Preview of Award 0757113 - Final Project Report

Cover

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Accomplishments

*** What are the major goals of the project?**

TEST:UP is a collaborative program, initiated in fall 2008, among three Hispanic Serving Institutions—California State University, Fullerton (CSUF), a four-year, comprehensive university, and Mt. San Antonio College (Mt. SAC) and Santa Ana College (SAC), two of CSUF's feeder two-year community colleges. All three campuses are located within 23 miles of each other and have diverse student bodies with enrollments exceeding 30,000 students. Through TEST:UP, our collaborative program sought to: 1) increase the recruitment and retention of STEM majors at Mt. SAC and SAC; 2) produce more STEM associate degrees and STEM transfers to four-year schools; 3) improve the retention and persistence of transfers and entering freshmen majoring in STEM fields at CSUF; 4) increase the number of students obtaining baccalaureate degrees in STEM disciplines at CSUF and other four-year institutions; and 5) improve mentoring and teaching skills of CSUF graduate students seeking community college teaching careers.

TEST:UP programs have impacted hundreds of students on each of our campuses by: by raising awareness of STEM majors and career paths; significantly improving STEM learning environments; improving STEM academic advisement at our partnering two year colleges; and facilitating the transfer of two-year STEM students from Mt. SAC, SAC and other community colleges to CSUF or other four-year institutions. Practices learned in TEST:UP have produced a collaborative and replicable model of cooperation between two- and four-year institutions that results in the production of more STEM students and graduates.

Like other projects in the National Science Foundation's STEP program, TEST:UP had two overarching goals: 1) To increase the number of STEM transfer students to four-year universities and colleges and, 2) To increase the

number of AA degrees and baccalaureates earned in STEM majors. The activities described herein achieved these goals for the most part and have become models for institutionalization of high impact practices at CSUF that are now in progress.

More specifically, in our program we aimed to increase by ca. 5% annually the number of new STEM majors at our partner community colleges (20 to 40 students per college for a total of 40 to 80 students annually) and to increase by 25 annually (50 at the two institutions) the number of students at those colleges who complete their associate degrees (or requirements) or who transfer to four-year institutions (including but not limited to CSUF) in any STEM major. At CSUF, we projected that TEST-UP would increase by 40 students annually the number of transfer students who eventually earn STEM baccalaureate degrees. The number of community college STEM transfers to four year institutions can be very hard to measure. We have not found information from the National Clearinghouse to be reliable. We depend on student exit interviews and transcript requests to get an estimate of this critical variable. Joint discussions with our campuses and NSF acknowledged this dilemma. We certainly do know if they come to CSUF and these numbers have been disappointing. We believe that this shortcoming is due to California's budget crisis-driven enrollment reductions, impaction (especially at Mt. SAC which is outside of our service area), and large tuition increases as State support has eroded significantly (students are staying at community colleges longer for financial reasons or cannot afford to attend a State university at all). We did achieve very substantial (~1 year) reduction in time to graduation for STEM transfer students. See Figure 1.

*** What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?**

Major Activities:

We exceeded our goals on increasing declared STEM transfers from and STEM degrees awarded at the community colleges. Improved retention rates for STEM freshmen and transfer students reflect the impact of all retention efforts. Overall, we are encouraged that the retention rates for STEM transfers are trending up since the baseline year. We have observed much improved passing rates and GPA's with Supplemental Instruction (SI) at all three institutions, and significant steps have been taken to institutionalize the programs. SI was supported by this grant in for all five years at SAC and Mt. SAC and at CSUF in years 3 and 5 with re-purposed funds approved by the Program Director. SI has been shown to significantly help close the achievement gap for underrepresented minorities (URM's) in key STEM gateway courses. All three campuses have taken steps to institutionalize SI within the baseline budgets. CSUF has developed a model to accelerate graduation rates that includes SI as a key element and baseline funding for a campus-wide SI program is expected in the next academic year.

Attachment 1 summarizes the data from TEST:UP in a strategy chart.

We hired one full-time Coordinator for STEM Transfer Student Services at CSUF and two half-time STEM Counselors and Advisors at Mt. SAC and SAC in 2008. The advisement activities of the two half-time STEM Advisors have been accepted by SAC and Mt. SAC counseling centers and are meeting with students regularly after significant initial barriers of acceptance (some dictated by collective bargaining agreements) that have been overcome with time and the support from the SAC and Mt. SAC Deans.Drop-in STEM advisement was made available and there has been an increase in student awareness of the need to get advice if a STEM degree is being sought. This is particularly important for STEM majors where hierarchical curricula are the rule and is very important for students with little knowledge of college programs, as is the case with first-generation college students and for many who belong to traditionally underrepresented minority (URM) groups. TEST: UP has assisted 1,055 students on the Mt. SAC (572) and SAC (483) campuses with developing academic plans for transfer. The half time Mt. SAC and SAC advisors have recruited participants in the TEST: UP program on their respective campus through class visits, information tables,

career day fairs and STEM week events.

The CSUF Coordinator for STEM Transfer Student Services and her STEM Peer Advisors have advised 643 of the 2,148 STEM transfer students from all community colleges since the program started in 2008. Since 2008, the STEM Advisors at SAC presented information to 925 students on STEM careers, student success in STEM, and pathways to STEM majors . Mt. SAC presented similar information to 1,490 students.

