

*Service Learning Transforming Educational Models in Science, Technology, Engineering,
and Mathematics (STEM)² Year One Evaluation Final Report*

California State University Consortium

Funding Provided by

Learn and Serve America: Corporation for National and Community Service



California State University

Submitted by Cobblestone Applied Research & Evaluation, Inc.

Rebecca M. Eddy, Ph.D.

H. Todd Ruitman, M.A., Monique Matelski, M.A., & Nancy Hankel, M.A.

July 31, 2011



Table of Contents

Table of Contents	2
Executive Summary	4
Introduction.....	7
Service-Learning Transforming Educational Models (<i>STEM</i>) ²	8
Program Purpose.....	8
Program Evaluation Methods	9
Key Evaluation Questions.....	10
Program Status.....	10
Section 1: Academic Program Development	11
Assessing the Current State of Service Learning in STEM Departments	11
STEM Service-Learning Self-Assessment Rubric	12
STEM Service-Learning Self-Assessment Results	13
Summary of Service-Learning Capacity in STEM Departments at the CSU	14
Innovative Practices in STEM Departments	15
Campus 1: Chico.....	15
Campus 2: Fresno.....	17
Campus 3: Monterey Bay.....	18
Campus 4: San Marcos.....	19
Campus 5: Sonoma	20
Summary of Innovative Practices.....	22
Engaged Department Initiative	22
Laying the Foundation	22
Engaged Department Institute	26
Section 2: Student Development.....	32
Replicating Successful Service-Learning Initiatives: <i>STEM C3</i>	32
Creation of the <i>STEM C3</i> Manual.....	33
<i>STEM C3</i> Presentations	33
<i>STEM C3</i> Awards and Impact	34
Section 3: Statewide Partnership Development.....	35
Strengthen Current Partnerships	35
California Campus Compact.....	35
California Department of Education, CalServe Initiative	36
California Volunteers	36
Develop New Partnerships.....	36
Society of Science and the Public.....	37
Project Kaleidoscope.....	38
Section 4: Results, Successes, and Challenges of (<i>STEM</i>) ²	39
Results of the (<i>STEM</i>) ² Program	39
Successes of the (<i>STEM</i>) ² Program.....	41
Challenges from the (<i>STEM</i>) ² Program.....	42
Conclusions	43

References	45
Appendix A. Self-Assessment Rubric for the Institutionalization of Service-Learning in University STEM Departments	47

Tables

Table 1. Components of Service-Learning Capacity Dimensions	12
Table 2. Chico <i>Innovation</i> Subgrant Activities and Projects	16
Table 3. Fresno <i>Innovation</i> Subgrant Activities and Projects	17
Table 4. Monterey Bay <i>Innovation</i> Subgrant Activities and Projects	19
Table 5. San Marcos <i>Innovation</i> Subgrant Activities and Projects	20
Table 6. Sonoma <i>Innovation</i> Subgrant Activities and Projects	21
Table 7. <i>Laying the Foundation</i> Subgrants Participants and Activities	23
Table 8. Mean Participant Ratings for Engaged Department Institute: Comparison of Pretest to Posttest	28
Table 9. Participant Mean Ratings for Engaged Department Institute Experience	29
Table 10. Participant Mean Ratings for Engaged Department Institute Vision and Goals	30
Table 11. Program Indicators, Long-term Goals, and Current Status	39
Table 12. 2008-09 through 2010-11 Service-Learning Courses and Students: Overall vs. STEM	40

Figures

Figure 1. Self-Assessment Ratings for All CSU Campuses	13
Figure 2. Number of Participating STEM Departments in <i>Laying the Foundation</i> Subgrants	24
Figure 3. EDI Participant Mean Ratings for Benefits of Service Learning to Students and the Community	29
Figure 4. Continuums of Service Conference Presentation Ratings	34

Executive Summary

In 2010, the CSU consortium was awarded \$1.5 million in funding (over 3 years) from Learn and Serve America: Corporation for National and Community Service to support efforts to promote service learning and community engagement in Science, Technology, Engineering, and Mathematics (STEM) fields throughout the California State University (CSU). The *Service-Learning Transforming Educational Models (STEM)²* program was delivered to the CSU campuses and supported by the CSU Chancellor’s office from September, 2010 through August, 2011.

The overarching goals of *(STEM)²* were to institutionalize service learning in STEM departments and promote college student retention and achievement in STEM disciplines. Three areas were targeted to support the grant goals: academic program development, student development, and partnership development throughout the CSU campuses and communities. The grant supported these three areas with several activities throughout the CSU system (see below).

Development Area	Activity	Description	
Academic Program Development	<i>Innovation Subgrants</i>	Five CSU campuses – Chico, Fresno, Monterey Bay, San Marcos and Sonoma – received \$25,000 subgrants to implement creative and innovative approaches to institutionalize service learning within STEM departments.	
	<i>Laying the Foundation Subgrants</i>	Fifteen of the twenty three CSU campuses received funding for service-learning offices to assess and showcase current service-learning activities in their STEM departments. Recipients of the subgrant received \$4,000 in funds that required 100% match by the campus.	
	<i>Engaged Department Initiative</i>	<table border="0" style="width: 100%;"> <tr> <td style="text-align: center; vertical-align: middle;"><i>Engaged Department Institute (EDI)</i></td> <td>The first EDI was offered in June 2011 and was specific to science departments, and included five teams from four campuses. The three-day long conference brought together teams of faculty, staff, and community partners to develop strategies to support service-learning activities in their departments.</td> </tr> </table>	<i>Engaged Department Institute (EDI)</i>
<i>Engaged Department Institute (EDI)</i>	The first EDI was offered in June 2011 and was specific to science departments, and included five teams from four campuses. The three-day long conference brought together teams of faculty, staff, and community partners to develop strategies to support service-learning activities in their departments.		
Student Development	<i>STEM C3 (Careers, Community and Connections)</i>	Program Directors from <i>CoyoteCareers</i> in San Bernardino created a manual and presented at multiple events that provided information on how to develop and sustain a successful campus program for STEM students which includes tutoring, career preparation, service-learning internships, and alumni networking.	
Partnership Development	Statewide Partnership Development	Partnerships were established or strengthened with key organizations including: California Campus Compact, Cal STEM, California Volunteers, Society for Science and the Public and Project Kaleidoscope.	

The evaluation was designed to assess how well the program was implemented in comparison to planned activities, and to determine whether these activities were successful and linked to identified program outcomes. Evaluation questions were developed to address each major program area. In addition, the evaluation assessed *(STEM)²* program successes and

challenges to the institutionalization of service learning in STEM departments. The evaluation questions and results are summarized below.

Evaluation Question	Answer
<p>What is the current state of service-learning capacity in STEM departments on CSU campuses?</p>	<p>According to the self-assessment rubric, STEM departments on 4 of the 23 campuses were at the “sustained institutionalization” stage of service learning. Eight campuses were making progress toward service-learning sustainability while the other eleven campuses were in the beginning stages.</p>
<p>What was the impact of the (STEM)² activities in promoting Academic Program Development?</p>	<p>Innovation: Four of five campuses reported successful integration of <i>Innovation</i> subgrant funds into their STEM service-learning programs for year one. The subgrants clearly provided campuses with the ability to include service learning in a way that was tailored to the specific needs of the institution and surrounding community.</p> <p>Laying the Foundation: Low faculty support made subgrant activities more difficult; however, all fifteen campuses were able to gain a better understanding of the state of service learning in their STEM departments and deliver planned activities.</p> <p>Engaged Department Institute: Departmental team members felt they strongly benefited from the experiences gained at the EDI. Participants strongly agreed that the strategies learned during the EDI prepared them to further develop department-community partnerships and service-learning opportunities. They also indicated that they are excited about the opportunity to develop these new partnerships in their communities and engage students in community-based work.</p>
<p>What was the impact of the (STEM)² activities in promoting Student Development?</p>	<p>The <i>STEM C3</i> team was successful in writing a manual to document activities and steps necessary to create a successful program on campus. The impacts on student development cannot be assessed yet given the early stages of the grant.</p>
<p>What was the impact of the (STEM)² activities in promoting Statewide Partnership Development?</p>	<p>Given the early stages of partnership development, (STEM)² was successful at gaining new partnerships (such as <i>Project Kaleidoscope</i> and <i>Society for Science and the Public</i>), and strengthening existing partnerships (such as <i>California Campus Compact</i>, <i>CalServe</i>, and <i>CaliforniaVolunteers</i>) to support service learning in STEM on CSU campuses.</p>
<p>Did the activities conducted in the (STEM)² program produce intended program results?</p>	<p>Over 6,000 K-12 students participated in projects and seven activities were created by projects funded through the <i>Innovation</i> subgrant. Anecdotal evidence suggests an increased interest of K-12 students that participated in SL activities. Forty-nine new STEM SL courses were added from 2008-09 to 2010-11. At pretest, 4 campuses reported “sustained institutionalization” on the self-assessment rubric. Nineteen CSU faculty members attended the first EDI and 100% reported increased competence in integrating SL in their STEM courses. Most quantitative indicators such as student retention and graduation can only be answered in future years.</p>
<p>What were the major successes of (STEM)² activities?</p>	<p>Campuses reported that by getting faculty interested and excited about service learning they would be able to create and sustain service-learning opportunities in the STEM disciplines. Through all of the (STEM)² activities, campuses used different strategies to establish faculty buy-in and gain support for service learning in the STEM fields. Those awarded grants were able to make good progress on specific plans for facilitating service learning in</p>

	STEM for K-12 students, college students and faculty. A manual was created that will be a resource for other campuses to develop unique partnerships on and off campus. Several department teams had the opportunity to develop concrete plans and will be able to pursue these plans immediately.
What challenges exist that prevent service learning from being fully integrated into STEM programs at the CSU?	Several challenges expressed by faculty are already being addressed by the <i>(STEM)²</i> program. These include a lack of service-learning resources for STEM faculty, lack of awareness of how to integrate service learning, a perception that service learning lacks quantitative evidence, a perception that the STEM curriculum does not work with service learning, and little publicity for service-learning opportunities. On one campus, student challenges cited were a lack of interest in service-learning courses and perceptions that service-learning courses take too much time. Also, current faculty policies on retention, tenure, and promotion suggest that service learning is not valued in comparison to other faculty pursuits (e.g., research, publications).

The *(STEM)²* program was an excellent opportunity for the CSU system to begin and expand (in some cases) the development of service-learning activities in STEM departments through academic program development, student development, and statewide partnership development. The *(STEM)²* program was successful at implementing many planned activities during the first year of the program. Campuses were able to accomplish a lot in a relatively short amount of time. Some STEM departments were able to establish relationships previously not in place—establishing these relationships is critical to the facilitation of service learning in STEM academic program development. There are some areas, however, that required longer-term assessment to determine the impact on students, faculty and community. The most informative part of the *(STEM)²* program was the assessment of the current state of service learning in STEM departments and the faculty and student attitudes revealed in the process. Barriers to integrating service learning in STEM were revealed and the evaluation provided good evidence that there is much work to be done before service learning is fully integrated on CSU campuses and has the reciprocal positive impacts on the communities for which they are a part.

Introduction

Within the United States, academic institutions have dedicated substantial resources to promote civic engagement across the curriculum (Altman, 1996). One strategy used to address the problem of civic disengagement is community engagement or community-based education. Community engagement refers to the “collaboration between educational institutions and their larger communities for the mutually beneficial exchange of knowledge and resources in a context of partnership and reciprocity”¹ (Carnegie Foundation for the Advancement of Teaching and Learning). Community engagement includes a number of activities such as service learning, voter registration drives, community-based research and community service.

Service learning is one type of community engagement activity that specifically focuses on civic involvement, active learning, and application of knowledge. Service learning is an educational methodology that combines community service with classroom learning to engage students in the educational process, teach civic responsibility, and strengthen communities (Bringle & Hatcher, 1995). Service learning helps students gain *socially responsive knowledge*, that is, education obtained through direct academic-based problem solving of social issues (Altman, 1996). Students participating in service learning apply the skills and knowledge they learn in their academic coursework to identify and solve real-world community problems and also access the expertise of community partners in addressing these problems. Additionally, students become contributing citizens and active community members through the service they perform.

Service-learning experiences are developed through a collaboration of community organizations and the institution or academic departments/programs. Successful service-learning programs depend on three main factors: the level of commitment by both the academic and community partners to carry out the service activity; the effectiveness of communication between the faculty, student and community organization throughout the duration of the project; and the compatibility between the goals of the student and organization participating in the service-learning program (Stoecker & Tryon, 2009).

Research indicates that service learning has an overall positive impact on students’ social, personal, and cognitive outcomes (Giles & Eyler, 1994). Students who participated in service-learning education had greater gains in perspective-taking, complex problems solving and critical

¹ http://www.calstate.edu/cce/about_us/vision.shtml

thinking than students who did not participate in service-learning education (Batchelder & Root, 1994; Markus, Howard, & King, 1993). Additionally, service learning increases students' awareness of contemporary social issues (Driscoll, Holland, Gelmon & Kerrigan, 1996), enhances students' self-efficacy relating to community service (Reeb, Katsuyama, Sammon, & Yoder, 1998), and increases positive attitudes about civic engagement and social responsibility (Markus et al., 1993). Although this form of community-based education has been linked to positive student outcomes, it also creates new challenges for the institution. Specifically, this type of undertaking changes the function of the institution, creates new demands for faculty roles, and affects not only what students learn but also what is taught.

