

METaS
A College of San Mateo HSI STEM project
Project Plan

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Introduction

Mission

The mission of the College of San Mateo METaS project is to increase the number of Hispanic and low-income students who graduate with STEM degrees, to enhance transfer and articulation to four-year institutions, and to provide evidence-based services and activities designed to improve student success. The objectives of the METaS project directly reflect the CSM Strategic Goals 2013/14 to 2015/16 by aiming to improve student success, promoting academic excellence, developing responsive and high-quality programs and services, and supporting professional development.

Objectives

The METaS project's mission is centered around seven objectives with measureable outcomes:

1. Increase enrollment of Hispanic and low-income full-time STEM field degree-seeking undergraduate students.
2. Increase fall semester to spring semester persistence of Hispanic and low-income STEM students.
3. Increase retention of Hispanic and low-income first time STEM field degree-seeking undergraduates who entered in one year and returned the following year.
4. Increase the percentage of Hispanic and low-income first-time degree-seeking students who graduate within 3 years with a STEM field degree or credential.
5. Increase the percentage of Hispanic and low-income STEM students transferring successfully to a four-year institution.
6. Increase the percentage of Hispanic and low-income participants who successfully complete gateway courses.
7. Decrease the percentage of Hispanic and low-income participants on Academic Probation 1 (based on grade point average).

Expected Outcomes

The expected outcomes of the METaS project, by September 2021, are:

- Increased enrollment of Hispanic and low-income STEM students
- Increased semester-to-semester persistence
- Increased retention and graduation
- Increased percentage of STEM degree students transferring into STEM fields at four-year institutions
- Increased percentage of Hispanic and low-income participants who successfully completed gateway courses
- Decreased percentage of Hispanic and low-income students on academic probation

Data

The following table shows the baselines, yearly targets, and final end targets for the seven objectives:

Objective	Baseline	Year 1: Fall 2017	Year 2: Fall 2018	Year 3: Fall 2019	Year 4: Fall 2020	Year 5: Fall 2021
1: Increase number of Hispanic and low-income full-time STEM field degree-seeking undergraduate students	16% 15.8% 30.3%	18%	20%	23%	27%	31%
2: Increase semester-to-semester persistence of Hispanic and low-income students	78% 78.4% 80.2% 81.5%	80%	82%	84%	86%	88%
3: Increase retention of Hispanic and low-income first-time STEM field degree-seeking undergraduate students who entered in one year and returned the following year	92% 92.3% 92.3% 92.2%	92.5%	93%	94%	95%	96%
4: Increase percentage of Hispanic and low-income first-time degree-seeking students who graduated within 3 years with a STEM field degree or credential	31% 31.9% 30.3% 36.8%	--	--	33%	36%	39%
5: Increase percentage of Hispanic and low-income STEM degree students transferring successfully to a 4-year institution	33%* FT: 33.3/39.4 25.0/27.9 22.6/26.7 PT: 31.6/36.8 21.6/27.0 23.6/30.6	--	--	34%	36%	40%
6: Increase percentage of Hispanic and low-income participants who successfully complete gateway courses	To be based on Fall 2016 numbers	+2%	+4%	+6%	+8%	+10%
7: Decrease percentage of Hispanic and low-income participants on Academic Probation I (grade-point average)	13% 13.1% N/A 9.7%	12%	11%	10%	9%	8%

Grant Text **Hispanic** **Low-Income** **Overall**

*3-year transfer/4-year transfer

Activities Plan

The METaS project will follow four institutional priorities to plan its activities and services.

- 1) Develop and/or improve key STEM program services and activities
 - Individualized student coaching
 - Math/Science Jams
 - Training Supplemental Instruction (SI) leaders/tutors for gateway courses
- 2) Expand STEM transfer and articulation
 - Puente Project
 - Develop transfer programs for Engineering and Astronomy
 - Bridges to Baccalaureate with San Francisco State University
- 3) Update STEM curriculum and related technology
 - Revise courses to incorporate undergraduate research components
 - Upgrade technology to support improvements in STEM courses
 - Create a new science research methods course
- 4) Provide STEM-focused professional development opportunities

Loan and Voucher Program

In addition to the above activities and services, the METaS project also plans on instituting several supply loan and/or voucher programs to assist students with expensive STEM supplies such as textbooks. The METaS project will work with the CSM bookstore, the Multicultural Center (MCC), the Puente project, and EOPS (Extended Opportunity Programs and Services) to coordinate loan and voucher services.

