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EXECUTIVE SUMMARY

Project ASCENCIÓN
Articulating STEM Cooperatives to Enhance Needs, Success, Integration, Outcomes & Networking

The focal point of Project ASCENCIÓN is a collaborative, fully productive and articulated program from K-12 through Oxnard College to a Baccalaureate degree to promote student interest and success in science, technology, engineering and mathematics; and entry in STEM programs and careers. This project is aggressive, inter-segmental, multi-layered and comprehensive.

Project ASCENCIÓN Design
“Easy as 1, 2, 3 and Working Simultaneously”

1 PARTNERSHIPS

2 PATHWAYS

3 PURPOSE

- Enlace: Bringing Together Learning & Cultural Forces
- Vistas Del Futuro: Future Curriculum and Pathways
- El Guia Mental: The Mental Guide –Tutoring/Mentoring
- CAN DO: Contextualized Activities Network (Integrated Learning)
- The HALO Effect: Helping And Leading Others

Five Interlocking Strategies
There has been tremendous activity since the awarding of the grant in October 2011. Below is a summary of activities, projects, programs and services that have been initiated and implemented in the first year to create Sustainable STEM Systems for Student Success. This has been made possible due to dedicated Faculty, Staff and Administrator’s Team-Work.

- Created and Implemented four High School Summer Bridge Programs at OC
  - Marine Studies and Environmental Resources
  - Engineering
  - Architectural Design and Financial Planning
  - Bio-Tech Undergraduate Research Studies
- On-going High School Math, Engineering, Science Achievement (MESA) Activities and Programs
- Created STEM Website [www.oxnardcollege.edu/stem](http://www.oxnardcollege.edu/stem)
- Implemented an annual STEM Expo on the OC Campus
- Initiated Mini-sessions University Outreach Programs for STEM
- Developing High School STEM Academies at three High Schools

- Developed Prototype/Model for the Oxnard College Transfer and Career Day
- On-going STEM Center Activities and STEM Application Process
- Integrated Degree Works Educational Planning On-line Tool
- Initiated the use of Naviance Educational and Career Planning: On-line Software Tool

- Initiated Tutoring and Mentoring Programs (HS-OC-CSUCI)
- Created and Implement Monthly STEM Stews – Professional Development Program for Faculty and Staff
- Hired Personnel: MESA Coordinator, Instructional Design Specialist, Instructional Technologist, Graduate Student Evaluators
- Created, Implemented High School – Oxnard College – University: Bio-tech Research Projects and Poster Presentations
- Implemented OC-CSUCI Cooperative Under-graduated Research Projects in the Biology and Chemistry Disciplines
- Developed Engineering Pathways Handbook/Manual
- Initiated Language and Writing Integration Project into STEM Curriculum and STEM Biology Research Project. Writing across the STEM curriculum. Project is in planning and development stage. Includes all STEM disciplines and Language Arts/Writing specialist working together to enhance STEM student success

- Implemented a Data-based Decision System to track access, progress, completion and transfer via the development of a system-wide evaluation process for STEM grant projects, activities and services to assure continuous quality improvement
  - Creation of Project-specific Logic Models
  - Development of Evaluation Tools and Techniques
  - Integration of Findings into Campus Student Success Committee (Includes Faculty, Staff and Administrators)
  - Development of Campus-wide Integration Systems – Replication of Best Practices – High Impact Programs
HIGH IMPACT PRACTICES USED IN YEAR 1 OF PROJECT ASCENSIÓN

SUMMER BRIDGE PROGRAMS
MESA PROGRAMS
STEM EXPO
IN-CLASS OUTREACH
MINI-SESSIONS
PROJECT-BASED LEARNING

ENTRY
WEB-BASED EDUCATION/CAREER PLANNING TOOLS
HIGH SCHOOL STEM ACADEMIES
MESA ACTIVITIES - COLLEGE PREP

PROGRESS
TUTORING
UNDERGRADUATE RESEARCH PROJECTS
PEER MENTORING RESEARCH
ENGINEERING PATHWAYS MANUAL
INTEGRATION - LANGUAGE/SCIENCE
FACULTY HOURS IN STEM CENTER

SUMMARY OF MAJOR OBSERVATIONS AND OUTCOMES
1. BROADENED EDUCATIONAL AWARENESS
2. INCREASED PARENTAL SUPPORT FOR COLLEGE
3. INCREASED STUDENT FOCUS
4. MADE THE CONNECTION: EDUCATION AND CAREER
5. INCREASED EQUITY IN OPPORTUNITY TO CLASS SCHEDULING (H.S.)
6. INCREASED FOCUS AND REALITY-BASED EDUCATIONAL PLANNING
7. INCREASED CONFIDENCE TO SUCCEED
8. PEER-PEER INTERACTION INCREASED STUDENT SUCCESS AND CONFIDENCE
9. LANGUAGE SKILL REQUIREMENTS DIFFER GREATLY FOR STEM
10. PROJECT-BASED LEARNING & RESEARCH PROMOTED CRITICAL THINKING, PLANNING, ORGANIZATION AND ANALYSIS
11. INCREASED STUDENT-FACULTY INTERACTION INCREASED STUDENT SUCCESS AND CONFIDENCE TO ASK QUESTIONS