Service-Learning Transforming Educational Models (STEM)²

The California State University (CSU) system is the largest system of higher education in the United States and recognizes the responsibility to provide its students with knowledge and opportunity to fully participate in civil society. For more than a decade, the CSU system has been committed to increasing opportunities for student community engagement, and has been expanding partnerships to do so. Learn and Serve America has been a partner to the CSU at various points since 2000. In 2010, the CSU consortium was awarded \$1.5 million in funding (over 3 years) from Learn and Serve America: Corporation for National and Community Service to support efforts to promote service learning and community engagement in the Science Technology, Engineering, and Mathematics (STEM) fields throughout the 23 campuses of the CSU. *The Service-Learning Transforming Educational Models (STEM)²* program was delivered to the CSU campuses and supported by the CSU Chancellor's office from September, 2010 to August, 2011. The focus of this initiative was threefold: academic program development, student development, and statewide partnership development. This report summarizes all program activities that took place in year one and describes the progress toward meeting evaluation goals for each of those activities.

Program Purpose

(STEM)² was designed to integrate service learning as part of the undergraduate educational experience for students in the STEM fields, while serving their local communities. Specifically, program goals were to 1) institutionalize service learning in STEM disciplines, and

2) promote college student retention and achievement in STEM disciplines. These goals were addressed through academic program development, student development, and statewide partnership development. A website was established to provide information about the initiative, and can be found at: <http://www.calstate.edu/cce/stem/>

(*STEM*)² included a variety of program activities throughout the CSU campuses in the first program year. These activities were intended to simultaneously expand service-learning experiences for CSU students while advancing their retention, graduation and career placement in the STEM disciplines. Activities included:

- *Laying the Foundation* subgrants were awarded to fifteen Service-Learning offices on CSU campuses to assess current STEM service-learning activities on their campuses and promote outreach of service learning in STEM departments.
- *Innovation* subgrants were awarded to five CSU campuses (Chico, Fresno, Monterey Bay, San Marcos, and Sonoma) to provide funding to carry out innovative projects and serve as demonstration sites from which to grow STEM service-learning initiatives throughout the CSU.
- *An Engaged Department Institute* (EDI) was held with five teams from multiple CSU campuses (Fresno, Los Angeles, Monterey Bay, and Bakersfield) to provide training, support, and resources to strategically embed service learning into academic programs while serving their respective communities.
- A how-to manual for STEM student success was written by a team at San Bernardino that provided specific information on developing a program modeled after their award-winning *CoyoteCareers* program, which includes facilitation of career soft skills, service-learning internships, tutoring support, and integration of alumni.
- Efforts to promote partnerships and participate in service-learning activities with key organizations such as Project Kaleidoscope and the Society for Science and the Public were also developed.

Program Evaluation Methods

Cobblestone Applied Research & Evaluation, Inc. was hired to evaluate the effectiveness of the (*STEM*)² initiatives and to determine the extent to which program goals were

accomplished. The evaluation relied on a variety of data collection activities including adapting an instrument to allow CSU campuses to determine their capacity for service learning in STEM departments; observations and surveys of the Engaged Department Institute to determine participant growth on key dimensions addressed during the institute; archival analysis of service-learning courses and student counts on each of the CSU campuses; and assessment of successes and challenges of integrating service learning in STEM departments on all CSU campuses through annual reports.

Key Evaluation Questions

The purpose of the evaluation was to answer key evaluation questions developed by the *(STEM)²* program and evaluation team to understand if program goals were accomplished. Evaluation questions were related to each major program area (e.g., Academic Program Development) as well as overall program effects (e.g., how many students were served). Key evaluation questions included:

- 1) What is the current state of service-learning capacity in STEM departments on CSU campuses?
- 2) What was the impact of the *(STEM)²* activities in promoting Academic Program Development?
- 3) What was the impact of the *(STEM)²* activities in promoting Student Development?
- 4) What was the impact of the *(STEM)²* activities in promoting Statewide Partnership Development?
- 5) Did the activities conducted in the *(STEM)²* program produce intended program results?
- 6) What were the major successes of *(STEM)²* activities?
- 7) What challenges exist that prevent service learning from being fully integrated into STEM programs at the CSU?

Program Status

In April 2011 it was announced that funding would be suspended indefinitely from the Corporation for National and Community Service. Therefore, the planned three-year initiative for *(STEM)²* would be suspended after one year of funding. Given this, many of the planned activities for the program would not have the opportunity to come to fruition and some goals

would necessarily not be met. For example, we do not expect that major program goals related to student retention and graduation would be accomplished after only one year of funding. Therefore, this report summarizes progress on instituting program activities and progress made on program goals after one year without the expectation that additional years will be assessed as part of this initiative from the Learn and Serve funding.

Section 1: Academic Program Development

Program activities were focused on three major areas: academic program development, student development, and statewide partnership development. The purpose of the first area, academic program development, was to facilitate service-learning initiatives in STEM departments on all CSU campuses. The rationale for supporting academic program development was to allow high-impact practices like service learning to become a core part of STEM curriculum, as opposed to an ancillary activity. Only by integrating service learning into core programs would this allow for long-term sustainability of service learning in the CSU and have the intended outcomes on students, faculty and communities. Prior to the implementation of academic program development activities, however, an assessment was conducted to understand the current state of service learning in STEM departments. The following section includes a description of the initial assessment process as well as a summary of all academic program development activities.

Evaluation Question 1: What is the current state of service-learning capacity in STEM departments on CSU campuses?

Assessing the Current State of Service Learning in STEM Departments

In an effort to show progress toward increasing the institutionalization of service learning as a result of grant activities, each campus completed a “Self-Assessment Rubric for the Institutionalization of Service-Learning in University STEM Departments” to act as a pretest measurement. A copy of the self-assessment rubric completed by campuses can be found in Appendix A.

The following is a brief summary of the assessment completed by all CSU campuses in fall 2010. The full results of the assessment can be found in the April, 2011 report *Self-*

Assessment Rubric for the Institutionalization of Service-Learning in University STEM Departments: An Assessment Tool of the (STEM)² Initiative – Pretest Results.

STEM Service-Learning Self-Assessment Rubric

The rubric was adapted from the work of Andrew Furco, University of California, Berkeley, 1999 (revised in 2002, 2003, 2006) and based on the Kecskes/Muyliaert *Continuums of Service Benchmark Worksheet*. Each campus self-rated twenty-two aspects of service-learning capacity divided into five dimensions of their service-learning program specifically related to STEM departments (see Table 1). Dimension 1 measures the development of a definition, philosophy, and mission of service learning on the campus. Dimension 2 measures STEM faculty support of, and involvement in, service learning. Dimension 3 measures STEM student support for, and involvement in, service learning. Dimension 4 measures community participation and partnerships, and finally, Dimension 5 measures departmental support for service learning.

Table 1. Components of Service-Learning Capacity Dimensions

Dimensions	Dimension Components
Dimension 1: Philosophy and Mission of Service-Learning	1.1 Definition of Service-Learning in STEM Departments
	1.2 Strategic Planning
	1.3 Alignment with Departmental Mission
	1.4 Alignment with Educational Reform Efforts
Dimension 2: STEM Faculty Support for and Involvement in Service-Learning	2.1 STEM Faculty Knowledge and Awareness
	2.2 STEM Faculty Involvement and Support
	2.3 STEM Faculty Leadership
	2.4 STEM Faculty Incentives and Rewards
Dimension 3: STEM Student Support for and Involvement in Service-Learning	3.1 STEM Student Awareness
	3.2 STEM Student Opportunities
	3.3 STEM Student Leadership
	3.4 STEM Student Incentives and Rewards
Dimension 4: Community Participation and Partnerships	4.1 Community Partner Awareness
	4.2 Mutual Understanding
	4.3 Community Partner Voice and Leadership
Dimension 5: Departmental Support for Service-Learning	5.1 Coordinating Entity
	5.2 Policy-Making Entity
	5.3 Staffing
	5.4 Funding
	5.5 Administrative Support
	5.6 Engaged STEM Department Status
	5.7 Evaluation and Assessment

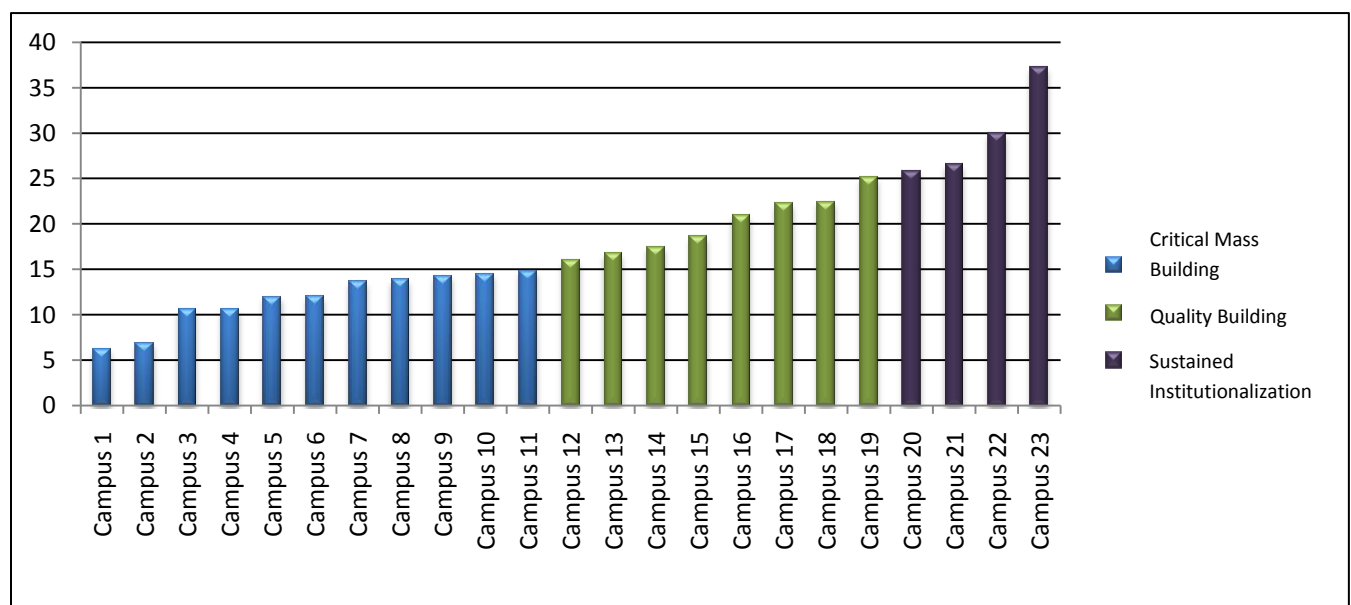
For each dimension component, respondents rated their current status on a scale of 1 to 9, with 1 representing the lowest possible rating and 9 representing the highest possible rating. The numerical ratings were accompanied by a statement to be used by the respondent as a guide for their rating.

A rating of 1 to 3 represented that a campus was in the stage of *critical mass building* meaning that the STEM departments were in the beginning stages of service-learning institutionalization; a rating of 4 to 6 represented the area of *quality building* which suggested that the STEM departments were aware of their service-learning needs and were working toward service-learning institutionalization; and a rating of 7 to 9 represented the area of *sustained institutionalization* meaning that service learning was fully integrated into the STEM departments. Following each of the 22 ratings, a space was provided for explanation should the respondent feel an explanation of the rating was necessary.

STEM Service-Learning Self-Assessment Results

Each campus also received a total score for their self-assessment. The average for each dimension was added together to obtain the total score. We used the average of each dimension thereby making each dimension of equal weight in the total score. Out of a total 45 points possible, campuses averaged a total score of 17.6, with a range of 6.3 to 37.2 points. Figure 1 shows the distribution of scores across all campuses.

Figure 1. Self-Assessment Ratings for All CSU Campuses



The total score for the self-assessment rubric shows that eleven campuses were in the *critical mass building* stage, eight were in the *quality building* stage, and four were in the *sustained institutionalization* stage overall.

While this information is helpful as an overall view of each campus, this information fails to show the strengths and weaknesses of each individual campus. For example, after averaging each of the five dimensions, the overall rating of the campus was in the *sustained institutionalization* stage on the rubric; however, a closer look at the individual campus results show a few components in Dimension 2 are rated in the *critical mass building* stage. Each of the 23 CSU campuses has either full dimensions or individual components that can be improved. The Chancellor's Office has access to the specific ratings and will utilize that information to inform future policies, initiatives and priorities.