Speaker Series

In coordination with other CSM and Bay Area community organizations, the METaS project will offer a speaker series to inspire, encourage, and educate prospective and current Hispanic and low-income STEM students. Potential partners include San Francisco State University, the CSM DREAM Center, and the CSM Equity Office.

Finals Study Hall

Three times a year, during finals week, the METaS program will advertise an organized study space for STEM students. Free snacks and refreshments will be provided.

Field Trips

The METaS project will organize and lead field trips to various locations of academic and professional interest to STEM students. Examples include four-year universities, STEM industries or government institutions, and STEM conferences/workshops aimed at strengthening student academic and professional skills.

Internships

The METaS project will actively seek out and advertise STEM internships that would be special interest to our students. METaS staff will also provide guidance and encouragement to students during the

application process. Examples of potential internship sites include Stanford University, San Francisco State University, and the United States Geological Survey.

Financial Aid Workshop

METaS will offer financial aid workshops for students to help them navigate the often confusing process of applying for financial aid. This activity is in line with the project's mission by providing services to low income students.

Transfer Application Day

METaS will offer a workshop for students to help them fill out their transfer applications to four-year institutions. This activity is in line with the project's objective of increasing the number of Hispanic and low-income STEM students who transfer to a four year institution.

Supplemental Instruction & Tutoring

A key component of the METaS program is to offer both tutoring and Supplemental Instruction (SI) in various STEM classes. These activities are predicted to increase the rates of persistence and retention in our target populations, as well as decreasing the number of our students on Academic Probation. Tutors and SI leaders will be students who will then be assisting their peers with STEM subjects. The METaS program will promote a diverse applicant pool, both to support the development of Hispanic and low-income students involved in STEM education, and to provide positive role models for other students.

STEM Outreach Programs

There are many opportunities throughout the school year to promote math and science: Mole Day, Pi Day, Earth Day, Cesar Chavez Week of Service are a few. METaS plans on hosting activities on these days to raise awareness and excitement about studies in the STEM fields. Other possible events include Astronomy activities (for example, the solar eclipse that is occurring in August 2017) and Noche de Ciencia (Night of Science). These activities will present math and science concepts and hands-on learning for students and their families, exposing underrepresented and underserved populations to STEM.

Facilities and Technology Updates

Up-to-date and available classroom facilities and technology are an important part of supporting students in their studies and helping them have meaningful educational experiences. There are a number of courses in the math/science division with outdated laboratories that make it a challenge for students to learn on the kind of technology/equipment they can expect to encounter in the working world. The current math lab is fully employed for teaching statistics and is not large enough to meet the increased demand of computers for math students. The METaS project provides a plan for expanding and improving CSM STEM facilities in order to better serve our students.

Math Computer Space

Budget funds are specifically allocated to the construction and expansion of computer labs for use with math software. Instructors for MATH 190 (Pathway to Statistics), which is considered a gateway course, recommend access to a computer lab to better prepare students to use software when enrolled in MATH

200 (Introductory Statistics). The course description for MATH 200 states the course content must contain “statistical analysis using technology such as SPSS, Excel, Minitab, or graphing calculators.” All publisher-produced introductory statistics courses utilize computer homework systems that work best with their chosen software.

According to anecdotal feedback from statistics instructors, Hispanic students often admit to no computer access at home and need due dates adjusted to accommodate working at the library on weekends. In addition, many of CSM’s underrepresented incoming students are not skilled at working with basic computer programs, following multistep processes, or understanding the need for precision of coding to successfully use software. When use of a statistical package is part of a course, it creates an obstacle to success for students without computer access or experience, unless CSM provides hands-on supervised work in the context in the classroom while students are working to improve their skills.

Finally, almost all full-time math faculty and over half of adjuncts regularly teach using some form of web-based homework system for at least one of the courses they teach. The inability to schedule classes in a computer time either regularly or for all class meetings is a frequent concern expressed by faculty. The METaS project will fund the expansion of the statistics lab, the creation of a computer classroom for mathematics, and the installation of additional student workstations. Proposed new software includes Statcrunch, Fathom, Geometer’s sketchpad, MyMathTest, and Aleks.