A rudimentary on-line early warning system was developed in 2010 to identify at-risk STEM students within their first semester at CSUF. The data clearly indicate that transfer students are less likely to take advantage of intrusive interventions as compared with first time freshmen. On the other hand, when the transfer students show up for the intervention, they are considerably more successful as students.The model that the campus is adopting for advisement will incorporate some form of automated Early Warning that bypasses faculty and relies on deviations from norms in the Learning Management System.

A study campaign similar to the 25-35 empowerment campaign at CSUF (encourage students to study 25-35 hours per week outside of class time) was implemented at SAC with the goal of increasing student study time in STEM courses. The College of NSM has also implemented and funds an NSM Day that takes place before the start of the fall semester at CSUF for both transfer students and first time freshmen. This is an outreach program that augments campus-wide orientation activities by bringing in new students and their families to learn more about time management and requirements for success in STEM fields at no cost to participants. These bilingual NSM days typically attract ~150 participants. NSM and ECS instituted mandatory on-campus academic advisement for newly arriving STEM transfer students in June, 2011. Registration is put on hold until they receive advisement by faculty at CSUF.

A pre-transfer survey was developed in fall 2010 and administered in December 2010 to 594 students in STEM classes at SAC and 529 students at Mt. SAC. A post-transfer survey was developed for administration to STEM transfers who come to CSUF, and was administered on-line in spring 2011.A representative sampling of 532 transcripts for STEM transfer students who came to CSUF's College of NSM in the 2006-2010 time period was undertaken in 2011-2012 with preliminary analyses conducted by the STEM Student Services Coordinator. The data were analyzed more rigorously in 2012-2013 by the Center for Research and Educational Access (C-REAL) at CSUF (see Attachment 2).

We implemented SI programs adopted after the University of Missouri-Kansas City model at CSUF and SAC. Mt. SAC had already implemented SI using this model prior to the grant and used TEST:UP funds to expand SI workshops. Results indicate consistent grade point average improvements and passing rate improvements in key gateway STEM courses and closing of the achievement gap bertween URM's and non-URM's. See Figure 2. CSUF administration is focusing efforts on moving students more rapidly to graduation and sees that our SI program is targeting courses that historically have had high repeat rates that slow progress towards graduation. A campus model to improve advisement and graduation rates has evolved to include institutionalization of SI under the auspices of the University Learning Center, and is anticipated to be part of baseline funding for the 2013-2014 AY.

CSUF has a significant number of graduate students who seek to obtain a teaching position at a two-year college. Two CSUF mathematics graduate students are teaching at SAC and one CSUF biochemistry graduate students is teaching at Mt. SAC in spring 2011. We increased to 3 graduate students in 2012 and 2013.

Specific Objectives: We aimed to increase by ca. 5% annually the number of new STEM majors at our partner community colleges (20 to 40 students per college for a total of 40 to 80 students annually) and to increase by 25 annually (50 at the two institutions) the number of students at those colleges who complete their associate degrees (or requirements) or who transfer to four-year institutions (including but not limited to CSUF) in any STEM major. At CSUF, we projected that TEST-UP would increase by 40 students annually the number of transfer students who eventually earn STEM baccalaureate degrees. The number of community college STEM transfers to four year institutions can be very hard to measure. We have not found information from the National Clearinghouse to be reliable. We depend on student exit interviews and transcript requests to get an estimate of this critical variable. Joint discussions with our campuses and NSF acknowledged this dilemma. We certainly do know if they come to CSUF and these numbers have been disappointing. We believe that this shortcoming is due to California's budget crisis-driven enrollment reductions, impaction (especially at Mt. SAC which is outside of our service area), and large tuition increases as State support has eroded significantly (students are staying at community colleges longer for financial reasons or cannot afford to attend a State university at all).

Significant Results: Reduction of time for STEM transfer student graduation at CSUF by one year.

Increased STEM awareness, declared STEM majors, STEM AA degrees, and STEM transfers to four year intitutions from the partner community colleges.

Improved STEM retention in the major.

Improved grades and passing rates in bottleneck STEM courses with Supplemental Instruction and significant narrowing of the achievement gap between URM's and non-URM's.

Characterization of STEM transfer student perceptions before and after transfer and evaluation of STEM transfer transcripts to assess preparedness for transfer to a four year institution as a STEM major.

Improved understanding by STEM transfer students and their families of the required time management and study skills to succeed in the four year institution.

Improved STEM counseling at the partner community colleges.

Survey results are outlined below.

A pre-transfer survey was developed in fall 2010 and administered in December 2010 to 594 students in STEM classes at SAC and 529 studentsat Mt. SAC. Findings indicate that: ~35% of SAC students and ~23% of Mt.SAC students are attending more than one community college; most (~95%) at both campuses do not intend to stop at an AA degree, ~20% intend to achieve a bachelor's degree, ~25% intend to achieve a master's level degree, and ~25% intend to go for a doctoral level degree; over 90% intend to transfer to a four year institution, 46% in STEM at SAC and 72% in STEM at Mt. SAC; 55% at SAC and 44% at Mt. SAC

reported that English is not their first language; 43% at SAC and 30% at Mt. SAC reported that they would be the first in their families to attend a four year university; over 45% at both campuses are employed while attending college; and about 12% at both campuses are foreign nationals . At SAC, the ethnicity and gender of the surveyed students were very similar to the general population with about ~53% Latinos, ~20% Asians and ~10% Caucasians, and ~38% male, ~62% female. At Mt. SAC the ethnicity and gender of the survey population was not typical of the general population and more like what one might expect from a typical STEM population based on the literature, with ~25% Latinos, ~42% Asians, and ~9% Caucasians and ~57% male and ~43% female. We tried to separate the self-proclaimed STEM majors to look more closely at that population, but the number of those surveys was then too small for meaningful analyses. The services of an outside consultant were contracted to code the data. The TEST:UP dataset did not utilize the "label" function in SPSS to provide additional clarity about how the variable was operationalized. This was part of our IRB requirement on student anonymity, but unfortunately made more detailed analyses of the hypotheses tested impossible to carry out.