Summary of Service-Learning Capacity in STEM Departments at the CSU

The self-assessment rubric revealed that most CSU campuses are either in the *critical mass building* stage or *quality building* stage. We initially expected to measure the growth of these dimensions from the pretest (described here) in comparison to the posttest (scheduled for the end of year 3 of the grant). We anticipated tracking gains reported by campuses over time as they were engaged in various *(STEM)²* program activities and investigate how these activities impacted institutionalization of service learning on all CSU campuses. While the self-assessment rubric was originally intended as being used primarily as a pretest-posttest measure, it has provided important and useful information about the state of STEM service learning in the CSU system and the strengths, challenges, and future areas of focus in working with STEM departments.

Evaluation Question 2: What was the impact of the *(STEM)²* activities in promoting Academic Program Development?

Grant activities that targeted academic program development at CSU campuses included *Innovation* subgrants (awarded to 5 campuses) and the *Engaged Department Initiative*, which included *Laying the Foundation* subgrants (awarded 15 campuses) and the *Engaged Department Institute* (awarded to 5 teams from 4 CSU campuses). The following describes each of these activities and their corresponding participants as well as successes, challenges and results for

each activity. A summary of corresponding outcomes for each activity is described in Section 4 of this report.

Innovative Practices in STEM Departments

One method of improving academic program development was to provide a subset of CSU campuses with funding for innovative practices in STEM service learning that could further serve as demonstration sites to other CSUs. Five campuses were awarded *Innovation* subgrants. These campuses were located in the three regions of the state (north, central, south). The diversity of the projects completed on the five campuses indicates the flexibility of service learning and clearly shows that service learning can be tailored to the needs of the individual campus and surrounding community – it is not a one-size-fits-all initiative.

The subgrantees were selected based on many factors: Learn and Serve America Notice of Funding Opportunity (LSA NOFO) criteria, innovation, region, type and size of institution, areas of focus, and sustainability. Campuses also demonstrated strong institutional support and matched the grant funds. All service-learning activities supported by these subgrants involved projects that directly affected and benefitted the local community with some service-learning activities involving and engaging K-12 students in STEM areas (two CSU campuses).

The following section summarizes the major activities conducted on each campus funded by the *Innovation* subgrants. See Tables 2 through 6 for a full description of activities per campus. Activities ranged from collecting data at, and cleaning up, a local creek to developing a docent program at the local planetarium.

Campus 1: Chico

The *Innovation* subgrant at Chico supported the development of materials and activities for the Geological and Environmental Sciences department. These materials and activities were created to support the Chico Gateway Science Museum where service-learning students conceptualized the activities within the classroom before developing their presentations at the museum. Specifically, accomplishments included “15 presentations of earth science topics at the museum, including monitoring earthquakes, demonstrations of volcanic eruption styles, introduction to

“Currently, implementation of service-learning activities is driven purely by faculty who do so because they are already motivated by increased student learning and/or for altruistic purposes of reaching the general public.”

-Chico

local geologic phenomena, and activities in which the general public observed and predicted relationships between the subsurface geology and related volcanic structures.”

The activities that were developed for the museum were reported to be a great success. While the target age for the projects was from 9 to 13, visitors of all ages were able to interact with service-learning students and their projects. In fact, when a group of young children visited the museum, one service-learning student “rallied and did a wonderful job simplifying terms and concepts and the children were able to participate and demonstrated they learned some basic volcanology as well.”

While the specific service-learning courses were a success, Chico reported that garnering faculty involvement was a “much more difficult prospect than originally envisioned.” This was attributed to the additional workload on faculty that comes with service-learning courses.

Table 2. Chico Innovation Subgrant Activities and Projects

Chico			
Major Activity	Activity Purpose	Results	Recipient of Activity or Material
Construct a seismometer for the public to observe and use data to monitor local (and global) earthquakes	To help visitors observe how seismometers work and also to understand that earthquakes occur frequently and all over the globe	Visitors reported new or increased understanding of how seismometers work; are able to relate personal experiences with earthquakes and media coverage of seismic data sets.	Museum visitors
Demonstration of emplacement of local rock unit (Tuscan Formation)	To increase visitors’ familiarity with the geologic history of their home	Visitors modified their reference of the Tuscan Formation from “the lava cap” to a debris flow; visitors related their personal experiences (e.g. digging through Tuscan Formation for landscaping).	Museum visitors
Demonstration of different types of volcanic eruptions	To engage visitors in understanding that eruption styles are not random, and depend on magma types	Children (and general public) recognized viscosity as an important factor in style of eruption and emplacement of materials (lavas, tubes, etc.).	Museum visitors
Geology of Sutter Buttes	To help visitors understand geologic principles related to a local geologic landmark	Visitors participated in hands-on activities to predict, and then, construct volcanic domes like the Sutter Buttes. Visitors report deeper understanding of the diversity of volcanic processes that resulted in the eruption of domes that make up Sutter Buttes.	Museum visitors

Campus 2: Fresno

Fresno used their funds to offer three service-learning courses to evaluate the effectiveness and sustainability of models for service learning in STEM fields. One service-learning course was offered for chemistry students using the tutoring model and a separate service-learning course using the tutoring model was offered for physics students. Additionally, a course was offered for physics students using a planetarium docent model. The students who enrolled in the tutoring courses provided tutoring to both local high school students and general physics and chemistry students at the university.

The major challenges encountered were recruiting students to participate in the courses, due to a perception among students that service-learning courses required more work than non-service-learning courses. In addition, although it was challenging, meaningful quantitative measures were developed for this course including identification of outcomes. The planetarium model of service-learning course was a great success. Through the course, service-learning students developed a pre-show video and throughout the year, noticed a marked increase in visitor engagement.

Though the planetarium course was such a success, overall sustainability of service learning appears to be a significant challenge given that funding was suspended after one year. Fresno will continue to offer the planetarium course, but will discontinue the physics tutoring course due to low enrollment. See Table 3 for a summary of activities for Fresno.

“... Students showed a significant increase in their oral presentation confidence and abilities during the semester, an area that is often lacking in our graduates.”

“It is easy to observe a significant increase in attending student engagement and interest in the STEM material presented in the planetarium show and museum. One example of where we see this transformation is an enormous increase in the number of questions asked by students.”

-- Fresno

Table 3. Fresno Innovation Subgrant Activities and Projects

Fresno			
Major Activity	Activity Purpose	Results	Recipient of Activity or Material
Peer-Instruction Tutoring Model	Improve understanding of core concepts / oral communication skills	Students demonstrated improved oral communication skills & confidence and improved basic skills. Served at least 175 students in chemistry and more in physics; not successful in reaching high school students so may utilize an online interface or hold sessions on high school campus in the future.	General chemistry / physics students
Peer-	Get students	Significant increase in attending K-12 students ⁷	Approximately 6,000

Instruction Planetarium Museum Docent	interested in and excited about science	engagement / interest in STEM material. SL college students demonstrated improvement in confidence in making oral presentations and ability to engage / interact with young children.	students attending planetarium and planetarium museum
--	---	---	---

Campus 3: Monterey Bay

The Monterey Bay campus began its first Faculty / Community Partner Learning Community during the fall 2010 semester and continued to develop and refine the service-learning program and its goals throughout the school year. First, the STEM SL-Learning Community (LC) was formed with six faculty and twelve community partners (two per faculty member). The learning community was designed to be a place for members to understand each other’s community and individual issues as well as discover common purposes and goals. A Service-learning Course Development Workbook was also created to outline upper division learning outcomes. Additionally, faculty/community partner teams were able to come together and regularly meet to formulate in-depth action research projects for STEM students. Social justice issues and new upper division service-learning outcomes were integrated into six service-learning classes and two new STEM service-learning courses were piloted. Faculty/community partner teams also developed projects that students can use for the required Senior Capstone Project.

Teams from Biological Health Services, Environmental Sciences, Math, Computer

“It should be noted that while it was difficult to bring the entire 18 member Learning Community together after the initial two meetings, each of the 6 partner teams successfully met numerous times over the first year of the program and completed their work in re-designing (or designing anew) their service-learning course.”

– Monterey Bay

Design, Biology Education, and Computer Science each experienced a success for the year. These include Dr. Dan Shapiro from the Environmental Sciences department preparing an article for the *Michigan Journal on Community Service Learning* on his work in assessing new Upper Division service learning, including the development and pilot of a new Biology Education service-learning course for education track biology students.

The greatest challenge reported was in finding time for the Learning Community to meet due to diverse and complex schedules. However, the faculty / community partner teams met multiple times throughout the school year and the campus is an obvious hub of activity focused

on service learning for its students. The campus reported “Service learning at CSUMB has proven itself to be sustainable and STEM-based service learning is a major part of that sustainability”. See Table 4 for a summary of Monterey Bay activities.

Table 4. Monterey Bay Innovation Subgrant Activities and Projects

Monterey Bay			
Major Activity	Activity Purpose	Results	Recipient of Activity or Material
Learning Community Formation	Give faculty & community partners a grounding in SL, STEM, and social justice	Enthusiastic participants, deep connections, common vocabulary / framework developed	Faculty, community partners, and administration
Create SL Course Development Workbook	To tie together community justice issues and content of SL courses	Strong partnerships between community partners and faculty; clearer links to social justice in STEM courses; course development worksheets became the basis for course proposals required of all SL courses	Faculty, community partners, and students
Student STEM-SL Capstones	To produce more SL-based STEM student capstones	Several pre-capstone students have begun a course in computer repair in the community, which is intended to transfer into capstone project	College students
Increased STEM-SL research time & faculty / community partner mentoring	To promote opportunities for STEM faculty to present research essential to the advancement of faculty scholarship and support	One professor is preparing to publish in a Community SL journal & present at a local conference; another professor will present at CSUMB-SL Faculty Lecture Series	Faculty

Campus 4: San Marcos

San Marcos’ subgrant-funded activities included launching service-learning opportunities for students, developing a brochure targeted at STEM faculty regarding the benefits of service learning, and supporting faculty innovation in STEM service learning through mini-grants for which the faculty could apply.

The most successful activity at San Marcos was the development and distribution of a service-learning brochure targeting STEM faculty. The

“Recipients of brochures seemed impressed!”

“Our STEM subgrant was touted as a source of campus pride and accomplishment, in President Haynes’ speech at Convocation.”

“The 2010-2011 academic year was filled with trial, error, and experimentation, perhaps befitting the fact that we were working on service learning precisely in the STEM disciplines.”

-- San Marcos

brochure was developed by physics faculty and the Office of Community Service Learning (OCSL) Director. The purpose of the brochure was to outline the connection between service learning and STEM disciplines and increase awareness and possibilities of service-learning projects. Over 200 brochures were distributed at various events and the brochure has been praised for its “creativity, cogent information, and design.”

One of the major challenges encountered was the lack of faculty response to the call for applications for mini-grants. No faculty applied for the mini-grants, for various reasons such as the small dollar amount of the grants and because so many faculty were so new to the idea of service learning. Additionally, due to scheduling conflicts, the two lead STEM faculty members who originally proposed the idea were unable to devote sufficient time to the project. Finally, due to the timing of the announcement of the subgrant, it was impossible to add the community service-learning course to the schedule for Spring 2011. Despite the initial enthusiasm and interest in integrating service learning across the campus, much of what was intended to be completed during the academic year was not accomplished. See Table 5 for a summary of San Marcos activities.

Table 5. San Marcos *Innovation* Subgrant Activities and Projects

San Marcos			
Major Activity	Activity Purpose	Results	Recipient of Activity or Material
Meetings with STEM faculty who co-authored the “Innovation” letter of intent	To strategize implementation of the sub-grant	Due to time constraints / unusual circumstances, STEM faculty unable to devote sufficient time; expanded STEM connections beyond sub-grant co-authors	Faculty, OCSL Director, OCSL Community Partnerships Coordinator
Research and development of SL brochure targeting STEM faculty	To develop a tool which serves to increase awareness of need / benefits of SL among STEM faculty	200+ brochures delivered at a variety of events. Recipients seemed impressed.	Faculty
STEM mini-grants offered to all STEM faculty who applied	To incentivize STEM faculty to incorporate SL into their classes	STEM faculty did not apply for these grants due to low dollar amounts, timing, SL is new to them, unwillingness to add to students’ academic load.	Faculty

Campus 5: Sonoma

Sonoma State University used *Innovation* subgrant funds to support the Sustainable Waterways Educational Engagement Program (SWEET). The primary purpose of this project was to embed service learning emphasizing sustainability of local waterways, in particular,

Copeland Creek. Funds were also used to convert the Campus Community Garden (adjacent to the creek) into an on-campus “laboratory” for biological pest control and watershed contamination analysis.

Copeland Creek is a waterway that runs through the Sonoma campus and the

“... [W]e developed a rare very positive relationship between Facilities and Academic Affairs and look forward to collaborating in other ways in the future.”

“The chemistry department participation was a particular success, and they are excited about designing labs that foster academic and civic learning and fulfill course goals, while contributing to a multidisciplinary watershed project.”

-- Sonoma

surrounding towns. Seven new service-learning courses were developed and agreements were established for data collection and restoration of Copeland Creek. Though there were unexpected regulations with regard to Creek access, Sonoma secured entrance by the end of the school year.