Integrated Science Centers

The Integrated Science Centers (ISC) includes the Math Resource Center (MRC), the Science Center, and the Engineering Science Center. The ISC represents a discipline-based equivalent of learning communities and is designed to support the needs of STEM students. The ISC will serve as the hub for programs, including the METaS project. In terms of classroom technology, the ISC will facilitate online course access by placing technology in the ISC for easy access by students. In addition, ISC staff will provide preparatory information for online learning at the start of each semester, to help students who are taking an online course for the first time. Technology purchases to support distance education include Dragon Naturally Speaking, Camtasia, high definition video cameras, photo Video Studio Lighting Kit, lapel wireless microphone systems, and teleprompters.

STEM Course Development, Equipment, and Technology Upgrades

CSM has identified the areas of Engineering and Astronomy as two STEM programs to develop and expand. CSM will upgrade and modernize the design projects in ENGR 100 (Introduction to Engineering), by developing a sensor and actuator toolkit for the basics of programming concepts and interfacing. CSM is also planning on developing a rocketry course that introduces students to the creation and implementation of unmanned flight vehicles and their payloads. Students will learn design, fabrication, programming, data acquisitions and analysis through the design and construction of rockets and drones equipped with scientific instrumentation. Finally, CSM will create more support for the Astronomy program by procuring more specialized computers for independent research students and additional full-dome planetarium programs for outreach and freshman courses.

Counseling Plan

Successfully pursuing a science major requires students to navigate through a complex combination of prerequisites. Currently there is no focus on academic advising for STEM students to ensure their educational plans are updated every semester. STEM students have three needs not addressed by general counseling:

- 1) Successful and timely completion of many pre-requisites, without taking too many science courses at one time
- 2) Deciding when to begin courses in the major
- 3) Participating in College activities (e.g., engineering club, physics club, sustainability committee) while keeping a focus on successfully completing the major's courses.

The METaS project will provide for increased academic counseling hours to address this need. If possible, CSM will utilize an academic counselor with a background in science. To facilitate the process, advisors will meet with STEM students each semester to ensure their educational plans are updated. The long-term institutionalization of this activity will be accomplished through a comprehensive professional development series for STEM faculty.

California's Student Transfer Achievement Reform Act (2010) enables California Community Colleges and California State Universities to collaborate on the creation of Associate of Arts and Associate of Science degree transfer programs. Upon completion of the associate degree, the student is eligible for transfer with junior standing into the CSU system. CSM currently has the following state-approved Associate in Science Degree transfer programs in STEM: Geology, Physics, Math, and Biology. Through the METaS project, CSM will enhance transfer opportunities by developing transfer programs for Astronomy and Engineering.

Partnership Model

The METaS project is not possible without collaborating with many other CSM programs, as well as the Bay Area community at large. This collaboration is necessary not only to reach and provide services for as many of our students as possible, but also to ensure institutionalization of METaS support objectives and optimization of resources. Some of the specific CSM programs that METaS will target for participation in our partnership model are:

- * Puente Project
- * Mana
- * Umoja
- * Multicultural Center
- * Equity Office
- * Transfer Center
- * DREAM Center
- * Division of Math and Science and its departments
- * Office of Financial Aid
- * Community Relations & Marketing Department
- * EOPS
- * Counseling
- * Student Learning Center

In addition to CSM campus collaboration, METaS anticipates having partnerships with many Bay Area universities, companies, and government entities. San Francisco State University has already been

selected as a partner in part for their Bridges to Baccalaureate program. Through internships, outreach opportunities, field trips, and guest speakers, the METaS program will involve the Bay Area community at large in expanding the opportunities and resources for our students.

Math and Science Jams

The Math and Science Jams are one-week workshops designed to help students with math tools and concepts for future courses. The three-fold focus of the Math and Science Jams are to:

- 1) Prepare students to retake the math placement exam and score higher
- 2) Prepare students for the math course they have placed into for the following semester
- 3) Prepare students to use math tools in Physics, Chemistry, or Astronomy.

These workshops are offered twice in the Summer (June and August) and once during the Winter Break (January). These events meet METaS objectives by recruiting student into STEM majors, and by helping students score higher on their placement exams, thus allowing them to move directly into higher level math and science courses and lessening time to completion/transfer. CSM's Math and Science Jams are modeled after a successful project implemented by Cañada College. Since the base year of the Cañada program, enrollments in transfer-level courses in math, engineering, biological, and physical sciences increased significantly, with the percentage increase of minority enrollment in the courses significantly higher than the percentage increase for the non-minority groups.