YEAR 1 RECOMMENDATIONS TO CONSIDER: CAMPUS-WIDE INSTITUTIONALIZATION
1. EXPAND THE INTEGRATION OF (SUMMER) BRIDGE/PROJECT BASED LEARNING EXPERIENCES
2. IMPLEMENT "DISCIPLINE-SPECIFIC" HIGH SCHOOL OUTREACH AND ARTICULATION DISCUSSIONS WITH TEACHERS-FACULTY-COUNSELORS - ROADBLOCK SUMMITS WITH FEEDER SCHOOLS
3. INTEGRATE TRANSFER/FINANCIAL AID MINI-SESSIONS (USE TRAINED STUDENT PEERS) INTO THE CLASSROOM FOLLOW-UP WITH 1:1 APPOINTMENTS
4. INCREASE STUDENT-USE OF DEGREE WORKS
5. INCREASE THE INTEGRATION OF DISCIPLINE-SPECIFIC OC-OHSD-UC/CSU OUTREACH PROJECTS
6. EXPAND THE USE OF UNDERGRADUATE RESEARCH PROJECTS
7. EXPAND THE USE OF CROSS-DISCIPLINE TEACHING/LEARNING
8. SYSTEMATIZE THE TRACKING OF TUTORING AND ITS IMPACT ON STUDENT SUCCESS (IMPLEMENT CQI PROCESS)
9. CONTINUE TO ENCOURAGE FACULTY OFFICE HOURS IN THE LRC AND STEM CENTER FOR ALL DISCIPLINES
# Evaluation System: Data-Based Decisions

A very comprehensive system of evaluation has been established over the first year. Each major project or program that is implemented under this grant begins with the development of a logic model. This grant’s effective program evaluation does more than collect, analyze, and provide data. It makes it possible for grant stakeholders to gather and use information, to learn continually about and improve programs that we operate in or fund. Oxnard College believes evaluation – especially program logic model approaches – is a learning and management tool that can be used throughout the grant program’s life – no matter what stake each person has in the program. Using evaluation and the logic model results in effective programming and offers greater learning opportunities, better documentation of outcomes, and shared knowledge about what works and why. The logic model is a beneficial evaluation tool that facilitates effective program planning, implementation, and evaluation. Each major project funded under ASCENCIÓN has a logic model which is a picture of how the program works - the theory and assumptions underlying the program. This model provides a road map of each program, highlighting how it is expected to work, what activities need to come before others, and how desired outcomes are achieved. Below is the general logic framework for the ASCENSIÓN.

## ASCENSION – General Theory of Action

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Activities</th>
<th>Participation</th>
<th>Local &amp; Global Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grant money</td>
<td>Implementing grant specified activities/projects</td>
<td># of partnerships and other stakeholders and industry leaders</td>
<td>Students’ satisfaction</td>
</tr>
<tr>
<td>STEM’s center</td>
<td>Recognizing students, community and educational agencies’ needs</td>
<td># of summer bridge activities</td>
<td>Dissemination of programs</td>
</tr>
<tr>
<td>Action board</td>
<td>Building partnerships</td>
<td># of long-term programs</td>
<td>Partnerships fostered</td>
</tr>
<tr>
<td>District</td>
<td>Negotiating partnerships</td>
<td>Extent of STEM tutoring services</td>
<td>Self-sustaining partnerships</td>
</tr>
<tr>
<td>Trustees</td>
<td>Developing programs</td>
<td># of Workshops / information sessions</td>
<td>Development of efficacious programs</td>
</tr>
<tr>
<td>Administrators (e.g., grant director, community partnership advisor, evaluators)</td>
<td>Hiring and assigning faculty and program facilitators</td>
<td># of students served</td>
<td>College readiness</td>
</tr>
<tr>
<td>Partnerships with CSUCI &amp; UCSB</td>
<td>Reviewing student progress</td>
<td># of professional development activities for teachers and counselors</td>
<td>STEM graduates</td>
</tr>
<tr>
<td>Connections with industries and industry leaders</td>
<td>Incorporating evaluations</td>
<td># unique sites and sustainable projects or program services</td>
<td>Students’ transfer to 4-year institutions</td>
</tr>
<tr>
<td>Legislation</td>
<td>Improving programs</td>
<td># consultants’ hours</td>
<td>Trained teachers, consultants, and faculty</td>
</tr>
<tr>
<td>Clients (OC, OUHSD, CSUs UCs, students, parents, the community)</td>
<td></td>
<td># STEM Stew meetings</td>
<td>Increased institutional capacity</td>
</tr>
<tr>
<td>Knowledge and Prestige</td>
<td></td>
<td># hours of program implementation on sites</td>
<td>Legislative goals met</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evaluators’ inputs</td>
<td>Replication and dissemination</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Achieve grant goals and objectives</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Self-sustaining educational communities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Data-based decision making</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OC STEM branding</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fostering college-going and STEM communities</td>
</tr>
</tbody>
</table>
The framework established in the first year of implementation is based on Tomas Rivera's (2008) Contributing Factors. Using this framework increased our evaluation’s effectiveness by focusing on questions that have real value for our student’s success.
The complexity of this grant is heightened by the fact that ASCENSIÓN is also developing evaluations around impacts made in the Personal, Social and Academic domains as outlined in the logic model below.