Faculty members were particularly engaged in the Creek project, especially those in the chemistry department. Additionally, positive relationships were built between Sonoma Facilities and Academic Affairs

as well as Sonoma Preserves and the Sonoma County Water Agency. Students were engaged in the project, especially because the Creek flows through their own “backyard.”

Through the service-learning courses and efforts, the Campus Community Garden became more accessible and can now be used as an outdoor classroom. Additionally, there is an informational hub providing materials about STEM, service learning, and the garden and creek partnerships, which is available for students and the general public.

Table 6. Sonoma Innovation Subgrant Activities and Projects

Sonoma			
Major Activity	Activity Purpose	Results	Recipient of Activity or Material
Meet with faculty, facilities, Sonoma County Water Board, Campus Preserves	Build collaboration and intentionality	Agreements in place for working in the Creek; development of 7 new SL courses	Students, community partners
Purchase scientific supplies	Provide service-learners the resources necessary for collecting data and doing restoration	Development of 7 new SL courses.	Students, community partners
Purchase garden supplies	Provide service-learners accessibility and an informational hub on SL and STEM	Campus Community Garden is more accessible / can be used for an outdoor classroom; informational hub developed that provides information about STEM, SL and the garden and creek partnerships	Students, community partners, community members

The multidisciplinary approaches to watershed studies supported by service-learning courses are a unique component of the strategies used at Sonoma. Having the unifying thread of Copeland Creek provided support across courses and disciplines throughout the university. They reported that sustainability will be realized if more STEM courses utilize the model of integrating meaningful real-world context (e.g. the Campus Community Garden) with course objectives. See Table 6 for a summary of Sonoma activities.

Summary of Innovative Practices

Overall, most campuses reported successful integration of *Innovation* subgrant funds into their STEM service-learning programs. One campus, San Marcos, experienced limited success due to many unforeseen changes on campus (e.g. an accelerated transition in the College of Arts & Sciences and overloaded faculty schedules). Even though this prevented San Marcos from achieving all their original goals, they reported, along with every other campus, increased awareness of and involvement in service learning on their campus. The subgrants clearly provided schools with the ability to include service learning in a way that was tailored to the specific needs of the institution and surrounding community. One issue with all projects was a lack of standardized evaluation tools to measure the success. Had the funding continued for the originally proposed three years, it appears likely that all campuses would have improved and expanded their service learning in STEM programs as well as their measurements of success.

Engaged Department Initiative

Another component of academic program development was the implementation of the *Engaged Department Initiative*. This initiative consisted of two components: 1) *Laying the Foundation* subgrants and 2) *Engaged Department Institutes*.

Laying the Foundation

The *Laying the Foundation* subgrants were offered to service-learning offices at each campus as an opportunity to assess and showcase current service-learning activities in their STEM departments. Recipients of the subgrant received \$4,000 in funds that required 100% match by the campus. Fifteen of the twenty three CSU campuses applied and were approved to receive funding for their activities. As was demonstrated in the assessment of service-learning institutionalization, the level of service-learning institutionalization varied greatly from campus to campus. Therefore, it was expected that the objectives and activities of the *Laying the*

Foundation subgrant recipients would also vary. In an effort to evaluate the overall impact of the subgrants, final reporting guidelines were provided to each of the recipients requiring specific information that could be synthesized into a summary of the subgrant.

We discuss the overall subgrant activities for the recipients and the results of their objectives outlined in the final reports received. We also review the challenges and successes discovered through the implementation of *Laying the Foundation* subgrants in the next section.

Laying the Foundation Activities

Upon analysis of reported campus activities, we generalized the various activities into several broad categories listed in Table 7. Most service-learning departments utilized some form of meeting or presentation to accomplish their objectives. The presentations ranged from keynote speakers to small informal presentations during departmental meetings. Generally, the meetings were used to gather information and interest level from STEM faculty members. Workshops delivered to STEM faculty on how to integrate service learning into their courses was another common activity. Other noteworthy activities were subgrant funds that aided in the creation of three service-learning courses at two of the campuses and projects that involved over 1,000 K-12 students.

Table 7. *Laying the Foundation* Subgrants Participants and Activities

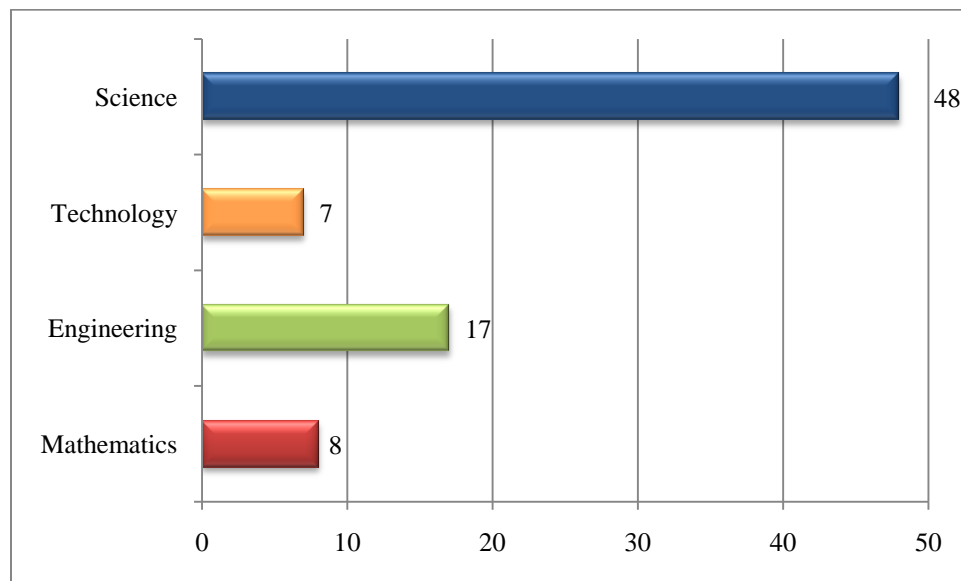
Activity	Frequency of Activity	Participating Faculty members	Participating Community partners	Participating College students	Participating K-12 students
SL Courses Created	3	6	4	7	500+
SL Courses in Development	30+	30+	8+	N/A	N/A
Created service-learning Resources	5	2	1	2	0
Honorarium/ Celebration of Existing SL Activities	2	28	42	16	0
K-12 Activities	4	15	30	125	1,162+
Meetings	11+	138	48	20	0
Presentations	24+	197	70	286	0
Surveys	6	112	27	13	0
Workshops	8	87	7	2	0
Other	2	24	1	3	0
Total	95+	639+	238+	474	1,662+

Note. Individual participants may have been involved in more than one activity. Totals reflect participation in each activity and are not mutually exclusive.

Laying the Foundation Subgrants Objectives and Results

Although each campus took a different approach in their activities to accomplish the goal of the *Laying the Foundation* subgrant, similar objectives emerged in the final reports that each grant recipient submitted. Most campuses reported on their objective to gather information about what service-learning activities were currently in place in the STEM departments. Another common goal was to assess the interest of STEM faculty in creating new service-learning courses or adding service-learning components to existing courses. Other objectives included identifying service-learning resources for STEM faculty, exploring and creating STEM partnerships within the community, creating service-learning courses in STEM, discovering obstacles to service-learning courses in STEM, and gathering student interest in service-learning courses in STEM. Most departments involved with the *Laying the Foundation* subgrants were science departments as identified by Service-Learning Directors—a summary of the frequency of type of participating departments in the STEM disciplines is shown in Figure 2.

Figure 2. Number of Participating STEM Departments in *Laying the Foundation* Subgrants



For campuses with a strong service-learning presence in the STEM departments, the subgrant funds were used more to showcase and celebrate their community partnerships, faculty, and students involved in their existing service-learning activities. These campuses focused more

on objectives that created a path to service-learning participation for new faculty and those few STEM faculty members that were not yet utilizing service learning on their campuses.

Several reports indicated positive results for their subgrant activities. One of the major accomplishments of the subgrants across several campuses was the creation of three new service-learning courses during the 2010-11 school year and the commitment of several faculty to incorporate service-learning components into over thirty existing STEM courses in the upcoming school year. Campuses also reported on six new community partnerships that were created as a result of their *Laying the Foundation* subgrant activities. In addition, numerous service-learning resources were created, purchased, or distributed with subgrant funds. Efforts to assess faculty interest in service learning yielded important discoveries in challenges facing institutionalization of service learning throughout the CSU system; however, the stories of success provide insight to how service learning can positively affect STEM departments.

Laying the Foundation Success Stories

Campuses provided narratives of successes that resulted from *Laying the Foundation* subgrant activities. The following examples highlight what several campuses reported overall. The workshops gave faculty a chance to brainstorm ways to incorporate service learning into their curriculum,

“Having conversations with STEM faculty, rewarding their work, and gathering stories of service learning in STEM has built a foundation for future outreach and collaboration.”

-SL Coordinator

engage their department, and build strong community partnerships. One report indicated “the presentation quickly turned into a group dialogue with all parties around the table interested and engaged.” Faculty and staff that attended these presentations indicated that they were excited about the chance to develop partnerships in their communities and engage students in service-learning opportunities. For example, “one faculty member left the workshop so enthused that he immediately set up an appointment with a local community center to get his service-learning project planned for the fall.” Additionally, campuses claimed that these presentations led to a “new enthusiasm and spirit of collaboration among the departments.” Faculty showed interest in developing stronger relationships within their department, between departments, and between departments and community partners.

Challenges to Implementing Laying the Foundation Subgrant Activities

While the subgrant itself was primarily intended to help service-learning offices assess and expand the current status of service learning in their STEM departments, there were some challenges identified that can be generalized to the institutionalization of service learning in each of the STEM departments that will be discussed later. Specific to the *Laying the Foundation* subgrants, the biggest challenges reported by service-learning staff were low survey response rates and low attendance to subgrant activities (e.g., workshops, meetings, presentations) suggesting that many faculty were not interested or did not have the time to participate in the subgrant activities.

Summary of Laying the Foundation Subgrants

Overall, the goal of the *Laying the Foundation* subgrant was accomplished. All fifteen campuses were able to gain a better understanding of the state of service learning in their STEM departments. While the goal of the subgrants was to assess and showcase current service-learning activities, important information was also gathered from this effort. This information was combined with other grant activities to provide us with a more complete picture of how the (STEM)² program has impacted the CSU system.

Engaged Department Institute

The Engaged Department Institute (EDI) was hosted by the CSU Center for Community Engagement and led by expert presenters in community engagement. The EDI was held in June 2011 in Long Beach, California at the CSU Chancellor's Office. The institute was offered to academic science departments from CSU campuses interested in the department as a unit of engagement and change. Specifically, the three-day long conference brought teams of faculty, staff, and community partners together to develop strategies to 1) include community-based work in both their teaching and their scholarship, 2) include community-based experiences as a standard for majors, and 3) develop a level of unit coherence that allows them to successfully model community engagement and progressive change in the department. The EDI was attended by five teams from four CSU campuses. Team members completed posttest surveys on the last day of the institute.

Engaged Department Institute Participants

The EDI was attended by departmental teams in the STEM fields from Bakersfield, Fresno, Los Angeles and Monterey Bay. Of the 23 departmental team members who attended the EDI, many had multiple roles which include the following: eighteen were faculty members, five were community partners, four were department chairs, three were service-learning directors/coordinators. EDI participants reported an average of 12.94 years of teaching experience at the postsecondary level. Most team members had experience teaching in the natural sciences and nursing field.

Engaged Department Institute Activities

Prior to the beginning of the institute, departmental teams were asked to draft a pre-Institute plan to develop community engagement in their department. Participants were given time everyday throughout the three-day long institute to work with their team members and further develop their engaged department plan. During the first day of the institute, team members learned about the history of community engagement across the STEM disciplines and the many ways that service learning contributes to student success, fulfilling the mission of the University, and promoting community change. Participants also discussed what community engagement currently looked like in their department, what it means to them, their students, university, and the community in which they belong. The participants also discussed what they hoped to gain from participating in the institute. During the second day of the institute, participants learned about successful existing campus-community partnerships, heard student perspectives on ways to engage students in service-learning opportunities, and discussed successful ways to navigate the politics of community engagement. On the final day of the EDI, participants' brainstormed ways to include, expand, and deepen community-based learning in their departments, and provide specific short-term and long-term goals for their departments. Departmental teams presented their community-engagement plans, discussed the faculty resources they currently had in place and the resources that are needed to create and maintain an *engaged department*. Although all the participating teams left the EDI with a plan for community engagement, their individualized plans were at different stages of development, had various short-term and long-term goals, and included unique approaches to achieving these goals. For example, one team planned to establish multiple service-learning lower division, upper division,

and capstone courses; another team planned to integrate community engagement into retention, tenure and promotion guidelines.

