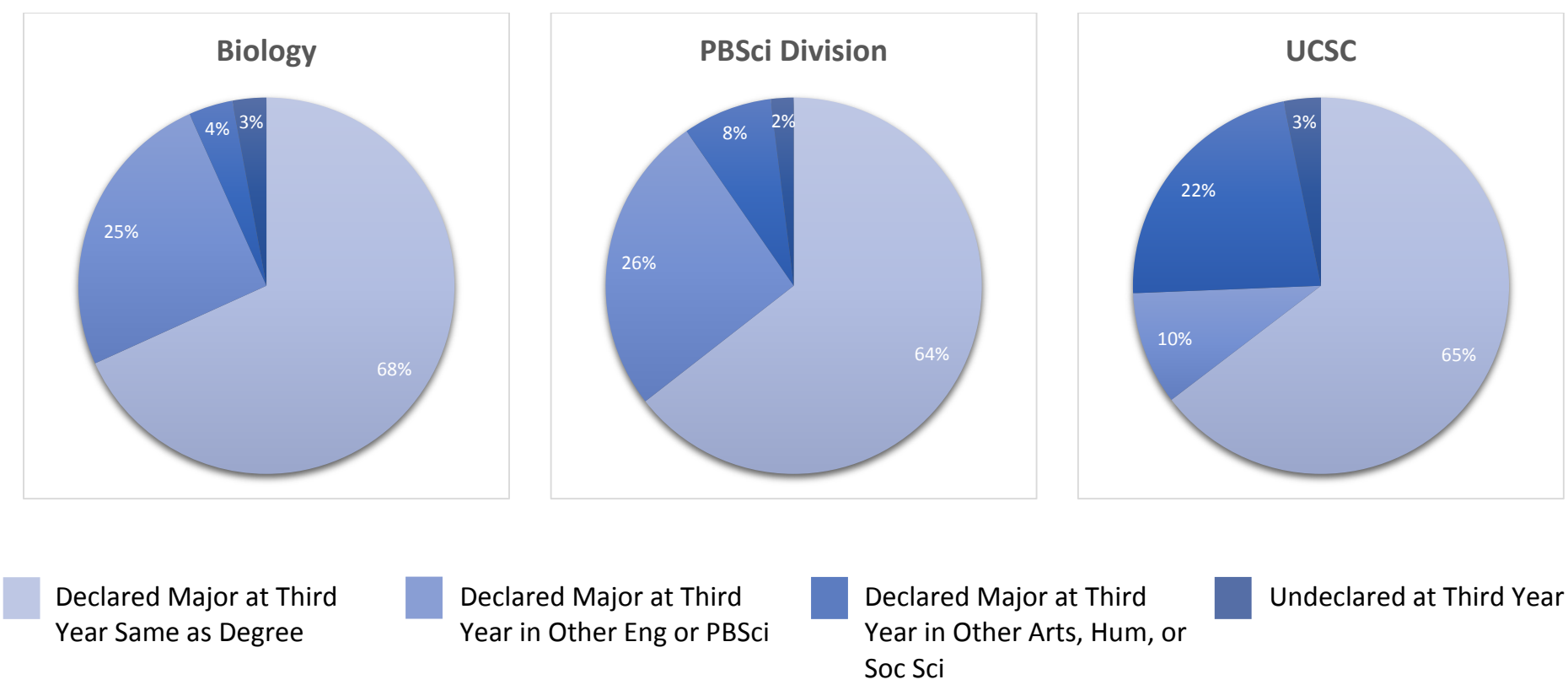
- HHMI Announcement
- UCSC selected to join new Science Education Alliance
- Hands-on research inspires freshman biology students

Success Indicators for 2005-2009 Third Year Cohorts by Major: Biology

Graduation Rates of Third Year Students by Major at Third Year



Degrees Awarded to Third Year Cohorts*



*Third year cohorts are the subset of entering frosh two years prior who were retained to the fall of their third year (e.g., the 2005 third year cohort students are the 2003 entering frosh who were enrolled in fall 2005). Degrees were awarded to third year students within six years of entering as frosh.