ASCENSION – General Theory of Action by Domains

**Inputs**
- Grant money
- STEM center Facility (OC, HSs, other)
- Action board, District, Trustees
- Partnerships with CSUCI & UCSB
- Connections with the surrounding industry
- Administrators (e.g., grant director, CPA, evaluators)
- Clients (OC, OUHSD, CSUs, students, parents, the community)
- Connections with industries and industry leaders
- Legislation
- Knowledge + Prestige

**Activities**
- Summer bridge activities
- Long-term programs
- STEM tutoring services
- One-time workshops / information sessions about college, the industry, etc.
- Internships/ job shadowing

**Outputs**
- Engage in activities that promote familiarity with college programs and requirements, campus life, and college financing
- Get hand-on exposure to the STEM field
- Engage in activities that promote the development of critical thinking, study habits, communication skills and perceived self-efficacy
- Get exposure to their surrounding area and its natural resources
- Engage in activities that promote interpersonal capacity

**Short-term Outcomes**
- Increase students’ comfort and interest in going to college and in the STEM fields
- HS students take the A-G courses and the college entry exams
- Students are well prepared for college
- Increase students’ knowledge and aspirations to transfer
- Enforce students’ Academic and STEM specific self-efficacy

**Long-term Outcomes**
- Students develop an educational / career plan
- Increase in the number of students who attend college
- Increase in the number of students who major in STEM
- Increase in the number of OC graduate and transfer students
- Increase retention
- Decrease length of time to graduation
- Students serve as role models and leaders in their community
- Replication of programs and dissemination of knowledge

**Personal Domain**
- Engage in activities that promote familiarity with college programs and requirements, campus life, and college financing

**Social Domain**
- Get hand-on exposure to the STEM field
- Get exposure to their surrounding area and its natural resources

**Academic Domain**
- Engage in activities that promote the development of critical thinking, study habits, communication skills and perceived self-efficacy
- Engage in activities that promote interpersonal capacity

[Diagram showing the logic model with connections between inputs, activities, outputs, and outcomes for each domain]
In addition, a concerted effort has been placed on working with the seven local high schools (Oxnard Union High School District, OUHSD) which are Oxnard College’s feeder high schools, in developing a logic model and programs to better prepare students to enter college/university. This working relationship involves partnering with them to develop summer bridge programs, tutoring and mentoring as well as STEM Expo’s on the Oxnard College Campus. Below is the Logic Model developed and used in the first year of this grant.
Because logic models are pictorial in nature, they require systematic thinking and planning to better describe programs. The visual representation of the master plan in our logic models are flexible, points out areas of strength and/or weakness, and allows stakeholders to run through many possible scenarios to find the best. We adjust approaches and change courses as program plans are developed. Ongoing assessment, review, and corrections produce better program design and a system to strategically monitor, manage, and report program outcomes throughout development and implementation. Effective evaluation and program success rely on the fundamentals of clear assumptions and expectations about how and why a program will solve a particular problem, generate new possibilities, and make the most of valuable assets. The logic model approach helps this grant create shared understanding of and focus on program goals and methodology, relating activities to projected outcomes. Below is the cycle of events that occurs throughout the evaluation and implementation of projects.