Engaged Department Institute Participant Survey Results

After finishing the 2011 EDI, participants were asked to indicate how much they agreed with statements about their experiences both *before* and *after* attending the institute through a posttest and retrospective pretest survey. Statistical results indicated statistically significant increases for all questions from pretest to posttest. Participants agreed the EDI helped them form a unified vision of community engagement. Additionally, team members agreed that the EDI helped them recognize the importance and benefits of community engagement for the community, students, faculty, the department and the higher learning institution. Overall, results suggest that team members felt they strongly benefited from the experiences gained at the EDI (see Table 8).

Table 8. Mean Participant Ratings for Engaged Department Institute: Comparison of Pretest to Posttest

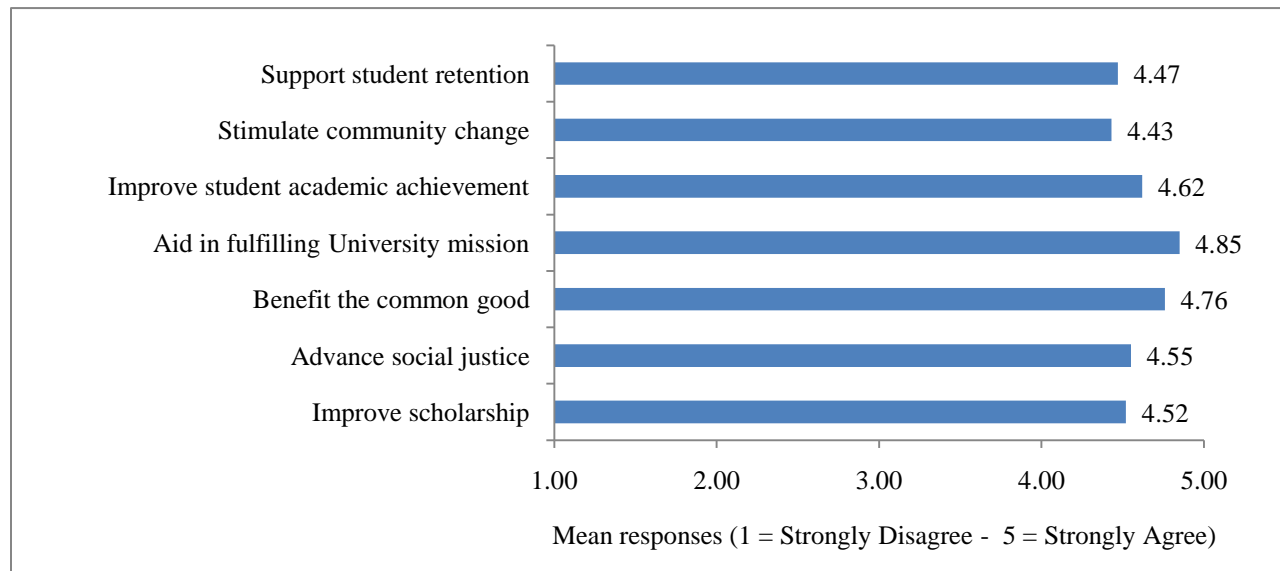
Statement Agreement	<i>Before</i> Attending the Institute Mean (<i>SD</i>)	<i>After</i> Attending the Institute Mean (<i>SD</i>)
Our EDI team has a unified vision of community engagement.	3.00 (1.28)	4.65*** (.49)
Community partners benefit from service more than the academic department does.	2.75 (1.07)	1.84*** (.83)
I can articulate <i>what</i> engagement in an academic program/department means to me.	3.57 (1.08)	4.65*** (.59)
Students participating in service-learning classes benefit from working in our communities.	4.37 (.60)	4.84*** (.37)
Faculty members have a responsibility to partner with the community as members of an academic institution.	3.63 (.83)	4.16*** (.83)
Our communities benefit from working with students from this academic department.	4.05 (.94)	4.83*** (.38)
I can articulate <i>why</i> engagement in an academic program/ department matters to me.	3.81 (1.08)	4.70*** (.47)
The students benefit from a service-learning experience in ways that are not possible in a classroom.	4.19 (.75)	5.00*** (.00)
Working with community partners provides faculty with valuable experiences.	4.20 (.62)	4.74*** (.45)
Generally, students benefit from service learning more than the community partner does.	2.79 (.98)	2.32* (1.06)

*Scale (1) Strongly Disagree to (5) Strongly Agree; *** $p < .001$, $p < .01$ **, $p < .05$ *

Departmental team members were also asked to answer questions about the benefits of service learning to students and the community. Participants agreed that the benefits of service-

learning programs depend on students' ability to learn from community partner's expertise. As indicated in Figure 3, participants strongly agreed that service learning improves student academic achievement ($M = 4.62, SD = .50$) and student retention ($M = 4.47, SD = .51$). In addition, participants also agree that service learning has a meaningful impact on the community, specifically it benefits the common good ($M = 4.76, SD = .44$), stimulates community change ($M = 4.43, SD = .51$), and advances social justice ($M = 4.55, SD = .51$).

Figure 3. EDI Participant Mean Ratings for Benefits of Service Learning to Students and the Community



Participants were also asked questions about their experience attending the conference along with other questions about future plans to implement engaged scholarship. Responses suggest that participants strongly agree that the strategies learned during the EDI prepared them to further develop department-community partnerships and service-learning opportunities. They also indicated that they are excited about the opportunity to develop these new partnerships in their communities and engage students in community-based work (see Table 9).

Table 9. Participant Mean Ratings for Engaged Department Institute Experience

Statement Agreement	Mean	SD
The strategies learned during the Institute have prepared me to further develop department/community partnerships.	4.71	.46
I am skeptical about the academic department's ability to fully engage students in service-learning opportunities.	1.95	.92
Completing the <i>Team Preparation Guide</i> helped us prepare for the Institute.	4.00	.58
I am excited about developing new partnerships in my community.	4.55	.51
I am excited about deepening my partnerships with the University through this	4.61	.61

department.		
I expect this academic department will utilize the strategies developed at the Institute.	4.71	.56
I understand how telling the story of the department in the community will build community engagement within this academic department.	4.50	.61
I have a plan to develop/modify courses to include more service-learning opportunities.	4.63	.72
I plan to become more engaged with others in this academic department to promote community engagement.	4.75	.44

**Scale (1) Strongly Disagree to (5) Strongly Agree*

Participants were then asked questions about the effectiveness of the EDI. Results indicate that participants strongly agreed that the EDI provided them with a vision of how their department could become more engaged within the community (M = 4.81, SD = .40). Responses also suggested that team members strongly agreed that the EDI helped their team develop realistic short-term and long-term strategies to accomplish their vision (see Table 10).

Table 10. Participant Mean Ratings for Engaged Department Institute Vision and Goals

Statement Agreement	Mean	SD
The Institute helped to provide our team with a vision of how this academic department can become more engaged within the community.	4.81	.40
The Institute helped me expand my view of the places where community engagement can be integrated into this department.	4.53	.51
The Institute deepened my understanding of how to support the diversity of students in community engagement.	3.94	.64
I learned new ideas I can apply to my engagement work from my peers at the Institute.	4.75	.44
The Institute helped our team develop realistic short-term key strategies (6-12 months) to accomplish our team's vision.	4.76	.44
The Institute helped our team develop realistic long-term key strategies (1-3 years) to accomplish our team's vision.	4.76	.44

**Scale (1) Strongly Disagree to (5) Strongly Agree*

EDI participants were also asked to reflect on which aspects of the EDI they liked the most. All participants overwhelmingly reported that the aspect of the event that they liked the most was the content of the institute. For example, one participant stated that she “enjoyed the mixture of hands on and informational content”. Another team member liked the “scholarly but applicable” discussions as well as “the different approaches in the exercises and instruction”. Participants also enjoyed the approach and expertise of the facilitators. One participant explained that the “facilitators had great and varied perspectives that were very helpful”. Another wrote

that facilitators “told their stories in an engaging manner and employed simple tools that repeatedly illustrated the content.”

Finally, participants were asked to provide possible improvements that could be made to the institute. One theme emerged: participants wished that the EDI would be offered to other departments and larger groups of faculty. Other suggestions included sending PowerPoint content ahead of lecture time, reinforcing key topics, and eliminating some of the overlapping topics. Lastly, participants wanted to have more interaction between teams.

Summary of Engaged Department Institute

Overall, departmental team members felt they strongly benefited from the experiences gained at the EDI. The institute brought together teams of faculty, staff, and community partners to develop strategies to integrate community-based work into curriculum and mobilize departmental change. Participants strongly agreed that the strategies learned during the EDI prepared them to further develop department-community partnerships and service-learning opportunities. They also indicated that they were excited about the opportunity to develop these new partnerships in their communities and engage students in community-based work. Although all participating teams left the EDI with plans for community engagement and appeared to be committed to implementing these plans, future research must be conducted in order to determine whether these goals were achieved. For example, the true impact of the EDI can only be measured in a subsequent follow up to determine if participants actually implemented short-term and long-term plans developed during the EDI, and to what extent these plans met the intended outcomes identified by the campus teams.

Section 2: Student Development

The second major program component was focused on student development. It was expected that as innovative practices in service learning in STEM departments were developed throughout the CSU system, that participating students would benefit from having more positive attitudes about STEM fields through high-impact practices, be more likely to persist in their degree programs and ultimately, have higher graduation rates where STEM service-learning initiatives thrived. Unfortunately, student development goals are more long-term in nature and as such were not able to be assessed in year one. Therefore, the following section provides information about the *STEM C3* initiative and implementation benchmarks for success in year one that excludes any analysis of impact on student development.

Evaluation Question 3: What was the impact of the *(STEM)²* activities in promoting student development?

Replicating Successful Service-Learning Initiatives: *STEM C3*

One important component of *(STEM)²* was to communicate successful initiatives on CSU campuses where service learning has already been integrated into a model for student success. One example of this was *STEM C3* (Careers, Community and Connections), which was a replication effort established to provide college campuses information about how to conduct successful STEM student success programs when leveraged with other campus resources. The initiative was facilitated by program directors of *CoyoteCareers* at San Bernardino, which was initially funded by a U.S. Department of Education Title V grant (for Hispanic-serving institutions). *CoyoteCareers* provides STEM student support in the form of tutoring in hard-to-pass gatekeeper courses, academic-career education training modules, service-learning internships, and alumni mentorship and networking. This award-winning program is currently in its fourth year and program successes have been well-documented.

Given the *CoyoteCareers* program's success, it was targeted to serve as a model for other CSU campuses. The *STEM C3* program was planned as a rollout in multiple phases. For the first year, the manual was scheduled for completion and publication by the CSU Chancellor's office. Subsequent years include providing symposium presentations to campus teams where they would have the opportunity to develop their own plans for a similar program. The success of the initiative would be measured by establishment of at least five similar programs at other CSU

campuses and feedback from symposium attendees that indicated that the presentation had adequately prepared them for developing a similar project on their own campus. In year one, the *STEM C3* team presented at regional and national conferences in addition to writing the manual. The following provides more specific information regarding the *STEM C3* activities this year.

Creation of the *STEM C3* Manual

Throughout the first program year, *STEM C3* authors outlined, drafted, then created the manual entitled “New Partners for a New Economy: A Guide to Effectively Preparing STEM Students for Careers of Choice” (Dixon, Eddy, Langford & Podolske, in press). Manual publication is currently underway. The manual will serve as a “how-to” guide for other campuses to institute similar programs, while providing valuable lessons learned and issues to consider such as program development, partnerships, evaluation, and logistics. The fully published version is scheduled to be available in fall 2011.

***STEM C3* Presentations**

Promotion of the manual and the *CoyoteCareers* program was accomplished through multiple presentations, including national and regional meetings and presentations to other groups throughout the CSU. Presentations provided attendees with information about the *CoyoteCareers* program as well as promoting the manual and subsequent symposium.

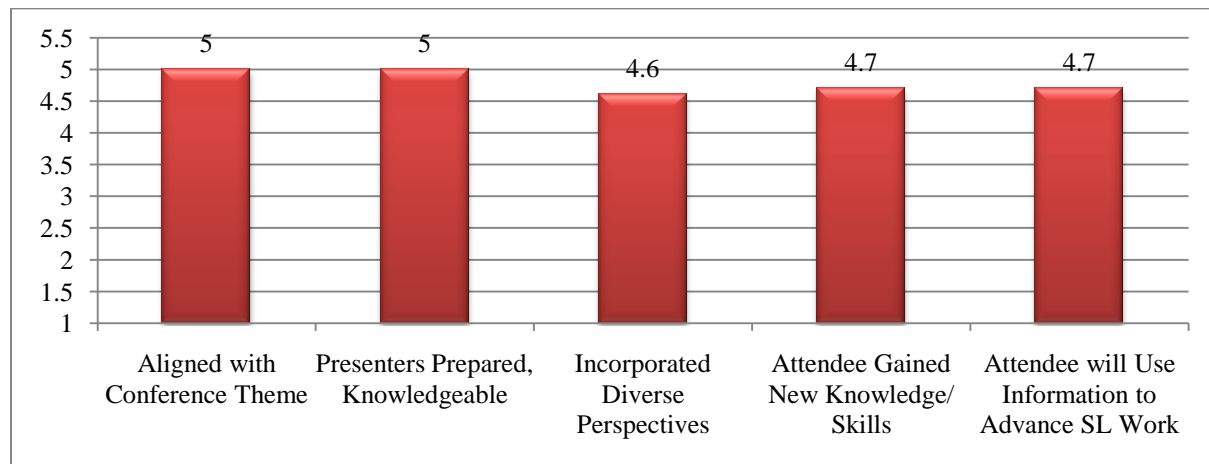
***STEM C3* Presentations**

- Southwest Regional Title V/ HSI Best Practices Conference at the University of La Verne, La Verne, CA
- CSU Alumni Council in Long Beach, CA
- American Association of Colleges & Universities Engaged STEM Learning Conference, Miami, FL
- 14th Annual Continuums of Service Conference in San Diego, CA
- CSUSB Administrative Council, San Bernardino, CA
- CSU Career Development Center Directors, Sacramento, CA

Presentations were well-received by attendees and were largely successful at garnering interest in the manual, specifically providing information about how to develop a similar program at other college campuses. An example of feedback from conference attendees is provided in Figure 4 below. At the conclusion of the *Continuums of Service* conference

presentation, attendees rated the presentation on multiple dimensions*. In general, attendees reported very positive feedback including that the presenters were effective in facilitating the session; the session include diverse perspectives, and attendees gained new knowledge/ skills from the session.