A post-transfer survey was developed for administration to STEM transfers who come to CSUF, and was administered on-line in spring 2011. We estimated that we needed over 200 responses to draw statistically valid conclusions and 247 responses were received. For the CSUF respondents, the population was about ~6% middle eastern, ~14% 'other', ~19% Latinos, ~25% Asians and ~30% Caucasians, and ~59% male, ~41% female. ~36% were first in their families to attend a four-year university, ~35% reported that English was a second language, ~61% were employed, ~89% had household incomes below $35,000, ~65% came from households of 1-4 people and ~30% from households with 5-8 people, ~21%, ~33%, and ~41% aspire to achieve bachelors, masters, and doctoral degrees, respectively, ~48% were science majors, ~7% were mathematics majors, ~31% were engineering or computer science majors, ~53% had obtained an AA or AS degree , ~28% reported attending SI sessions, ~20% reported having never seen a counselor at the community college, ~56% reported having seen a community college counselor less than 3 times per semester ~9% more than 3 times per semester with 15% not responding, ~46% reported having seen a community college transfer center advisor, less than half had seen a STEM counselor at a community college, and ~48% never discussed STEM courses with STEM faculty at the community colleges.

Results of the transcript analyses are outlined below.

A representative sampling of 532 transcripts for STEM transfer students who came to CSUF's College of NSM in the 2006-2010 time period was undertaken in 2011-2012 with preliminary analyses conducted by the STEM Student Services Coordinator. The ethnicity of the students was 15% Hispanic, 35% Asian, 32% Caucasians, 8% multiracial, 3% African-American. 35% were biology majors, 23% were biochemistry majors, 15% were mathematics majors, 12% were chemistry majors, 8% were geology majors, and 6% were physics majors. The mean number of units transferred in was 84 and the average entering GPA was 2.96. 46% of the transfers had attended only one community college, 36% had attended two community colleges, and 18% had attended three or more community colleges. Of the 532 students reviewed in the 2006-2010 time period, 69 (13%) had graduated, 293 (55.1%) were persisting in the majors, 12 (2.3%) had been disqualified but were still persisting via our Open University program, 140 (26.3%) had left the STEM major programs. An additional 18 (3.4%) were not

enrolled in classes for a semester but had not officially dropped out. There was no discernible difference on graduation/persistence between males and females or between ethnic groups of any significant enrollment. 36% passed all STEM courses taken at CSUF the first time but the rest had retaken courses multiple times. In the first semester after transfer to CSUF 63% were in good academic standing, 51% were attending full time, and mean GPA dipped from 2.96 at the community colleges to 2.72 at CSUF. Students reporting at least one class not passed over the time at CSUF included 67% of Hispanic students, 59% of Asian students, 54% of Caucasian students, and 55% of females and 61% of males. When considering a number of pre-transfer factors, Asians had the highest chance of succeeding post-transfer and students who participated in undergraduate research had a higher chance of persisting at CSUF than those who did not participate in research.

The data were analyzed more rigorously in 2012-2013 by the Center for Research and Educational Access (C-REAL) at CSUF. To try and overcome the lack of identifying labels on students, they employed a wider data base of community colleges and created dummy variables to try and fill the gaps. Their full report is included as Attachment 2. These analyses indicated that: there was no significant impact of gender or the number of units taken at the community college on persistence; students who finish the needed prerequisites at the community college had higher persistence rates at CSUF; undergraduate research experiences led to higher persistence rates; Asians were most likely (81%) to persist with Hispanics and Caucasians at lower but identical rates (69%); transfer GPA is a good predictor of GPA at CSUF but high school GPA is not; and Asians are most likely to take STEM classes at the community colleges and to persist to graduation.

Key outcomes or Other achievements:

Table 1 below and Figure 1 summarize the years to graduation for STEM transfer students and STEM native students. These data reveal a relatively weak movement toward graduation for native students in STEM, with fewer than half of CSUF students graduating within six years. The stronger trends for STEM transfer students have clearly been impacted by TEST:UP efforts, but there are likely other contributing factors.

Table 1. Mean Years to Degree by STEM Status

		First-Time Freshmen		Transfer	
		N	Mean	N	Mean
2007-08	STEM	139	5.7	211	4.4
	Non-STEM	1741	5.1	3975	3.3
	Total	1880	5.1	4186	3.4

2008-09	STEM	164	5.4	219	3.9
	Non-STEM	1808	5.0	4093	2.9
	Total	1972	5.1	4312	3.0
2009-10	STEM	183	5.6	201	3.7
	Non- STEM	1849	5.1	3991	3.0
	Total	2032	5.1	4192	3.0
2010-11	STEM	200	5.8	200	3.8
	Non-STEM	2036	5.2	4124	2.9
	Total	2236	5.2	4324	2.9
2011-12	STEM	195	5.6	188	3.5
	Non-STEM	2141	5.0	3918	3.0
	Total	2336	5.1	4106	3.0

*** What opportunities for training and professional development has the project provided?**

TEST:UP has engaged faculty from CSUF, SAC and Mt. SAC in new and more focused efforts to attract and retain more STEM students . TEST:UP provided the impetus for the three campuses to work together to institute or increase the number of SI sections and other programs to improve student learning and performance in key gateway math and science courses.