- Data Needs
- Process/Procedure Changes
- Form Revisions
- Communication Methods and/or Improvements
- Training …

Include integration and communication to and from other committees or personnel

SHARE the outcomes and developments within and outside the college to build knowledge, integration and continuous improvement

Complete a quick SWOT analysis and identify Improvement Need(s) and Desired Outcome(s)

Make Recommendations based on Findings

Oxnard College STEM Grant 2011-12 Integration, Evaluation & Improvement Approach

Assign Ownership "who will do what by when"

Develop a plan and/or timeline of events with expected outcomes

Monitor activities and timeline of actions to be taken/events at each meeting

Analyze and Interpret the outcomes and data

Make Recommendations based on Findings

Include integration and communication to and from other committees or personnel

Data Needs

Process/Procedure Changes

Form Revisions

Communication Methods and/or Improvements

Training …
II. SUMMER BRIDGES

A. MARINE CENTER SUMMER BRIDGE

Project “ASCENSION” Oxnard College, in cooperation with California State University Channel Islands (CSUCI), University of California at Santa Barbara (UCSB), and Oxnard Union High School District (OUHSD) set as one of its goals to continue to establish an early readiness awareness framework for STEM degrees among Hispanic students.

Under Project “ASCENSION”, a 3-week summer bridge program took place in the Marine Center at Oxnard College. The program served 30 incoming 12th grade students at Hueneme High School. Aiming to increase students’ interest and motivation in STEM disciplines, the program exposed students to science through project-based learning activities and various educational excursions. Students also experienced collaborative work, preparing and delivering presentations—desired skills in STEM disciplines and in higher education.

Concentrating on both outcomes and implementation of the program, the program was evaluated using multiple evaluation components and perspectives. Results indicated that the program successfully exposed students to the sciences, specifically, environmental science, biology, and geology, collaborative work, preparing and delivering presentations, and to higher education and industry settings. Specifically, statistical analyses revealed the following outcomes:

- Increases in students’ confidence performing in environmental science, biology, and geology, as well as in math.
- Increases in students’ interest in environmental science, biology, and geology.
- Improved attitudes toward environmental science, biology, and geology.
- Increases in students’ self-evaluations of their content knowledge in environmental science, biology, and geology.
- Increases in students’ interest, motivation, and understanding of STEM disciplines and careers.
- Increases in students’ confidence performing in groups.
- Improved attitudes toward collaborative work.
- Increases in students’ confidence preparing for and delivering presentations.

Overall, students and professors had a very positive perception of the program, its implementation and operation. In addition, as Project “ASCENSION” aspires to contribute to the generation of knowledge and the improvement of practice in servicing pre-college Hispanic students, considering the feasibility of replicating the program across settings was an important side-goal set by the project director. The implementation of the program this year allowed for the initiation of a process aimed at recognizing the critical elements for a successful replication of the program across settings and its implementation by other high schools-community colleges’ partnerships.
Under Oxnard College’s Title V STEM grant (“Project ASCENCION”), a three-week summer bridge program was offered to incoming 12th grade students at Hueneme High School. All participating students (N=30) belonged to the school’s Engineering Academy cohort.

STUDENTS’ CHARACTERISTICS
Hueneme High School professionals provided the following student profile:

- Students belong to the school’s Engineering Academy cohort
- Participation in the program is highly encouraged by the school, though it is not mandatory as some students must attend various familial and other commitments during the summer
- The group of students may be classified as heterogeneous, as it includes English language learners, migrants, and students with varying degree of mathematical knowledge, among others
- School professionals indicated students are experiencing socio-economic, cultural, and familial barriers attending college.

PROGRAM GOALS
Centered in the Marine Center at Oxnard College and facilitated by three of the Center’s professors (Tom O’Neil, Bryan Swing, and Dee Anderson), the program aimed to achieve the following six goals:

1. Students experience science (i.e., environmental science, biology, geology) through project-based work.
2. Students develop their abilities of thinking and working in teams, and learn to appreciate the value of collaborative work.
3. Students develop their presentation skills:
   a. develop their ability to effectively prepare a visual presentation,
   b. develop their ability to deliver an effective oral presentation.
4. Decreased students’ stereotypes about STEM careers (and those who work in STEM)
5. Increased students’ understanding of STEM careers and the integration among STEM disciplines.
6. Increased students’ interest and motivation in learning and working in STEM.

CURRICULUM
Curriculum followed weekly themes; the learning of the students was fostered by designated educational excursions.

  Week 1: The exploration of coastal and island plants, marine life, and physical oceanography.
    Educational excursion: Santa Cruz Island
Week 2: The exploration of geology and Pleistocene through Recent life.
Educational excursion: La Brea Tar Pits
Week 3: The exploration of near-shore animals, algae and their different habitats.
Educational excursions: Oxnard College, and Ty Warner Sea Center.

PROTOCOL
The aim of the evaluation was twofold: (a) to measure program outcomes with respect to the pre-declared goals; (b) to provide insight into the program’s implementation and operation. Accordingly, several surveys were administered to students as follows:

- **Pre-post survey** – the same survey was administered twice; on the first day of the program and at the end of the program with the purpose of analyzing the data via paired comparisons to guide conclusions on the outcomes of the program.
- **Week 1 survey** – tailored to the specific weekly theme and educational excursion; included both scale and open-ended questions.
- **Week 2 survey** – Following week 1 survey and the recognition that the administration of the surveys may be burdensome on students, the original survey was shortened and, hence, week 2 survey was shorter than week 1 survey.
- **Week 3 survey** – same as week 2 survey above.
- **End-of-program survey** – included both scale questions and one open-ended question.