Figure 4. Continuums of Service Conference Presentation Ratings



*Scale (1) Strongly Disagree to (5) Strongly Agree

STEM C3 Awards and Impact

(STEM)² was considered a catalyst for publicizing the *STEM C3* program and has brought national recognition to the team. For example, Ms. Pamela Langford received the Council for Advancement and Support of Education (CASE) award. Ms. Carol Dixon received the National Association of Colleges and Employers (NACE) Innovation Excellence Award for Diversity. Both programs recognized *CoyoteCareers* accomplishments, specifically for the sustainability achieved through the *STEM C3* replication efforts. In addition, the program directors were nominated for a James Irvine Foundation Leadership Award by Chancellor Reed, and the team will compete for a President’s Award at the campus level.

The most important marker of success for the *STEM C3* program was unanticipated, as San Bernardino recently approved a student success fee to sustain program efforts beyond external funding support. The funding is expected to continue *CoyoteCareers* program activities at San Bernardino with half of the fee designated for career success programs.

Although the *STEM C3* initiative would have included other campuses in future years, the first year was successful as evidenced by the completion of the manual, presentations, awards, and sustainability efforts in the form of student fees.

Section 3: Statewide Partnership Development

The last program component was statewide partnership development, in which the *(STEM)²* program would strengthen current relationships or build new relationships with other organizations focused on service learning, particularly in the STEM fields. *(STEM)²* worked with statewide and national partners to build a network of support, information, and resource sharing to ensure that California coordinates efforts to increase the number of professionals in STEM-related careers.

Evaluation Question 4: What was the impact of the *(STEM)²* activities in promoting statewide partnership development?

The CSU approached partnership development in two ways: (1) strengthen/expand current service-learning partnerships to include specific efforts focused on STEM; and (2) develop new partnerships with STEM organizations that include specific collaborations focused on service learning and community engagement.

Strengthen Current Partnerships

The first goal in partnership development was to strengthen current service-learning partnerships to include focused efforts on STEM. The CSU has long-standing relationships with other statewide organizations that promote service learning including California Campus Compact (www.cacampuscompact.org), the California Department of Education CalServe initiative (<http://www.cde.ca.gov/ci/cr/sl/initiative.asp>), and California Volunteers (<http://www.californiavolunteers.org/index.php>), the state office that manages programs and initiatives aimed at increasing the number of Californians engaged in service and volunteering. As a result, with the launch of *(STEM)²*, the CSU immediately began conversations with these long-standing partners about how together they could advance service learning in STEM.

California Campus Compact

[California Campus Compact](#) (CACC) and their national office, *Campus Compact*, provided the initial model of the Engaged Department Institute and were eager to again partner to offer the four Engaged Department Institutes. Because of time and resources constraints, CACC did not participate in the first EDI, but plans were made to involve them in the other three planned Institutes. If additional funding becomes available to support the three remaining

Institutes, CACC and their member campuses will be involved. CACC also shared best grant management practices with the CSU and vice versa, since they share many of the same subgrantees in common with *(STEM)*². Communication occurred with this organization on a monthly basis.

California Department of Education, CalServe Initiative

California Department of Education, CalServe Initiative (CalServe) had just launched the “[California STEM Service-Learning Initiative](#)” (CalSTEM), when *(STEM)*² began. A long-time partner of the CSU, CalServe was putting a similar focus and effort on STEM service learning with their Learn and Serve funding. They established regional networks and coordinators of STEM service learning in those regions. Several regional leads began working with CSU campuses, some of whom were awarded grant funds from CalServe to encourage K-12/higher education partnerships for STEM service learning (i.e. Region 5 with CSU Monterey Bay). Plans were developed to continue to encourage collaboration between the K-12 service-learning regional leads and CSU campuses within their region.

California Volunteers

[CaliforniaVolunteers](#) is led by the nation’s first state cabinet secretary for service and volunteering (appointed by the Governor). Among other things, *CaliforniaVolunteers* convenes a statewide group of service leaders to advance a statewide service agenda. The CSU was in conversations with the Secretary’s chief of staff about utilizing the statewide service group to initiate statewide conversations about STEM service learning and community engagement. However, since the cabinet secretary position is appointed by the Governor and the state was in the middle of an election, and the inauguration of a new Governor, new staff, and a major fiscal crisis in the state, *(STEM)*² was not able to move forward with these plans. Now with the loss of LSA grant funding, plans with *CaliforniaVolunteers* have been put on hold. Nonetheless, the initial planning conversations with *CaliforniaVolunteers* were encouraging and helped to raise the level of visibility and awareness of STEM service learning at the highest levels of state government.

Develop New Partnerships

The second goal in partnership development was to develop new partnerships with STEM organizations with partnership opportunities focused on service learning and community

engagement. Through *(STEM)²*, the CSU developed two new partnerships in the first year of this initiative with the Society for Science and the Public (SSP), www.societyforscience.org, and Project Kaleidoscope within the Association of American Colleges and Universities (AAC&U), <http://www.aacu.org/pkal/index.cfm>.

Society of Science and the Public

The [Society of Science and the Public](http://www.societyforscience.org), based in Washington, DC, is a nonprofit 501(c)(3) membership organization dedicated to public engagement in scientific research and education. Their vision is “to promote the understanding and appreciation of science and the vital role it plays in human advancement: to inform, educate, and inspire.” One way in which they accomplish that mission is to host an International Science and Engineering Fair. This Fair has been in existence for more than 60 years and in recent years has been sponsored by Intel.

The Intel® International Science and Engineering Fair ([Intel ISEF](http://www.intel.com/isef)), the world's largest international pre-college science competition, provides an annual forum for more than 1,500 high school students from 65 countries, regions, and territories to showcase their independent research. The Intel ISEF is the premier global science competition for students in grades 9–12.

The May 2012 Fair was held in Los Angeles, CA and thus provided *(STEM)²* with an opportunity to partner with this organization. More than 60 CSU faculty, staff, students and alumni serve as volunteers, judges, interpreters and facilitators throughout the Fair. Dr. Terry McGlynn, Associate Professor of Biology at CSU Dominguez Hills, one of many CSU faculty judges, came to the Fair not only to represent the CSU, but also to participate as an Intel ISEF alumnus who competed as a high school finalist back in 1988! CSU students from a variety of science, education, and language programs connected their classroom learning with this service experience reaching out to thousands of K-12 students, inspiring their interest in science and engineering. The partnership will continue when Intel ISEF returns to California in 2014 and 2017, and other ways to partner are currently being explored.

A press release and video about the experience of CSU participants at the Intel International Science and Engineering Fair is available at:
<http://www.calstate.edu/pa/News/2011/Story/IntelISEF.shtml>

Project Kaleidoscope

Since its founding in 1989, [Project Kaleidoscope](#) (PKAL) has been one of the leading advocates in the United States for building and sustaining strong undergraduate programs in the fields of science, technology, engineering, and mathematics (STEM). With an extensive network of over 7,000 faculty members and administrators at more than 800 colleges and universities, PKAL has developed far-reaching influence in shaping undergraduate STEM learning environments that attract and retain undergraduate students.

PKAL accomplishes its work by engaging campus faculty and leaders in funded projects, national and regional meetings, community-building activities, leadership development programs, and publications that are focused on advancing what works in STEM education. More information on PKAL is available at the following link:

<http://www.aacu.org/pkal/documents/PKALFlyerJan102011.pdf>

Given PKAL's focus on advancing engaged STEM learning, they were a natural partner for *(STEM)²*. The current executive director, Dr. Susan Elrod, is also a former CSU faculty member, so there was a solid relationship already in place. After several exploratory conversations, the first natural starting place was to invite Dr. Elrod to serve as one of the facilitators of the Engaged Department Institute, providing the important national – and international – perspective about what is working in engaged STEM learning. This proved beneficial not only for the participants but also for Dr. Elrod who learned more about the pedagogy of service learning and the practice of community engagement. In fact, she shared her experience on the PKAL Blog with the thousands who follow PKAL

<http://pkal.aacu.org/blog/index.php/2011/06/29/community-engagement-in-stem/>.

Additionally, the *(STEM)²* coordinator and the *STEM C3/CoyoteCareers* team presented at the *PKAL/AAC&U* Engaged STEM Learning conference in March and not only benefitted from disseminating information about service learning in STEM, Learn and Serve and the *CoyoteCareers* model, but also gained valuable knowledge and insights from other conference participants and speakers about the variety of ways to create engaged learning experiences in STEM. We expect to continue this partnership for years to come.

In the first year of *(STEM)²*, many important new partnerships were developed and existing partnerships were strengthened in the program. Although some partnership have been put on hold temporarily due to funding cuts, it is likely that these relationships could resume.

Section 4: Results, Successes, and Challenges of (STEM)²

The effectiveness of the (STEM)² program was determined by the extent to which the program produced intended outcomes as well as other successes and challenges identified by the evaluation team. The evaluation was designed to be formative during year one and summative during year three. Given this, many of the program outputs (counts of faculty and student participation) as well as outcomes (student retention and graduation) were not able to be adequately assessed in this report.

Evaluation Question 5: Did the activities conducted in the (STEM)² program produce intended program results?

Results of the (STEM)² Program

Table 11 provides a summary of each program indicator, the identified final performance goal, and the current status after year one. In 2008-09 school year, 10.1% of service-learning courses (284 of 2,809) were offered in STEM departments. This increased to 11.8% (324 of 2,737) during the 2010-11 school year (see Table 12).

Table 11. Program Indicators, Long-term Goals, and Current Status

	Indicator	Goal After 3 Years	Status After Year 1
K-12 Students STEM Education	CSU STEM SL students will reach K-12 students through STEM-content activities	1,000 K-12 students	Over 6,000 K-12 students participated in projects funded by the <i>Innovation</i> subgrant.
	CSU STEM SL students will create activities and materials for quality K-12 STEM education	50 types of activities and materials	7 activities and materials created for projects funded by the <i>Innovation</i> subgrant
	Participating K-12 students will report increased understanding of and increased interest in STEM	75% reported increase	Anecdotal evidence suggests an increased interest of K-12 students that participated in SL activities. These K-12 students were not surveyed.
Strengthening Communities	CSU students will participate in new STEM SL activities	3,000 CSU students	In comparison with the baseline year in 2008-09 where 5,750 students participated in STEM SL courses, in 2010-11 6,733 students participated in STEM SL courses—an increase of 983 students
	STEM courses will integrate new SL activities	150 STEM courses	49 new STEM SL courses were added from 2008-09 to 2010-11
	CSU campuses will have the internal capacity and external relationships sufficient to sustain SL in STEM disciplines	18 CSU campuses	At pretest, 4 campuses reported “sustained institutionalization”

College Students	Students, new to STEM SL courses, will participate in STEM SL projects	3,000 CSU students	In comparison with the baseline year in 2008-09 where 5,750 students participated in STEM SL courses, in 2010-11 6,733 students participated in STEM SL courses—an increase of 983 students
	STEM SL students will have increased academic engagement	75% reported increase	Not able to assess after year 1
	STEM SL students will graduate from CSU campus in STEM disciplines	75% of SL participants	Not able to assess after year 1
Faculty	CSU STEM faculty will participate in EDI	120 CSU faculty	18 CSU faculty members attended the first EDI
	EDI participating CSU faculty will report increased competence in integrating SL into their STEM courses	75% of CSU faculty	100% reported increase competence
	CSU will increase in the number of SL STEM courses offered annually	150 SL STEM courses	49 new STEM SL courses were added from 2008-09 to 2010-11
STEM C3	STEM C3 program will be operating on additional CSU campuses	5 CSU campuses	Not able to assess after year 1
	STEM C3 subgrantees will report an increase in retention and persistence among STEM students	25% reported increase	Not able to assess after year 1
	Students served by the STEM C3 programs will graduate in their STEM disciplines and be placed in STEM-related fields	25% of students	Not able to assess after year 1

Table 12. 2008-09 through 2010-11 Service-Learning Courses and Students: Overall vs. STEM

Service-Learning Information	2008-09	2009-10	2010-11
Total Number of CSU Students Enrolled	450,000	433,000	412,000
Number of Service-Learning Courses	2,809	2,738	2,737
Number of Service-Learning Students	60,077	61,010	58,350
Percent of all CSU Students Enrolled in Service-Learning Courses	13.4%	14.1%	14.2%
Number of STEM Service-Learning Courses	284	323	324
Percent of all Service-Learning courses in STEM Fields	10.1%	11.8%	11.8%
Number of STEM Service-Learning Students	5,750	6,275	6,733
Percent of all Service-Learning students in STEM Fields	9.6%	10.3%	11.5%

Data presented in Table 12 was generated by accessing the CSU Academic Planning Database. It is noteworthy that despite the fact that overall student enrollment in the CSU has decreased in the past three years (from 450,000 to 412,000) and the number of service-learning courses and overall number of students enrolled in these courses have also decreased, the proportion of CSU students enrolled in service-learning courses has increased. In addition, an opposite trend has been observed for service-learning courses in the STEM fields. The percent of service-learning students in the STEM fields has increased from 9.6% to 11.5% over this timeframe and 11.8% of all service-learning courses are offered in the STEM fields (from 9.6% in 2008-09). Unfortunately, many of the activities that occurred during year one will not be reflected in these data until the 2011-12 school year, at which time we expect this number to continue to increase given the new initiatives developed by the *(STEM)²* program.