TEST:UP participating faculty at CSUF and SAC and the CSUF Coordinators for STEM Transfer Student Services attended workshops held at the University of Missouri-Kansas City to learn about the UMKC SI model. Instructional strategies have been modified and new approaches being taken on the CSUF and SAC campuses. Participating TEST:UP faculty have learned about effective strategies to increase student learning and performance in entry level math and science courses, and are sharing this knowledge with one another. Conversations between some CSUF, Mt. SAC, and SAC faculty have developed as part of this collaborative SI effort.

CSUF PI Mark Filowitz and CSUF co-PI's Rochelle Woods, Marty Bonsangue (Math), and CSUF faculty members Sean Walker (Biology), Phil Janowicz (Chemistry), Mike Dubuque (Physics), Nicole Engelke and Todd Cadwalladerosker (Math), and others, are actively involved in College of NSM retention efforts and regularly attend meetings related to TEST:UP goals. The full-time CSUF Coordinator of STEM Transfer Student Services and the two half-time STEM advisers honed skills in advising and counseling and learning about STEM careers. The Coordinator strengthened and applied her skills in student services to form student communities and to make students aware of the coursework and achievement needed for transferring to four-year institutions in STEM fields. During her tenure in TEST:UP she has completed one Master's program in counseling and started another Master's degree program in counseling, both at California State University Long Beach. Ricardo Lopez, our STEM Student Success Coordinator hired from re-purposed funds, also strengthened his skills and is currently engaged in assisting undocumented students in obtaining access and success in colleges in Southern California.

The CSUF Coordinator of STEM Transfer Student Services also attended the NSF-STEP Two Year/Four Year Partnership Workshop, at Belknap, Oregon, the National Institute for the Study of Transfer Students conference in Addison, Texas, and the NSF STEP Project Directors Meeting in Arlington, Virginia and a NSF STEP Grantees

Meeting in Washington, DC.

The number of CSUF undergraduate and graduate student SI leaders is growing and these students are being educated in methods of engaging students and stimulating them to advance their learning by working cooperatively to solve problems. Several of these students have gained interest in teaching and are now considering or are actively engaged in teaching careers in math and science, an unplanned outcome of our STEP project. New CSUF undergraduate peer mentors have learned the importance of learning communities and have been educated in how to engage students, organize activities, and develop functioning learning groups.

Similarly faculty and students working in the SI program at SAC are developing skills in improving instruction and education in STEM courses. At SAC, an additional advantage of TEST:UP is that NSF funds have provided opportunity and the resources for faculty to meet and make contact with STEM faculty from other colleges and universities. Dr. Cher Carrera (Department Chair, Mathematics and then Acting Dean, Science, Math, and Health Sciences) has attended the NSF STEP Two-Year/Four Year Partnership Workshop at Belknap, Oregon. This workshop laid the foundation for her further involvement in this program. In spring 2010, Cher Carrera and Carol Comeau (retired Dean of Science, Math and Health Sciences) attended the NSF STEP Program Directors meeting in Arlington, Virginia, and in 2011, 2012 and 2013 Cher Carrera and Kathy Takahashi were at the NSF STEP Grantees meeting in Washington, D.C. From Mt. SAC, Larry Redinger, Dean of Natural Sciences and Math, and Iraj Nejad, professor of chemistry, attended the NSF STEP Grantees meeting in Washington, D.C. in 2011, and Larry Redinger again in 2012 and 2013. Eva Figuroa, SI Coordinator at Mt. SAC, and Kathy Takahashi, biology professor at SAC, attended the January, 2011 SI workshop at California State University, Fullerton (CSUF) with SI student leaders. TEST:UP PI Mark Filowitz attended the STEP grantees meeting in each of the past four years.

*** How have the results been disseminated to communities of interest?**

We have made other community colleges aware of TEST:UP and its programs and goals. Our original vision was to use TEST:UP as a vehicle to form closer bonds between CSUF and neighboring community colleges in order to facilitate the transfer of STEM students. To date, TEST:UP has served as the foundation for expanding CSUF STEM relationships with three other community colleges: Citrus College, Santiago Canyon College, and Cypress College. During the course of TEST:UP, we completed subcontracts with Citrus for increasing STEM advisement and with Citrus and Cypress for providing summer research experiences on the CSUF campus for two-year STEM students. Our agreement with Citrus College enabled us to hire a second full-time Coordinator for STEM Transfer Student Services who developed similar STEM advisement programs at Citrus College. Citrus College reported a 7-fold increase in STEM majors in the contract period. This same person, Ricardo Lopez, was hired for the TEST:UP program with re-purposed funds, upon conclusion of the Citrus program. At CSUF, we continue to expand outreach activities to increase awareness of the value of a STEM education and career opportunities in STEM fields, particularly with underrepresented populations. As an example of establishment of best practices an continued outreach to our community college partners, the core elements of the NSF TEST:UP program were adopted to a $6 million Department of Education HSI-(STEM)2 grant where CSUF is collaborating with Cypress, Citrus, and Santiago Canyon Colleges to build on improvements in STEM transfer success. Therefore, CSUF has now partnered with five local HSI community colleges to facilitate STEM awareness and success for transfer students. At SAC a total of 32 outreach and social events were sponsored since grant inception, including visits to CSUF and NASA laboratories, STEM Week activities, research weekends, conferences (such as SACNAS) and workshops on STEM opportunities and application processes to enroll in four-year universities. At Mt. SAC 13 outreach and social events were sponsored by the grant since inception, as the program got off to a slow start on that campus in the first two years. Mt. SAC inaugurated a new natural history and exploration center in a prime campus location in spring 2011, and Professor Iraj Nejad started actively participating in the grant with Dean Larry Redinger. The STEM advisers have developed educational and curricular roadmaps for STEM transfers. A STEM recruitment DVD was completed at SAC and informative STEM web sites at the three campuses are all active and up to date. Good progress was made to more fully integrate STEM advisers with regular academic services on all three campuses, and to more actively involve STEM faculty in TEST:UP. Classroom visits in STEM subjects increased on both community college campuses with the permission of the Deans, department chairs and instructors, who generously allowed class time to promote STEM awareness, career opportunities, surveys, and events. STEM weeks on the community college campuses and invited speakers from four-year institutions both provided forums to educate