In addition, at the end of the program, a survey was administered to the professors, encouraging them to reflect on the program’s implementation, operation, and pre-defined goals.

PROGRAM OUTCOMES: ANALYSES AND RESULTS

*INCREASED CONFIDENCE, MOTIVATION, AND INTEREST IN STEM-RELATED FIELDS*

Three subject matters were central to the curriculum of the program: environmental science, biology, and geology. Students were asked to indicate on a scale ranging from 0 to 100 their level of confidence in each of these areas. More specifically, students reflected on six aspects per subject area (i.e., understand the specific content area; explain concepts in the content area to others; get good grades in content area; enjoy learning content area; pursue a college degree in content area; and, have a job that requires some knowledge in content area). In light of the high reliabilities among the six items in each content area (Cronbach’s $\alpha$ ranging between 8.1 and 9.15),
averaged confidence scores (pre- and post- program) were calculated for each student on each of the three content areas. Paired t-test comparisons revealed significant increases in students’ confidence performing in each area (results are presented in the table below).

<table>
<thead>
<tr>
<th></th>
<th>M (pre)</th>
<th>M (post)</th>
<th>Difference</th>
<th>t</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental science</td>
<td>62.1</td>
<td>69.36</td>
<td>8.27</td>
<td>2.21</td>
<td>25</td>
<td>.037</td>
</tr>
<tr>
<td>Biology</td>
<td>63.87</td>
<td>69.10</td>
<td>5.90</td>
<td>1.73</td>
<td>25</td>
<td>.096</td>
</tr>
<tr>
<td>Geology</td>
<td>56.24</td>
<td>65.48</td>
<td>8.88</td>
<td>2.75</td>
<td>25</td>
<td>.034</td>
</tr>
</tbody>
</table>

*Note: N=26*

Similarly, though not at the core of the curriculum, students were also asked to indicate their levels of confidence with STEM content areas (i.e., mathematics, technology, engineering, and science) on the same six domains as listed above. Similar statistical procedures (i.e., reliability testing, computing averages and conducting paired comparisons) revealed that the program also had a positive effect on students’ confidence in mathematics (p=.042) and science (p=.042).

In addition, students also reflected directly on their change in interest and confidence in the three subject matters central to the program’s curriculum, as follows:
STUDENTS’ ATTITUDES AND CONTENT KNOWLEDGE IN ENVIRONMENTAL SCIENCE, BIOLOGY, AND GEOLOGY

Students indicated their attitudes toward environmental science, biology, and geology on a scale ranging from 1=strongly dislike to 7=strongly like. These ratings were averaged such that each student had two scores: to reflect his/her attitudes pre- and post-program. Students also self-rated their knowledge in each of the subjects on a 7-point scale (ranging from 1=very weak to 7=very strong). These ratings were also averaged. Paired comparisons revealed no significant change in students’ attitudes, though the shift in attitudes was in the desired direction ($M=5.01$, $M=5.19$, for pre- and post-survey respectively). A significant increase in students’ self-evaluation of their content knowledge was evident ($M=4.24$, $M=4.63$, for pre- and post-survey respectively; $p=.012$).

INCREASED INTEREST, MOTIVATION, AND UNDERSTANDING OF STEM DISCIPLINES AND CAREERS

Students were asked to reflect on their interest, motivation, and understanding of STEM by responding to six items (on a scale ranging from 1=fully disagree to 7=fully agree). Particularly, the following items were introduced to the students:

- I have an interest in at least one of the subjects included under the STEM field
- It is important to me personally to be good in STEM
- I see myself, in the future, working in a field that requires some STEM knowledge
- I have an understanding of different STEM careers
- I have an understanding of how the STEM disciplines are connected
- I would like to study one of the STEM subjects in college

High Cronbach’s $\alpha$ reliabilities (.86 for pre-survey items; .85 for post-survey items) supported the computation of averaged scores. Thus, two scores were calculated per student: to reflect the pre- and post-perceptions of the students. Significant increase on the composite score, meaning in students’ interest, motivation, and understanding of STEM, was found ($M=5.35$ pre-survey; $M=5.86$ post-survey; $p=.012$).