Evaluation Question 6: What were the major successes of *(STEM)²* activities?

Successes of the *(STEM)²* Program

The overall successes of the *(STEM)²* program provide insight to the potential of service learning to thrive in STEM departments at the CSU. In addition to validating the use of service learning in STEM, faculty and administration may be able to use successes from other campuses to inform their practices.

Overall, campuses reported that by getting faculty interested and excited about service learning they would be able to create and sustain service-learning opportunities in the STEM disciplines. Through all of the *(STEM)²* activities, campuses used different strategies to establish faculty buy-in and gain support for service learning in the STEM fields. One campus assigned liaisons to each department to help faculty implement their service-learning projects. Another campus created resource packets for their STEM departments that gave examples of service-learning activities, projects, and templates for assignments and assessments. Other campuses hoped to increase

“Simply providing faculty with time to meet and brainstorm with the PIs and Community Engagement partner on campus established synergy in this area. Faculty who were interested but did not know how to implement projects now have the necessary connections, as well as partners to help them pursue their ideas.”

-Service-Learning Coordinator

faculty support for service learning by giving faculty the opportunity to “re-evaluate their existing departmental structure and connect with each other.” Regardless of the strategies employed, the majority of campuses reported that the funding allowed them to increase faculty awareness and support for service learning in the STEM disciplines. One Service-Learning Director said “*“Connecting the community with faculty and students is key to the mission of CICE and this subgrant has been instrumental in increasing our ability to fulfill this role.”*”

The other successes of *(STEM)²* have been documented throughout this report. For example, those awarded *Innovation* subgrants were able to make good progress on specific plans for facilitating service learning in STEM for K-12 students, college students and faculty. While not all planned activities were implemented, many campuses now have a good start to their programs. Through *STEM C3*, a manual was created that will be a resource for other campuses to develop unique partnerships on and off campus. In addition, several department teams had the opportunity to develop concrete plans through the EDI and will be able to pursue these plans immediately.

Challenges from the *(STEM)²* Program

The challenges discovered through the evaluation of *(STEM)²* program activities may be used as an opportunity for learning how the CSU system can address current obstacles to integrating service learning in STEM.

Evaluation Question 7: What challenges exist that prevent service learning from being fully integrated into STEM programs at the CSU?

Throughout the evaluation of the *(STEM)²* program we have discovered major obstacles or challenges for integrating service learning in the STEM departments on CSU campuses. Most challenges can be generalized to the culture of the STEM departments of most campuses. Fortunately, a number of challenges are being addressed by the activities of the *(STEM)²* grant. These include a lack of service-learning resources for STEM faculty, lack of awareness for some faculty about service learning in general, a perception that service learning lacks quantitative evidence, a perception that the STEM pedagogy does not work with service learning, and little publicity for service-learning opportunities. In addition to these challenges, there are other issues

that should be considered when estimating the likelihood of expanding and sustaining service-learning opportunities in STEM departments.

Based on faculty feedback, the most detrimental obstacle to service learning in the CSU system is the current policies on retention, tenure, and promotion. Many faculty members commented on the difficulty of integrating service learning into their courses given the current focus on research and publishing. This suggests a lower priority for service-learning related pursuits in comparison to other modes of achieving tenure. If service learning is not valued among the other pursuits, there will be little incentive for this practice to be integrated system-wide. We suggest that policy changes would need to occur before STEM departments would more fully embrace service learning.

Conclusions

The (*STEM*)² program was successful at implementing planned activities during the first year of the program. Campuses were able to accomplish a lot in a relatively short amount of time. The recipients of the *Laying the Foundation* subgrants were able to establish relationships previously not seen on campuses, and this gave them a good excuse to interact with STEM faculty. Establishing these relationships is critical to the facilitation of serving learning in STEM academic program development, so at the very least the seeds have been sown to open possibilities that did not exist before. In this respect, the relatively low cost for establishing plans and relationships appears well worth the investment. A similar investment can be observed in statewide partnership development where it is critical to form relationships with other STEM partners to coordinate STEM educational experiences for all students in California.

There are some areas, however, that require longer-term assessment to determine the impact on students, faculty and community. Obviously, funding cuts prevented program activities from continuing and therefore the overall effectiveness of these initiatives cannot be known at this point—as the evaluation in year one is largely formative and long-term impacts on students and faculty can only occur over a longer time-frame. For example, *Innovation* subgrantees described new efforts to integrate service learning. Plans changed in some cases, and other plans that were implemented lacked adequate assessment strategies, particularly for K-12 students. The *STEM C3* manual was written and multiple presentations were developed. Presentations garnered a lot of interest from attendees; however, it is unclear how feasible it will be to implement a similar *STEM C3* program model on other campuses. Additional evaluation is

certainly required to assess the likelihood that this part of the initiative could impact student development on other campuses.

The most informative part of the *(STEM)²* program was the assessment of the current state of service learning in STEM departments and the faculty and student attitudes revealed in the process. For example, we described common barriers to integrating service learning in STEM such as the perception from faculty the RTP rules may prevent initiatives from being fully realized when it is not an engrained value in a department or on a campus. Most of the STEM departments were rated well below the *Sustained Institutionalization* stage, which provided good evidence that there is a lot of work to be done before service learning is fully integrated on CSU campuses and has the reciprocal positive impacts on the communities for which they are a part.

References

- Altman, I. (1996). Higher education and psychology in the millennium. *American Psychologist*, *51*(4), 371–378.
- Batchelder, T. H., & Root, S. (1994). Effects of an undergraduate program to integrate academic learning and service: Cognitive, prosocial cognitive, and identity outcomes. *Journal of Adolescence*, *17*, 341–355.
- Bringle, R. G., & Hatcher, J. A. (1995). A service-learning curriculum for faculty. *Michigan Journal of Community Service Learning*, *2*, 112–122.
- Dixon, C., Eddy, R., Langford, P., & Podolske, D. (in press). *New partners for a new economy: A guide to effectively preparing STEM students for careers of choice*. The California State University Center for Community Engagement. Long Beach, CA.
- Driscoll, A., Holland, B., Gelmon, S., & Kerrigan, S. (1996). An assessment model for service-learning: Comprehensive case studies of impact on faculty, students, community, and institutions. *Michigan Journal of Community Service Learning*, *3*, 66–71.
- Giles, D., & Eyler, J. (1994). The impact of a college community service laboratory on students' personal, social and cognitive outcomes. *Journal of Adolescence* *17*, 327-339.
- Hidayat, D., Pratsch, S., & Stoecker, R. (2009). Principles for success in service learning – the Three Cs. In R. Stoecker & E. A. Tryon (Eds.), *The unheard voices: Community organizations and service learning* (pp. 147 – 161). Philadelphia, PA: Temple University Press.
- Markus, G. B., Howard, J. P. F., & King, D. C. (1993). Integrating community service and classroom instruction enhances learning: Results from an experiment. *Educational Evaluation and Policy Analysis*, *15*, 410–419.

Reeb, R. N., Katsuyama, R. M., Sammon, J. A., & Yoder, D. S. (1998). The Community Service Self-Efficacy Scale: Evidence of reliability, construct validity, and pragmatic utility.

Michigan Journal of Community Service Learning, 5, 48–57.

Appendix A. Self-Assessment Rubric for the Institutionalization of Service-Learning in University STEM Departments

DIMENSION I: PHILOSOPHY AND MISSION OF SERVICE-LEARNING

A primary component of service-learning institutionalization in your Science, Technology, Engineering, and Mathematics (STEM) departments on your campus is the development of a definition for service-learning that provides meaning, focus, and emphasis for the service-learning effort in your STEM departments. How narrowly or broadly service-learning is defined on your campus will effect which campus constituents participate/do not participate, which campus units will provide financial resources and other support, and the degree to which service-learning will become part of the campus' institutional fabric.

DIRECTIONS: For each of the four categories (rows), highlight or circle the number in the continuum that best represents the CURRENT status of the development of a definition, philosophy, and mission of service-learning in your STEM departments.

	<i>Critical Mass Building</i>	<i>Quality Building</i>	<i>Sustained Institutionalization</i>	<i>Explanation</i>
DEFINITION OF SERVICE-LEARNING IN STEM DEPARTMENTS <i>(circle one)</i>	There is no definition for service-learning across STEM departments. The term "service-learning" is used inconsistently to describe a variety of service and outreach activities. 1 2 3	There is an operationalized definition for service-learning in the STEM departments, but there is some variance and inconsistency in the application of the term. 4 5 6	The STEM departments have a formal, universally accepted definition for high quality service-learning that is used consistently to operationalize many or most aspects of service-learning. 7 8 9	
STRATEGIC PLANNING <i>(circle one)</i>	The campus does not have an official strategic plan for advancing service-learning.. 1 2 3	Although certain short-range and long-range goals for service-learning have been defined for the campus, these goals have not been formalized into an official strategic plan for STEM departments that will guide the implementation of these goals. 4 5 6	The campus has developed an official strategic plan for advancing service-learning, which includes viable short-range and long-range institutionalization goals for STEM departments. 7 8 9	

<p>ALIGNMENT WITH DEPARTMENTAL MISSION</p> <p><i>(circle one)</i></p>	<p>While service-learning complements many aspects of the campus's mission, it remains on the periphery. Service-learning is rarely included in larger efforts that focus on the core missions of the campus, particularly within STEM departments.</p> <p>1 2 3</p>	<p>Service-learning is often mentioned as a primary or important part of the campus's mission, but service-learning is not included in the campus; official mission or strategic plans, particularly within STEM departments.</p> <p>4 5 6</p>	<p>Service-learning is part of the primary concern of the campus. Service-learning is included in the campus's official missions and/or strategic plans, particularly in STEM departments.</p> <p>7 8 9</p>	
<p>ALIGNMENT WITH EDUCATIONAL REFORM EFFORTS</p> <p><i>(circle one)</i></p>	<p>Service-learning stands alone and is not tied to other important, high profile efforts on campus (e.g., STEM departments/ community partnership efforts, establishment of learning communities, improvement of undergraduate teaching, faculty research).</p> <p>1 2 3</p>	<p>Service-learning is tied loosely or informally to other important, high profile efforts on campus (e.g., STEM departments/community partnership efforts, establishment of learning communities, improvement of undergraduate teaching, faculty research).</p> <p>4 5 6</p>	<p>Service-learning is tied formally and purposefully to other important, high profile efforts on campus (e.g., STEM departments/community partnership efforts, establishment of learning communities, improvement of undergraduate teaching, faculty research).</p> <p>7 8 9</p>	

Please provide any overall comments about your ratings from above.

DIMENSION II: STEM FACULTY SUPPORT FOR AND INVOLVEMENT IN SERVICE-LEARNING

One of the essential factors for institutionalizing service-learning in higher education is the degree to which faculty members are involved in implementation and advancement of service-learning on a campus (Bell, Furco, Ammon, Sorgen, & Muller, 2000).

DIRECTIONS: For each of the four categories (rows), highlight or circle the number in the continuum that best represents the CURRENT status of STEM faculty involvement in and support for service-learning in STEM departments.