Communication Plan

METaS staff has already begun meeting with the CSM Marketing department to discuss the branding, advertising, and social media plans for the grant project. A logo specifically for the METaS program is in development, with links to the broader CSM brand. The METaS team has chosen to focus social media efforts on Facebook, Twitter, and Instagram.

The METaS program will have its own website, with links to its program application, campus support services, project activities, internship/employment/scholarship opportunities, and other information of interest to METaS students. Flyers will be created for various METaS, Financial Aid workshop and Math/Science Jam activities, with the possible addition of postcards, sandwich boards, and banners.

Communication with students will be a combination of email and text. This plan is in recognition that various students respond to different types of communication, largely related to age group. Informal surveys of students have confirmed that a variety of communication methods would be most appropriate. The METaS program is exploring the use of graphics and photo banners in email messages to increase interest and attention, as well as the use of data analytics tools to inform how many students are opening emails.

Professional Development Plan

STEM faculty support is a crucial component of the METaS project. Faculty buy-in for the program is necessary to identify and recruit STEM tutors and SI leaders, advertise Math/Science Jams, secure textbook commitments for multiple semesters, providing undergraduate research opportunities, and mentoring METaS students. The intended objective of METaS's STEM professional development is to increase faculty and staff knowledge and skills in best practices, which will impact several areas including course success, persistence, retention, and completion. Providing professional development opportunities through the faculty/staff Canvas portal would be an accessible and appropriate platform, especially for online hybrid course delivery. Four specific areas of need for STEM professional development have been identified:

- 1) Integrated Science Centers
 - * There is currently no training for faculty who are assigned SI leaders
 - * Current tutor and SI training is not coordinated with the main Learning Center
 - * Training for peer tutors and SI leaders is more difficult in the sciences because of the pre-requisites
- 2) STEM Tutor Program
 - * Current tutor training is general and not faculty-driven nor STEM specific
- 3) Online Hybrid Course Delivery
 - * Hispanic students are the most underrepresented online student population, and have significantly lower success rates than their White and Asian counterparts. (Public Policy Institute of California 2015)
 - * There are gaps in training opportunities for faculty who teach online and hybrid courses and how to best help Hispanic students to transition to online courses
 - * This area has been specifically identified as being suitable for Canvas-based professional development.
- 4) Effective Teaching for Basic Skills
 - * Almost 70% of CSM's entering students test into basic skills courses
 - * Many CSM math faculty have expressed interest in attending conferences on how to teach basic skills

Evaluation & Research Plan

Project staff will be involved in evaluation work in addition to utilizing the services of an outside evaluator. In addition, in order to facilitate data-driven decision making, quantitative and qualitative data will be collected, analyzed, and reported throughout the implementation stages of the grant. One key aspect of this approach is the use of benchmarks to monitor progress on objectives and assess impact on participants. The chosen benchmarks are included in the "Data" section of this document.

The METaS evaluation plan consists of both a formative and summative evaluation component. The evaluation plan addresses the following elements:

- 1) Assesses the extent to which the achievement of objectives and implementation

- activities has been met
- 2) Determines how the achievement of objectives helps to solve major problems identified by CSM
 - 3) Evaluates the effectiveness of the Competitive Preference Priority intervention as it relates to meeting the What Works Clearinghouse (WWC) Evidence Standards

External Evaluator

As required by the grant, the METaS project will have an external evaluator to ensure impartiality and to meet the high level of intensity of this project. The external evaluator will have the following duties:

- 1) Assess the overall effectiveness of the project
- 2) Advise staff regarding evaluation instruments and collection/analysis of data
- 3) Make recommendations for improvements
- 4) Conduct site visits to review project documents/reports and interview staff and participants
- 5) Provide yearly reports including a final summative review

The external evaluators for the METaS project will be Dr. Krista Schumacher and Ms. Kay Floyd. The external evaluators will review the internal quarterly reports and prepare a report indicating findings and recommendations. This will serve as an objective assessment of the project's progress and contribution to solving identified problems. External evaluations will be made available to project stakeholders and members of the public as appropriate.