STEM-RELATED STEREOTYPES

Students stereotyped perception of STEM fields were measured by averaging across eight items (e.g., “working in the STEM field means doing the same routine job every day”, Cronbach’s $\alpha = .70$ for pre survey, .74 for post survey) ranging on a scale between 1=fully disagree to 7=fully agree. Paired comparisons did not result in significance. It is interesting to note, though, that students’ initial levels of stereotyped perception were relatively low ($M=2.42$, $M=2.30$, for pre- and post-survey respectively). This means that students’ stereotyped perception was not strong to begin with.
COLLABORATIVE WORK

Five items (on a 0-100 scale) were used to evaluate students’ confidence participating in collaborative work (Cronbach’s $\alpha = .88$ for pre survey and .90 for post survey) and five items (7-point scale) evaluated students’ perceptions and attitudes toward working in collaboration (Cronbach’s $\alpha = .86$ for pre survey and .92 for post survey). Averaging across categories and conducting paired comparisons showed no significant differences in students’ confidence and/or attitudes between the start of the program and its ending. Still, the trend was in the desired direction. More specifically, students’ confidence increased from $M=86.62$ to $M=89.08$, and their attitudes changed in the positive direction, increasing from $M=5.54$ to $M=5.86$. Considering the students participating in the program have been working together as a cohort for a couple of years, achieving this amount of positive changes in their confidence levels and attitudes toward collaborative work is very satisfying.

INCREASED CONFIDENCE IN PREPARING FOR AND DELIVERING PRESENTATIONS

Students were asked to evaluate their ability to deliver an effective oral presentation as well as to prepare an effective visual presentation. Results indicated increased students’ confidence in both domains ($p=.001$ and $p=.003$, in this order).
STUDENTS’ DEVELOPMENT
At the end of the program all, but one student, indicated that the program was relevant to their scholar development.

![Graph](image)

PROGRAM IMPLEMENTATION AND OPERATION: ANALYSES AND RESULT
STUDENTS’ PERSPECTIVES
CURRICULUM
Each of the three weeks of the program had a pre-defined theme and an accompanying educational excursion. At the end of each week students were asked to reflect on their week’s learning using a scale ranging from 1=fully disagree to 7=fully agree. The results (presented in the following graph) indicate that all topics were covered in their respective week, as planned.

![Bar chart](image)
STUDENTS’ SATISFACTION WITH THE WEEK-SPECIFIC ACTIVITIES

At the end of each week students were asked to indicate the extent to which they agree with the following statement: “I think this week’s activities should be kept in the program for next year”. As indicated in the graph below, students were pleased with the activities.

![Graph showing students' satisfaction](image)

In addition, students were asked to reflect on their weekly educational excursion, particularly, the extent to which the trip was valuable, interesting, prompted their thoughts about their plans for the future, and should be kept in the program for next year. A 7-point scale was used with higher averages indicating more favorable attitudes. Averages per excursion are detailed in the table below.

<table>
<thead>
<tr>
<th>Excursion</th>
<th>Valuable</th>
<th>Interesting</th>
<th>Promoted thoughts about the future</th>
<th>Should be kept in the program for next year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa Cruz Island (Week 1)</td>
<td>5.92</td>
<td>6.33</td>
<td>5.25</td>
<td>6.39</td>
</tr>
<tr>
<td>La Brea Tar Pits (Week 2)</td>
<td>5.88</td>
<td>6.36</td>
<td>4.71</td>
<td>6.28</td>
</tr>
<tr>
<td>Oxnard College (Week 3)</td>
<td>6.04</td>
<td>6.20</td>
<td>6.08</td>
<td>6.48</td>
</tr>
<tr>
<td>Ty Warner Sea Center (Week 3)</td>
<td>6.04</td>
<td>6.12</td>
<td>5.56</td>
<td>6.28</td>
</tr>
</tbody>
</table>

\[
\text{\textit{n}} \quad 28 \quad 25 \quad 26 \quad 26
\]
LENGTH OF THE PROGRAM

Most students agreed with the length of the program (i.e., 3 weeks): \( n = 18 \) stated the length was “just right”; \( n = 6 \) thought the program was “too short”; and, \( n = 1 \) found it to be “too long”.

STUDENTS’ OVERALL SATISFACTION WITH THE PROGRAM

At the end of the program students pointed out very high satisfaction with the program. Particularly, all respondents indicated that they will recommend other students to participate in the program.

The positive perceptions of the students were also evident in their comments. Here are a few examples of students’ comments:

- “No comments; It was really fun”
- “Everything was interesting”
- “Great program!! 😊”
- “I think it’s a really great program”
- “I love it; it was great”
- “It was very fun. We learned something new every day”
- “Make the program longer!!! It’s really interesting.”
- “Thanks to everyone that made this possible”

PROFESSORS’ PERSPECTIVES

Professors were asked to reflect on several topics, including but not limited to, the curriculum, educational excursions, and the goals of the programs. Their cooperation with the evaluation component along the way should be praised and their responses to the end-of-the-program survey proved insightful and valuable. A summary of the professors’ perspectives follows.
**CURRICULUM**

Revision to the current curriculum may be in place as follows:

- Some worksheets need to be updated.
- Some lectures should be refined.
- An addition of one educational excursion during the second week is recommended.
- Professors felt that the presentation component was important for the experience of the students and proved successful; still, they noted to make it clearer to students that students should choose a theme for their presentations.