	<i>Critical Mass Building</i>	<i>Quality Building</i>	<i>Sustained Institutionalization</i>	<i>Explanation</i>
STEM FACULTY KNOWLEDGE AND AWARENESS <i>(circle one)</i>	Very few STEM faculty fully know what service-learning is or understand how service-learning is different from community service, internships, or other experiential learning activities. 1 2 3	An adequate number of STEM faculty members know what service-learning is and understand how service-learning is different from community service, internships, and other experiential learning activities. 4 5 6	A substantial number of STEM faculty members know what service-learning is and can articulate how service-learning is different from community service, internships, or other experiential learning activities. 7 8 9	
STEM FACULTY INVOLVEMENT AND SUPPORT <i>(circle one)</i>	Very few STEM faculty members are instructors, supporters, or advocates of service-learning. Few support the strong infusion of service-learning into the academic programs or into their own scholarly and professional work. Service-learning activities in STEM are sustained by a few faculty members on campus. 1 2 3	While a satisfactory number of STEM faculty members are supportive of service-learning, few of them are advocates for infusing service-learning into the academic programs or into their own scholarly and professional work. An inadequate or unsatisfactory number of KEY STEM faculty members are involved in service-learning. 4 5 6	A substantial number of influential STEM faculty members participate as instructors, supporters, and advocates of service-learning and support the infusion of service-learning into the academic programs or into their own scholarly and professional work. 7 8 9	
STEM FACULTY LEADERSHIP <i>(circle one)</i>	None of the most influential STEM faculty members serve as leaders for advancing service-learning in the STEM departments. 1 2 3	There are only one or two influential STEM faculty members who provide leadership to the STEM departments' service-learning effort. 4 5 6	A highly respected, influential group of STEM faculty members serves as the STEM departments' service-learning leaders and/or advocates. 7 8 9	

<p>STEM FACULTY INCENTIVES AND REWARDS</p> <p><i>(circle one)</i></p>	<p>In general, STEM faculty members are not encouraged to be involved in service-learning activities; few if any incentives are provided (e.g., minigrants, sabbaticals, funds for conferences) to pursue service-learning activities; STEM faculty members' work in service-learning is not usually recognized during their review, tenure, and promotion process.</p> <p style="text-align: center;">1 2 3</p>	<p>Although STEM faculty members are encouraged and are provided various incentives (e.g., minigrants, sabbaticals, funds for service-learning conferences) to pursue service-learning activities, their work in service-learning is not always recognized during their review, tenure, and promotion process.</p> <p style="text-align: center;">4 5 6</p>	<p>STEM faculty who are involved in service-learning receive recognition for it during the department's review, tenure, and promotion process; STEM faculty are encouraged and are provided various incentives (e.g., minigrants, sabbaticals, funds for service-learning conferences) to pursue service-learning activities.</p> <p style="text-align: center;">7 8 9</p>	
--	--	---	--	--

Please provide any overall comments about your ratings from above.

DIMENSION III: STEM STUDENT SUPPORT FOR AND INVOLVEMENT IN SERVICE-LEARNING

An important element of service-learning institutionalization is the degree to which students are aware of service-learning opportunities in the STEM departments and are provided opportunities to play a leadership role in the development of service-learning in the STEM departments.

DIRECTIONS: For each of the four categories (rows), highlight or circle the number in the continuum that best represents the CURRENT status of student support for and involvement in service-learning in your campus STEM departments.

	<i>Critical Mass Building</i>	<i>Quality Building</i>	<i>Sustained Institutionalization</i>	<i>Explanation</i>
STEM STUDENT AWARENESS <i>(circle one)</i>	For STEM students, there is no mechanism for informing students about service-learning courses, resources, and opportunities that are available to them. 1 2 3	While there are some mechanisms for informing STEM students about service-learning courses, resources, and opportunities that are available to them, the mechanisms are sporadic and concentrated in only a few programs (e.g., course flyers). 4 5 6	There are coordinated mechanisms (e.g., service-learning listings in the schedule of classes, course catalogs) that help STEM students become aware of the various service-learning courses, resources, and opportunities that are available to them. 7 8 9	
STEM STUDENT OPPORTUNITIES <i>(circle one)</i>	Few service-learning opportunities exist for STEM students; only a handful of service-learning courses are available. 1 2 3	Service-learning options (in which service is integrated in core academic courses) are limited to only a certain groups of students in the STEM departments (e.g., students in certain majors, honors students, seniors). 4 5 6	Service-learning options and opportunities (in which service is integrated in core academic courses) are available to STEM students in many areas throughout the STEM departments, . 7 8 9	
STEM STUDENT LEADERSHIP <i>(circle one)</i>	Few, if any, opportunities in the STEM departments exist for students to take on leadership roles in advancing service-learning in their department. 1 2 3	There are a limited number of opportunities available for STEM students to take on leadership roles in advancing service-learning in their department. 4 5 6	STEM students are welcomed and encouraged to serve as advocates and ambassadors for institutionalizing service-learning in their department. 7 8 9	

<p>STEM STUDENT INCENTIVES AND REWARDS</p> <p><i>(circle one)</i></p>	<p>The campus has neither <u>formal</u> mechanisms (e.g., catalogued list of service-learning courses, special notation on students' transcripts) nor <u>informal</u> mechanisms (e.g., news stories in paper, unofficial student certificates of achievement) that encourage or reward STEM students to participate in service-learning activities.</p> <p style="text-align: center;">1 2 3</p>	<p>While the campus offers some <u>informal</u> incentives and rewards (e.g., news stories in paper, unofficial student certificates of achievement) that encourage and/or reward STEM students to participate in service-learning activities, the campus offers few or no <u>formal</u> incentives and rewards (e.g., catalogued list of service-learning courses, special notation on students' transcripts).</p> <p style="text-align: center;">4 5 6</p>	<p>The campus has one or more <u>formal</u> mechanisms in place (e.g., catalogued list of service-learning courses, special notation on students' transcripts) that encourage and/or reward STEM students to participate in service-learning activities.</p> <p style="text-align: center;">7 8 9</p>	
--	---	--	---	--

Please provide any overall comments about your ratings from above.

DIMENSION IV: COMMUNITY PARTICIPATION AND PARTNERSHIPS

An important element for service-learning institutionalization is the degree to which the STEM departments nurture community partnerships and encourage community agency representatives to play a role in implementing and advancing service-learning in the STEM departments.

DIRECTIONS: For each of the three categories (rows), highlight or circle the number in the continuum that best represents the CURRENT status of community participation and partnerships in your STEM departments.

	<i>Critical Mass Building</i>	<i>Quality Building</i>	<i>Sustained Institutionalization</i>	<i>Explanation</i>
<p>COMMUNITY PARTNER AWARENESS</p> <p><i>(circle one)</i></p>	<p>Few, if any, community agencies that partner with the campus are aware of the campus’s goals for service-learning and the full range of service-learning opportunities that are available to STEM students.</p> <p>1 2 3</p>	<p>Some, but not the majority of community agencies that partner with the campus are aware of the campus’s goals for service-learning and the full range of service-learning opportunities that are available to STEM students.</p> <p>4 5 6</p>	<p>Most community agencies that partner with the campus are aware of the campus’s goals for service-learning and the full range of service-learning opportunities that are available to STEM students.</p> <p>7 8 9</p>	
<p>MUTUAL UNDERSTANDING</p> <p><i>(circle one)</i></p>	<p>There is little or no understanding between the campus and community representatives regarding each other's needs, timelines, goals, resources, and capacity for developing and implementing service-learning activities in STEM.</p> <p>1 2 3</p>	<p>There is some understanding between the campus and community representatives regarding each other's needs, timelines, goals, resources, and capacity for developing and implementing service-learning activities, but there are some disparities between community and STEM departments’ goals for service-learning.</p> <p>4 5 6</p>	<p>Both the campus and community representatives are aware of and sensitive to each other's needs, timelines, goals, resources, and capacity for developing and implementing service-learning activities. There is generally broad agreement between the STEM departments and community on the goals for service-learning.</p> <p>7 8 9</p>	
<p>COMMUNITY PARTNER VOICE & LEADERSHIP</p>	<p>Few, if any, opportunities exist for community agency representatives to take on leadership roles in advancing service-learning in STEM departments; community</p>	<p>There are a limited number of opportunities available for community agency representatives to take on leadership roles in advancing service-learning in</p>	<p>Appropriate community agency representatives are formally welcomed and consistently encouraged to serve as advocates and ambassadors for</p>	

<i>(circle one)</i>	agency representatives are not consistently invited or encouraged to express their particular agency needs or recruit student and faculty participation in service-learning. 1 2 3	STEM departments; community agency representatives are provided limited opportunities to express their particular agency needs or recruit student and faculty participation in service-learning. 4 5 6	institutionalizing service-learning in STEM departments; community agency representatives are provided substantial opportunities to express their particular agency needs or recruit student and faculty participation in service-learning. 7 8 9	
---------------------	--	--	---	--

Please provide any overall comments about your ratings from above.

DIMENSION V: DEPARTMENTAL SUPPORT FOR SERVICE-LEARNING

In order for service-learning to become institutionalized, the STEM departments must provide substantial resources, support, and muscle toward the effort.

DIRECTIONS: For each of the seven categories (rows), highlight or circle the number in the continuum that best represents the CURRENT status of STEM departmental support for STEM service-learning.

	<i>Critical Mass Building</i>	<i>Quality Building</i>	<i>Sustained Institutionalization</i>	<i>Explanation</i>
COORDINATING ENTITY <i>(circle one)</i>	There are no STEM faculty and/or STEM department leaders that are devoted to assisting the various campus constituencies in the implementation, advancement, and institutionalization of service-learning. <div style="display: flex; justify-content: space-around; width: 100%;"> 1 2 3 </div>	There are STEM faculty and/or STEM department leaders who utilize service-learning activities, but the entity either does not coordinate them exclusively or provides services only to a certain constituency (e.g., students, faculty) or limited number of STEM departments or programs. <div style="display: flex; justify-content: space-around; width: 100%;"> 4 5 6 </div>	There are STEM faculty and/or STEM department leaders who maintain a coordinating entity (e.g., committee, center or clearinghouse) that are devoted primarily to assisting the various constituencies in the implementation, advancement, and institutionalization of service-learning. <div style="display: flex; justify-content: space-around; width: 100%;"> 7 8 9 </div>	
POLICY-MAKING ENTITY <i>(circle one)</i>	The campus’s official and influential policy-making board(s)/committee(s) do not recognize service-learning as an essential educational goal for the STEM departments. <div style="display: flex; justify-content: space-around; width: 100%;"> 1 2 3 </div>	The campus’s official and influential policy-making board(s)/committee(s) recognize service-learning as an essential educational goal for the STEM departments, but no formal policies have been developed. <div style="display: flex; justify-content: space-around; width: 100%;"> 4 5 6 </div>	The campus’s policy-making board(s)/committee(s) recognize service-learning as an essential educational goal for the STEM departments and formal policies have been developed or implemented. <div style="display: flex; justify-content: space-around; width: 100%;"> 7 8 9 </div>	
STAFFING <i>(circle one)</i>	There are no staff and/or faculty members on campus whose primary paid responsibility is to advance and institutionalize service-learning in STEM. 	There is an appropriate number of staff and/or faculty members on campus who understand service-learning fully and/or who hold appropriate titles that can support the advancement and institutionalization of service-learning throughout the STEM departments; however their appointments are temporary or paid 	The campus houses and funds an appropriate number of permanent staff and/or faculty members who understand service-learning and who hold appropriate titles that can support the advancement and institutionalization of service-learning in the STEM departments. 	

		from soft money or external grant funds.		
	1 2 3	4 5 6	7 8 9	
FUNDING <i>(circle one)</i>	The campus's service-learning activities in STEM are supported primarily by soft money (e.g., short-term grants) from sources outside the institution.	The campus's service-learning activities in STEM are supported by both soft money (e.g., short-term grants) from sources outside the campus as well as hard money from within the campus..	The campus's service-learning activities in STEM are supported primarily by hard funding from the campus or directly from STEM departments.	
	1 2 3	4 5 6	7 8 9	
ADMINISTRATIVE SUPPORT <i>(circle one)</i>	The campus's administrative leaders have little or no understanding of service-learning in STEM, often confusing it with other campus outreach efforts, such as community service or internship programs.	The campus's administrative leaders have a clear understanding of service-learning in STEM, but they do little to make service-learning a visible and important part of the campus's work.	The campus's administrative leaders understand and support service-learning in STEM, and actively cooperate to make service-learning a visible and important part of the campus's work.	
	1 2 3	4 5 6	7 8 9	
ENGAGED STEM DEPARTMENT STATUS <i>(circle one)</i>	The STEM departments are not considered by the broader university community to be engaged departments.	The STEM departments are considered to be emerging engaged departments by the broader university community.	The STEM departments are considered to be advanced engaged departments by the broader university community.	
	1 2 3	4 5 6	7 8 9	
EVALUATION & ASSESSMENT <i>(circle one)</i>	There is no organized effort underway for STEM department to account for the number, quality, and impact of service-learning activities taking place.	An initiative to account for the number, quality, and impact of service-learning activities taking place throughout in the STEM departments has been proposed.	An ongoing, systematic effort is in place to account for the number, quality, and impact of service-learning activities that are taking place throughout the STEM departments.	
	1 2 3	4 5 6	7 8 9	

Please provide any overall comments about your ratings from above.