students on STEM career opportunities. One critical component of this has been to teach students how to apply to the CSU as a transfer student. We have leveraged our NSF STEP grant with other external funding by involving a number of SAC and Mt. SAC STEM majors in weekend and summer research experiences at CSUF supported by programs like the Howard Hughes Medical Institute (HHMI) biomedical research program, thus integrating the impact of the research experiences with the goals of TEST:UP. At SAC, the TEST:UP counselor has worked with SAC Early Decision students to provide STEM advisement. These are high school students from local feeder high schools in the Santa Ana Unified School District that were placed into their first college course in fall 2010. Preliminary math placement tests indicate that over 1,000 students went through this process. Handouts were developed for these students identifying STEM counseling contacts and student contact information collected so that counseling staff can follow-up when they arrive on campus. The CSUF Coordinator for STEM Transfer Student Services met with science and mathematics department chairs and faculty and gained access to introduce TEST:UP in classroom visits and to administer the pre-transfer surveys described earlier. The sciences at Mt. SAC recently relocated into a new building containing a study center that houses tutoring services and supplemental instruction activities. As noted earlier, a study campaign similar to the 25-35 empowerment campaign at CSUF (encourage students to study 25-35 hours per week outside of class time) has been implemented at SAC with the goal of increasing student study time in STEM courses. Also as noted earlier, students and their families often do not recognize that compared to high school, much more time is needed outside of the classroom to succeed in college. This is particularly true for first generation college students. The College of NSM has also implemented and funds an NSM Day that takes place before the start of the first semester at CSUF for both transfer students and first time freshmen and their families.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
Attachment 1.pdf	Attachment 1. Strategy Chart	Mark Filowitz	06/18/2013
Figure 1.pdf	Figure 1. Graduation rates	Mark Filowitz	06/18/2013
Figure 2.pdf	Figure 2. Impact of SI in Calculus and Biology	Mark Filowitz	06/18/2013
Attachment 2. CREAL Analysis.pdf	Attachment 2. CREAL Survey Analyses	Mark Filowitz	06/18/2013

Products

Journals

Martin Bonsangue, Todd Cadwalladerolsker, Nicole Engelke, Cathy Fernandez-Weston, Mark Filowitz, James Hershey, Hye Sun Moon, Chris Renne, Ed Sullivan, Sean Walker, Rochelle Woods (6/1/13). The Effect of Supplemental Instruction on Transfer Student Success in First Semester Calculus. *The Learning Assistance Review.* 18(1) 61-75.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; ISSN: 1087-0059

Filowitz, M., Walker, S.,Binsangue, M., Moon, H., Sullivan, E. (4/1/13). Supplemental Instruction for Increased STEM Student Success. *League for Innovation in the Community Colleges, Learning Abstracts.* 15(4) ??.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Books

Book Chapters

Thesis/Dissertations

Conference Papers and Presentations

Hye Sun Moon, Ed Sullivan, Martin Bonsangue, Sean Walker, Mark Filowitz (11/10/11). *"The Effectiveness of Supplemental Instruction Closing the Gap between URM and Non-URM Students in STEM Courses,"*. Annual CAIR 2011 Conference. Sonoma, CA.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Rochelle Woods, Cathy Fernandez-Weston, Mark Filowitz (11/18/11). *"Bridging the Gap: Facilitating Transfer Student Success Through Services and Programs,"*. National Association of Professional Student Administrators, 2011 Western Regional Conference. San Diego, CA.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Martin Bonsangue, Mark Filowitz, James Hershey, Hye Sun Moon, Edward Sullivan, Sean Walker (1/26/12). *The Effect of Supplemental Instruction on STEM Transfer Students*. 10th Annual Conference of the National Institute for the Study of Transfer Students. Ft. WOrth, TX.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Sean Walker, Hye Sun Moon, William Hoese, Martin Bonsangue, Danielle Zacherl, Ed Sullivan, Mark Filowitz (1/3/13). *Supplemental Instruction and Student Success in an Introductory Biology Course*. Society for Integrative and Comparative Biology Annual Meeting. Charleston, South Carolina.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Hye Sun Moon, Walker, Sean ,Sullivan, Edward , Hershey, James ,Bonsangue, Martin ,Filowitz, Mark ,Fernandez-Weston, Cathy , Unnikrishnan, Raman ,Delgado, Victor (11/4/13). *High-Impact Educational Practices as Promoting Student Retention and Success,*. The 9th Annual National Symposium on Student Retention. San Diego, CA.