Formative Evaluation

Internal formative evaluations will be used throughout the grant in order to influence the project as it progresses. Quarterly evaluation reports will measure progress, ensure targets are being met, and monitor the proper spending of budgets. Quarterly evaluation reports will also allow the consideration of adjusting original objectives in the event of altered circumstances. In the event any task cannot be completed, a detailed report will include the reasons for failure to meet the original target, a new timeline and strategy for accomplishing the specified task, and how the new plan will impact the original objectives. Formative evaluation reports will be provided to the external evaluator.

Summative Evaluation

At the end of the grant's five-year period, a final comprehensive summative evaluation will occur. This evaluation will be prepared by the Project Director and will include:

- 1) History of the project
- 2) Projected budget compared to actual
- 3) How results to measure success have been met
- 4) How objectives were accomplished
- 5) How identified goals and problems were impacted
- 6) Unintended project outcomes
- 7) How the project has produced further evidence of the Competitive Preference Priority intervention

Proposed Research Experiment

The College of San Mateo is proposing a randomized experiment which will test the hypothesis that Hispanic and low-income STEM students who receive individualized coaching will persist at a higher rate

than comparable STEM students who do not receive coaching. This research project will be done working in close conjunction with InsideTrack, the organization who worked on the Bettinger and Baker (2011) student coaching study. Data collection, analysis, and reporting will occur over the course of the project period. Approval for the research will be sought by the CSM Institutional Review Board (IRB). The impact assessment design for the student coaching intervention is a randomized controlled trial (RTCT), using a lottery to assign eligible students to the intervention group or to the control group. Current projections are to have 100 students per cohort (Fall 2017, Fall 2018, and Fall 2019), with 50 students per intervention and control group, although the METaS staff is currently exploring expanding this number. The primary outcome for CSM's study will be persistence in college by Hispanic and low-income STEM students as measured over 6-month intervals through 24 months. Persistence is defined as the percent of the original admission cohort that returns with each advancing semester and year, and is a strong predictor of graduation. The use of individualized student coaching will also promote evidence-based practices, as this study is modeled after one Bettinger and Baker (2011).

Data Collection and Methodology

Data sources to be used for this project include:

- 1) Banner student information system
- 2) IPEDS (Integrated Postsecondary Education Data System)
- 3) Tracking system reports
- 4) Exit surveys
- 5) National Student Clearinghouse reports
- 6) HSI STEM project database
- 7) California Community College Student Success Scorecard database
- 8) Post-survey results
- 9) Internal reports
- 10) Surveys, interviews, and/or focus groups of both students and staff

Timeline (subject to change)

Fall 2016

- Recruit and hire project staff
- Prepare for January Math/Science Jam
- Begin developing plan for expansion/addition of SI, science tutoring, intrusive counseling
- Begin instructional upgrades for existing courses
- Begin Science Seminar Series with San Francisco State University

Spring 2017

- Install project staff
- Finalize plans for Math/Science Jam at CSM, SI, science tutoring, intrusive counseling
 - Determine which sections to support each semester
- Meet with Puente Project faculty and PRIE to finalize mechanism for identifying Hispanic STEM majors
- Establish book loan reward program for students meeting regularly with counselors
- Continue upgrades in existing science courses
- Discovery visit held with InsideTrack to launch individualized student coaching

Fall 2017

- Begin upgrade of new math computer classroom
- Being year one of individualized student coaching
- Begin expanding resources in the ISC
- Continue upgrades of existing courses
- Schedule/organize professional development activities for faculty, staff, and students

Spring 2018

- Continue upgrade of new math computer classroom
- Continue year one of individualized student coaching
- Identify any support staff/student workers required in the ISCs
- Identify faculty for reassign time to develop new science research course

Fall 2018

- Faculty develop new science research course
- Begin year two of individualized student coaching
- Complete upgrade of math computer classroom and schedule classes for spring 2019

Spring 2019

- Faculty continue development of new science research course

- Continue year two of individualized student coaching
- Offer first classes in the new math computer classroom

Fall 2019

- Faculty move new science research course through Committee on Instruction, to offer Fall 2020
- Year three of individualized student coaching
- Add new online support services in ISCs

Spring 2020

- Faculty identify instructors for new science research course and purchase equipment
- Complete year three of individualized student coaching
- Identify equipment needs for faculty participating in online course development activities

Fall 2020

- First offering of new science research course
- Coaching professional development for CSM faculty
- Identify Bridges to Baccalaureate applicants

Spring 2021 – Fall 2021

- Offer second semester of new science research course
- Identify Bridges to Baccalaureate participants
- Identify summer conference participation for students in science research course