**EDUCATIONAL EXCURSIONS**

- In general,
  - All educational excursions were a great experience to students.
  - Students should be briefed before each educational excursion and during the bus drive about the things they see (or about to see); also, students should be advised to bring their own snacks to educational excursions.

- More specifically,
  - Santa Cruz Island:
    - Ranger Tiffany Leon (who is in her early twenties) gave a great talk about her career; the hike from Prisoners’ to Pelican worked great.
    - More sandwiches are needed for this kind of an educational excursion; a later pick up time from Island Packers may permit looking for whales; verify bus driver knows where to drop off the students.
  - La Brea Tar Pits:
    - Worksheets need to be developed; and background about time period should be stressed.
  - Oxnard College:
    - Speakers were excellent; STEM Center video film was informative; visiting OC made students feel more comfortable about how to enroll to and take classes at OC.
    - Should be made longer as speakers could have used more time.
  - Ty Warner Sea Center
    - The educational excursion emphasized careers in STEM; meeting one of the OC Marine Center’s former student workers who functions as the lead aquarist there was powerful.
Due to the possibility of running into unexpected heavy traffic on the highway, it is recommended that the bus would take the coastal rout both directions. Evaluator comment: the original plan was for the educational excursion to include two stops. One at the sea center and one at UCSB. Due to heavy traffic and time limitation, in practice, professors decided not to visit the second location. Next year’s planning should take this into consideration.

**PROGRAM’S GOALS**

Unanimously, all professors agreed that the program fully met its pre-defined goals. In addition, they thought goals were appropriately and sufficiently defined to address students’ needs within the STEM framework. No revision or additions to the pre-defined goals were suggested.

**PROGRAM’S STRENGTHS**

According to the professors, the program demonstrated to students that science can be both challenging and fun. It also exposed students to STEM educational and career paths, and to related course and program offerings at Oxnard College.

**OPERATION**

- Having the program based at the Marine Center proved beneficial and important as students had access to aquaria and both lecture and lab rooms.
- Computer programs needed to be upgraded.
- An additional educational excursion – to the Santa Barbara Museum of Natural History and Botanical Gardens – should be incorporated into the program.
- Additional purchases: flash drives (one per student), additional backup cameras, and large ice chest on wheels for educational excursions, first aid pack for educational excursions and for lab.
- Food and water: have less days of pizza and more days of sandwiches; more bottled water is needed.
- Need a hand held microphone in addition to a lavalier for students’ presentations.
- Bringing the juniors over on the last day to see the seniors’ presentations was good and induced juniors with motivation and anticipation to next year.
- Professors felt that their team worked well together, and that there was an excellent fit between the team of instructors and the content of the program.
REPLICATION OF THE PROGRAM

The professors agreed that the program may be replicated to any group of students that have desire and motivation to participate in a STEM bridge program; it may also be altered to fit different students’ backgrounds. Nevertheless, having the program run specifically in the marine center was found by the professors to be crucial to the success of the program. Running the program multiple times during one summer was also mentioned feasible.

EVALUATION

Professors noted that the evaluation surveys were too lengthy to students.

EVALUATION: LESSONS LEARNED

1. Working closely with the professors prior to the beginning of the program on the development of the evaluation component and tailoring the evaluation to the specific program goals and operation had an extremely high value.
2. Students should be surveyed less frequently, and more importantly, surveys should not be lengthy. This, of course, is a subjective call and should be informed by the overall number of surveys, ratio of open-ended questions to scale questions, amount of questions per category/table, etc.
3. In surveying students, do not use statements that are phrased on the negative side (i.e., reverse coded items). This confused the students and proved invalid.
4. In surveying students, minimize the use of open-ended questions. This increased the burden on students and, in hindsight, did not add value to the evaluation.
5. Administration of end-of-program survey to professors proved to be very important and beneficial. Their input can be directly integrated into next years’ programs.
6. As planning and implementation may change during the course of the program, it is very important for the evaluator to keep informed with developments and revisions in the program plan, and update the evaluation materials accordingly.