Status = ACCEPTED; Acknowledgement of Federal Support = Yes

Hoese, W.J. & S.E. Walker (7/15/09). *Getting the horse to drink: The effect of supplemental instruction on student performance in introductory biology at a large, urban, commuter university*. American Association for the Advancement of Science: Transforming Undergraduate Education in Biology: Mobilizing the Community for Change. Washington, D.C..

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Bonsangue, M., Carrera, C, and Renne, C. (9/20/10). *Supplemental Instruction Workshops in Gateway STEM Courses at Cal State Fullerton and Santa Ana College*. Creating Pathways for STEM Transfer Student Success. Asheville, NC.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Ricardo Lopez, Cathy Fernandez-Weston, Mark Filowitz, Rochelle Woods, Martin Bonsangue, Sean Walker (9/12/11). *Elucidating Key Variables in the STEM Transfer Student Experience From the Integration of Multi-Institutional Research Projects*. NISTS Conference on Creating Pathways for STEM Transfer Student Success. Asheville, NC.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Cathy Fernandez-Weston, Ricardo Lopez, Mark Filowitz,Rochelle Woods, Martin Bonsangue, Sean Walker (9/13/11). *STEM Transfer Student Services: Bridging the Transfer Gap and Mitigating Transfer Shock.* NISTS Conference, Creating Pathways for STEM Transfer Student Success. Asheville, NC.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Cathy Fernandez-Weston, Tammy Camacho, Carol Comeau, Mark Filowitz,Ricardo Lopez, Rochelle Woods, Martin Bonsangue, Sean Walker (10/4/11). *Talent Expansion in STEM a 2yr to 4 yr collaborative.* STEMtech Conference. Indianapolis, IN.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Cathy Fernandez-Weston, Mark Filowitz, Rochelle Woods, Martin Bonsangue, Sean Walker (3/10/12). *Facilitating Transfer Student Success with Services and Programs.* NASPA National Conference,. Phoenix, AZ.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Cathy Fernandez-Weston, Ricardo Lopez, Mark Filowitz,Rochelle Woods, Martin Bonsangue, Sean Walker (10/3/11). *Facilitating Transfer Student Success with Services and Programs.* Western Regional Careers in Student Affairs Day, University of Southern California. Los Angeles, CA.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Cathy Fernandez-Weston, Mark Filowitz,Rochelle Woods, Martin Bonsangue, Sean Walker (10/3/11). *TEST:UP, Talent Expansion in Science and Technology-An Urban Partnership,".* Western Regional Careers in Student Affairs Day Conference, University of Southern California. Los Angeles, CA.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Martin Bonsangue (10/29/12). *The Effect of Supplemental Instruction in STEM Transfer Student Success.* STEMTech Annual Conference. Kansas City, Mo.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Martin Bonsangue (11/4/12). *America's Math Story.* National Council of Teachers of Mathematics-Southern Section, Annual Conference. Palm Springs, CA.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Sean Walker (4/8/13). *Impact of Supplemental Instruction on Calculus and Introductory Biology COurses.* Conference on Excellence in Gateway Course Completion. Indianapolis, IN.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Martin Bonsangue (5/27/13). *Institutionalizing Best Practices in Minority STEM Education.* National Conference on Race and Ethnicity, Annual Conference. New Orleans, La.

Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Other Publications

Technologies or Techniques
Nothing to report.

Patents
Nothing to report.

Inventions

Nothing to report.

Licenses
Nothing to report.

Websites

Title: TEST:UP

URL: http://nsm.fullerton.edu/testup/default.asp

Description: This is a dedicated website for CSUF's TEST:UP program. The website contains links to websites for Santa Ana College and Mount San Antonio College(under development), Internal and external advisory committees for participating institutions, strategies and programs, reports and presentations. The website also provides contact information and will distribute publications and other program products.

Other Products
Nothing to report.

Participants

Research Experience for Undergraduates (REU) funding

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
Cathy Fernandez-Weston	Other Professional	12
Rochelle Woods	Co PD/PI	1
Mark S Filowitz	PD/PI	1
Larry Redinger	Co PD/PI	1
Carol Comeau	Co PD/PI	1
Martin V Bonsangue	Co PD/PI	1
Sean Walker	Faculty	1
Cheryl Carrera	Community College Faculty	1
Iraj Nejad	Community College Faculty	1
JOSE ZAVALA	Undergraduate Student	1
SABRINA ZARZA	Undergraduate Student	1
Paula Young	Community College Faculty	1

Name	Most Senior Project Role	Nearest Person Month Worked
YuHang Yang	Undergraduate Student	1
BENSON WU	Undergraduate Student	1
ROBERT WRIGHT	Undergraduate Student	1
Serena Wong	Undergraduate Student	1
Zephram Wolf	Undergraduate Student	1
JEREMY WILSON	Undergraduate Student	1
TAMMY VU	Undergraduate Student	1
ANGEL WEBER	Undergraduate Student	1
BRIAN VU	Undergraduate Student	1
Nicholas Voss	Undergraduate Student	1
DANIEL VILLAVECER	Undergraduate Student	1
Jason Vickers	Other	1
Vincent Vendiola	Undergraduate Student	1
ZULEMA VELASCO	Undergraduate Student	1
Summer Valentino	Undergraduate Student	1
MICHAEL VALDIVIA	Undergraduate Student	1
Brandon Uribe	Undergraduate Student	1
CHRISTINA TRAN	Undergraduate Student	1
NHI TRAN	Undergraduate Student	1
YING YING TRAN	Undergraduate Student	1
NGHIA TRAN	Undergraduate Student	1
Thao Tran	Undergraduate Student	1
JOSELYN TORRES	Undergraduate Student	1