Appendix E. Estimating the Average Cost to Award a Bachelor's Degree

	Theoretical Using Actual Rates							Theoretical Using 2019-20 Target						
	Fall of Yr 1	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**	**Fall of Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**
Native Frosh Cohort Count of 3,700					4yr rate	5 yr rate	6 yr rate					4yr rate	5 yr rate	6 yr rate
% Graduated by		*0.0%*	*0.0%*	*2.7%*	*49.5%*	*68.5%*	*72.1%*					*65.0%*	*80.0%*	*82.0%*
# Graduated		**-**	**-**	**100**	**1,832**	**2,535**	**2,668**					**2,405**	**2,960**	**3,034**
% Retained to		*88.0%*	*77.3%*	*71.9%*	*19.5%*	*2.3%*	*0.6%*		*93.0%*	*88.0%*	*83.0%*	*18.6%*	*3.2%*	*0.0%*
# Retained		3,256	2,860	2,660	722	85	22		3,441	3,256	3,071	688	118	-
Cum Frosh Leaving w/o Degree		444	840	940	1,147	1,080	1,010		296	518	592	607	622	666
Native Frosh Students With Costs	**3,700**	**3,256**	**2,860**	**2,660**	**722**	**85**		**3,700**	**3,404**	**3,182**	**3,108**	**688**	**118**	
Transfer Cohort Count of 1,000			2 yr rate	3 yr rate	4yr rate					2 yr rate	3 yr rate	4yr rate		
% Graduated by		*0.9%*	*47.2%*	*76.0%*	*82.4%*					*65.0%*	*82.0%*	*87.0%*		
# Graduated		11	590	950	1,030					813	1,025	1,088		
% Retained to		*88.8%*	*33.8%*	*6.6%*	*1.8%*				*92.0%*	*25.0%*	*5.2%*	*0.0%*		
# Retained		1,110	423	83	23				1,150	313	52	-		
Cum Transfers Leaving w/o Degree		129	238	218	198				100	100	128	163		
Transfer Students With Costs	**1,250**	**1,110**	**423**	**83**				**1,250**	**1,150**	**338**	**97**			

				Differences
Total Number of Students w/Annual Costs		**16,148**	**17,035**	**887**
Total Number of Degrees [1]		**3,698**	**4,122**	**424**
Cost of Instruction [2]		**$279,000,000**	**$288,800,000**	**$9,800,000**
Total State Support [3]		$101,900,000	$101,900,000	$0
Total Institutional Support		$42,100,000	$44,500,000	$2,400,000
Total Tuition		$135,000,000	$142,400,000	$7,400,000
Cost/Degree		**$75,500**	**$70,100**	**-$5,400**
State Support/Degree		$27,600	$24,700	-$2,900
Institutional/Degree		$11,400	$10,800	-$600
Tuition/Degree		$36,500	$34,600	-$1,900
Financial Aid [4]				
Total State (i.e., Cal Grant)		$81,700,000	$86,200,000	$4,500,000
Per Degree		$22,100	$20,900	-$1,200
Total Institutional (i.e., Blue and Gold)		$67,100,000	$70,800,000	$3,700,000
Per Degree		$18,100	$17,200	-$900

State's Estimated Total Cost/Degree Savings:

$2,900 x 17,035 students educated = **$49M**

State's Estimated Total Fin Aid/ Degree Savings:

$1,200 x 17,035 students educated = **$20M**

[1] Total degrees achieved within 6 years for native frosh cohort, within 4 years for transfer cohort.

[2] From *Sources of University Funds*, Display II-7 (p. 55): Per-Student Average Expenditures for Education (2013-14 Dollars). The 2014-15 estimated cost is $18,060, which includes $7,090 in state general fund support, $2,610 in institutional support, and the remainder funded by tuition. (http://www.ucop.edu/operating-budget/_files/rbudget/2015-16budgetforcurrentoperations_.pdf)

[3] State support is based on UCSC's current budgeted enrollment. Taking average State cost ($7,090) for canpus's current budgeted enrollment. State support does not change in current model when enrollments exceed budgeted numbers. This amount will not increase under the Governor's current funding plan, which does not address changes to enrollment.

[4] Financial Aid estimates are based on overall proportion of students receiving specific aid and the average award: In 2013-14, 41.5% of enrolled undergraduate students received an average of $12,189 in aid from the State (i.e., Cal Grant) and 61.5% received an average of $6,760 aid from UC sources.