Name	Most Senior Project Role	Nearest Person Month Worked
EDWIN TIZON	Undergraduate Student	1
STEPHANY AGUIRRE	Undergraduate Student	1
MIGUEL AMEZCUA	Undergraduate Student	1
EDUARDO AMEZCUA	Undergraduate Student	1
GEORGE BALCH	Undergraduate Student	1
John Barkman	Other	1
MICHELLE BECERRA	Undergraduate Student	1
Weston Beck	Undergraduate Student	1
NICHOLAS BLACKFORD	Undergraduate Student	1
MOKHTAR BOUKHARI	Undergraduate Student	1
Tammy Camacho	Community College Faculty	4
JENNY CHANG	Undergraduate Student	1
Dulcinea Chau	Undergraduate Student	1
JOANNA CHAVEZ	Undergraduate Student	1
Kevin Chavez	Undergraduate Student	1
Elissa Chung	Undergraduate Student	1
Robert Clanahan	Undergraduate Student	1
BREANNA CONNETT	Undergraduate Student	1
Asha Cyrs	Undergraduate Student	1
Anh Jeff Dang	Undergraduate Student	1
NOOPUR DAVE	Undergraduate Student	1
SUSAN DEEB	Undergraduate Student	1
NNAEMEKA DIRIBE	Undergraduate Student	1

Name	Most Senior Project Role	Nearest Person Month Worked
Catalina Dominguez	Undergraduate Student	1
Stephanie Dreikorn	Undergraduate Student	1
Nick Elkins	Undergraduate Student	1
Oscar Flores	Other Professional	3
EDEN ELLIS	Undergraduate Student	1
REBECCA ETNYRE	Undergraduate Student	1
ALLIA FAWAZ	Undergraduate Student	1
NAILA FERDOUSI	Undergraduate Student	1
NANCY GARCIA	Undergraduate Student	1
EMANUEL GLUCKMAN,	Undergraduate Student	1
Brittany Gomez	Undergraduate Student	1
JESSIE GORFU	Undergraduate Student	1
BRITTANY GRASSBAUGH	Undergraduate Student	1
MARY GUTASKUS	Undergraduate Student	1
Desiree Hickerson	Undergraduate Student	1
Amanda Ho	Undergraduate Student	1
JULE HOFSTRA	Undergraduate Student	1
JIA WEN HUANG	Undergraduate Student	1
Kenny Huang	Community College Faculty	1
ANTOUNEO KASSAB	Undergraduate Student	1
Urvi Khetani	Undergraduate Student	1
Sewan Kim	Undergraduate Student	1
Alfred Lee	Undergraduate Student	1

Name	Most Senior Project Role	Nearest Person Month Worked
Yanting Li	Undergraduate Student	1
Jiyang Li	Undergraduate Student	1
KELLY TANG	Undergraduate Student	1
Kathleen Takahashi	Community College Faculty	1
PHILLIP SPARKS,	Undergraduate Student	1
CASEY THOMPSON	Undergraduate Student	1
STEPHEN SHEPARD	Undergraduate Student	1
GRADY SAUER	Undergraduate Student	1
AKRAM SADEGHI	Undergraduate Student	1
GUSTAVO RODRIGUEZ RIOS	Undergraduate Student	1
Haley Redinger	Undergraduate Student	1
MARIO RAZO	Undergraduate Student	1
Nicole Randall	Undergraduate Student	1
Stephanie Ramirez	Undergraduate Student	1
FERNANDO QUINTINO	Undergraduate Student	1
Victor Pham	Undergraduate Student	1
DEEP PATEL	Undergraduate Student	1
IVAN OZAETA	Undergraduate Student	1
DANNY ORTON	Undergraduate Student	1
PETER NGUYEN	Undergraduate Student	1
Hanah Nakamoto	Undergraduate Student	1
Lynn Marecek	Community College Faculty	1
Anthony Macias	Undergraduate Student	1

Name	Most Senior Project Role	Nearest Person Month Worked
Long Lo	Undergraduate Student	1

What other organizations have been involved as partners?

Name	Location
Mount San Antonio College	Walnut, CA
Santa Ana College	Santa Ana, CA

Have other collaborators or contacts been involved? N

Impacts

What is the impact on the development of the principal discipline(s) of the project?

Increasing the numbers of STEM transfers to four-year institutions and the number of STEM baccalaureate degrees is of national significance and stand as the principal goals of this project. Various strategies for achieving these objectives are being used in two- and four-year colleges throughout the country. In TEST:UP, we are focusing on the developing approaches that prove most successful with thestudents that populate our three camp uses. These populations are characterized by high numbers of: 1) traditionally under-represented students in STEM fields, 2) students with little or no parental college experience, and 3) students that come from low-income families. Moreover, our institutions are commuter campuses where students move back and forth between home, work, and school. It has historically been difficult to produce large numbers of STEM students from a student population dominated by these characteristics. Yet, increasingly in southern California and various parts of the country, campuses like our own are becoming more highly populated by students with these characteristics. Through TEST:UP, we hope to improve our understanding of the effectiveness of approaches to recruit, retain, and successfully transfer or graduate these students in a timely way.

Members of our TEST:UP team have been active in attending STEP PI meetings held by NSF as well as other meetings focusing on STEM transfer students and on student learning. We are working on more complete and robust analysis of TEST:UP program elements with our external evaluator with emphasis on STEM advisement at the two-year colleges and Supplemental Instruction outcomes for enrolled students as well as the impact of participation on the peer facilitators. One of our goals is to work with individualized data to eventually predict the characteristics of entering freshmen and transfer STEM students who will most benefit from programs that facilitate their transition to CSUF. The idea is to target these students and to institutionalize those best practices of our program that enable the retention and persistence of these students.

We now have substantial evidence that Supplemental Instruction (SI) is assisting students to pass and improve their grades in traditional gateway courses in mathematics, science, and engineering. We have made significant inroads to institutionalizing SI at the community college partners and at CSUF. Dedicated facilities exist at all three institutions to conduct SI.

The techniques developed in advising, SI, creating learning communities, and providing services before and after transfer have been leveraged to form similar partnerships with three more community colleges (Cypress, Citrus, and Santiago Canyon-all HSI institutions) under a $6 million (STEM)2 grant from the Department of Education.

What is the impact on other disciplines?

We are increasing knowledge among traditional STEM faculty of the importance of taking a more holistic approach in assisting STEM students, an approach that strongly involves student affairs. In addition, we are working with some

success to increase dialogue within and between faculty in the various STEM disciplines focusing on the identification of best practices for achieving elevated student performance in STEM subjects. We have implemented Supplemental Instruction at the College of Engineering and Computer Science. In addition, we have expanded discussions of Supplemental Instruction among non-STEM disciplines (such as our Mihaylo College of Business and Economics) at CSUF and also transferring lessons learned from our new student orientations, study campaigns, and other activities designed to facilitate the transition of new students to the campus.

What is the impact on the development of human resources?

We are developing students and staff with increased skills and knowledge to work in the fields of STEM teaching and STEM recruitment/retention. In the second year of the grant, Gina Garcia, one of our original project staff, entered a Ph.D. program at UCLA to pursue dissertation work in these areas. We know that other TEST:UP participants are advancing their careers with knowledge and experience obtained from our program. The current coordinator for STEM Transfer Student Services, Cathy Fernandez-Weston, has completed one Master's program in counseling and is in a second Master's program in counseling at California State University Long Beach . This work was inspired by her work with the two partner community college counselors. Ricardo Lopez, who was hired for one year using re-purposed funds from the grant, has worked at the Academic Advising Center and is now engaged in assisting AB540 undocumented students move forward with their education.

An unplanned outcome of the SI program is the increased interest in teaching careers from undergraduate peer facilitators. We are working to quantify this and to explore relationships between SI facilitator experiences and increases in the number of students seeking to become math and science teachers.

What is the impact on physical resources that form infrastructure?
Nothing to report.

What is the impact on institutional resources that form infrastructure?

Institutionalization of SI is planned for 2013-2014

What is the impact on information resources that form infrastructure?
Nothing to report.

What is the impact on technology transfer?
Nothing to report.

What is the impact on society beyond science and technology?

We continue to develop improved understanding of STEM programs and the needs of STEM students for counselors, advisers, and others on our campuses. In addition, we are working to increase the dialogue between STEM and non-STEM faculty about STEM students and opportunities, as well as with other persons who may work with or advise STEM students at our institutions.

Changes

Changes in approach and reason for change

A total of $149,295 in funds available to Mt. SAC were not spent in years 1 and 2. After consultation with the Program Director, these funds were re-allocated to Santa Ana College and CSUF to support programs associated with the grant. SAC used re-purposed funds to further support their SI program by adding 15 more SI sections to assist students in mathematics and biology courses. In addition, SAC is used these funds to augment their presentation and instructional resources supporting STEM courses. In year 3 CSUF used re-purposed funds to support 39 SI sections in math, biology, computer science and chemistry in spring 2011. In year 4, the College of NSM supported 101 sections of SI at CSUF in mathematics, biology, chemistry, and compute engineering with State

funds. In year 5, TEST:UP, with permission of the Program Director, supported 124 sections of SI in mathematics, biology, chemistry, and physics. The demonstrated success of SI has led to the move to institutionalize SI campus-wide under the direction of the University Learning Center as part of an overhaul of the efforts in both Academic Affairs and Student Affairs to accelerate graduation rates.

Year three funds were also used to support a one-year year appointment for a STEM Student Success Coordinator at CSUF who: evaluated five years of historical and current transcripts of STEM transfer students to assess transfer-student preparedness for a four-year STEM degree program; administered and analyzed pre- and post- transfer student surveys developed specifically for this program; piloted an on-line early warning system; and ran a STEM student retention campaign on the CSUF campus. The transcript and survey activities provide increased capacity to assess the efficacy of our advisement programs and point out needs for change.

Actual or Anticipated problems or delays and actions or plans to resolve them
Nothing to report.

Changes that have a significant impact on expenditures
Nothing to report.

Significant changes in use or care of human subjects
Nothing to report.

Significant changes in use or care of vertebrate animals
Nothing to report.

Significant changes in use or care of biohazards
Nothing to report.

Special Requirements

Responses to any special reporting requirements specified in the award terms and conditions, as well as any award specific reporting requirements.
Nothing to report.