Conclusions and Recommendations

The Marine Center summer bridge program serviced 30 Hueneme high school incoming 12th grade students. The three-week program focused on exposing students to science through project-based learning and introducing students to the natural resources in their surrounding area. The program covered topics in environmental science, geology, and biology, and aimed to increase students’ interest, motivation, confidence, and familiarity with STEM disciplines.
Data collected demonstrated that the program achieved most of its pre-defined goals. More specifically, analyses revealed increases in students’ motivation, interest, and understanding of STEM, and in students’ presentation skills. All of which, in turn, contribute to the preparation of students to 12th grade, and may increase the likelihood of students’ attending college and majoring in STEM. Data did not support a change in students’ stereotyped perceptions, but suggested students’ pre-program perceptions was not saturated with stereotypes. In addition, positive changes in students’ attitudes toward team work were found, though were not significant. Considering the small sample size, these results are still encouraging.

Students’ and professors’ reflections on the operation of the program indicated that the program was well planned and properly delivered. Though minor, suggestions for improvements were offered by the professors, and it is recommended that these suggestions be taken into consideration in planning for next year. Considering the successful implementation and most favorable outcomes of the program, it is recommended that the program run again each summer and perhaps expand to include multiple sessions to allow for the service of more students. More thought is needed in the replication of the program to other populations (e.g., groups of students who do not belong to a pre-defined cohort) and to other locations. If replication across populations and locations is an important vision of the program, it may prove beneficial to have the evaluator participate as an observer in next year’s program to extract the critical components for successful implementation.

**B. Pre-engineering Summer Bridge**

Under Project “ASCENSION”, a 3-week summer bridge program took place at Oxnard College. The program served 39 incoming 11th grade students at Hueneme High School. Aiming to increase students’ interest and motivation in STEM disciplines, the program exposed students to science through project-based learning activities and various educational excursions. Students also experienced collaborative work, problem solving and the planning of work procedures—all of which are skills desired in STEM disciplines and in higher education.

Concentrating on both outcomes and implementation of the program, the summer bridge was evaluated using multiple evaluation components and perspectives. Results indicated that the program successfully exposed students to the sciences, specifically, physics, engineering and chemistry, to collaborative work, and to higher education and industry settings. Critical elements for replication of the program across settings were recognized, thus, suggesting other high schools-community college partnerships may successfully implement the program.
Under Oxnard College’s Title V STEM grant (“Project ASCENCION”), a three-week summer bridge program was offered to incoming 11th grade students at Hueneme High School. Prior to participating in the summer bridge program, students were already affiliated with the school’s Engineering Academy (N=23), or had just been selected to enter the cohort in the upcoming year (N=16). All of these students were offered the opportunity of participating in the pre-engineering summer bridge program.

STUDENTS’ CHARACTERISTICS

Hueneme High School professionals provided the following student profile:

- Some students (n=23) were taking a class together before the summer but not necessarily working together in teams.
- Participation in the program was highly encouraged by the school, though it was not mandatory as some students must attend various familial and other commitments during the summer.
- Some students were familiar with team work since they may have experienced that in one of their classes, however, this program would offer a great learning opportunity to work within different teams at various intervals of the program.
- The group of students may be classified as heterogeneous, as it includes English language learners, migrants and students with varying degree of mathematical knowledge among others.
- School professionals indicated students are experiencing socio-economic, cultural, and familial barriers attending college.

PROGRAM GOALS

Centered at Oxnard College, the program was facilitated by two Hueneme High School instructors-Jay Robnett and Lupe Zamora, and one university graduate assistant-Emmanuel Guerreo. The program aimed to achieve the following five goals:

1. Students experience science (i.e., physics, engineering, chemistry) through project-based work.
2. Students develop their abilities related to thinking and working in teams, and learn to appreciate the value of collaborative work.
3. Students build up their perseverance and develop a healthy approach to coping with complex problems.
4. Students develop their planning skills (mainly week 1).
5. Increased students’ interest and motivation learning about the STEM fields and working in related areas.

1 Mr. Zamora facilitated weeks 1 and 2.
CURRICULUM
Curriculum followed weekly themes and the learning of the students was fostered by designated educational excursions.

    Week 1: Rube Goldberg Activity.
    Week 2: Robotics using Lego NXT. Educational excursion: The Navy Base
    Week 3: Chemistry. Educational excursions: California State University Channel Island and the Marine Center at OC.

PROTOCOL
The aim of the evaluation was twofold: (a) to measure program outcomes with respect to the pre-declared goals; (b) to provide insight into the program’s implementation and operation. Accordingly, several surveys were administered to students as follows:

    o Pre-post survey – the same survey was administered twice; on the first day of the program and at the end of the program with the purpose of analyzing the data via paired comparisons to guide conclusions on the outcomes of the program.
    o Week 1 survey – tailored to the specific weekly theme; included both scale and open-ended questions.
    o Week 2 survey – tailored to the specific weekly theme and educational excursion; included both scale and open-ended questions.
    o Week 3 survey – see week 2 survey above. Following week 1 and week 2 surveys and the recognition that the administration of the surveys may be burdensome on students, the original survey was shortened and, hence, week 3 survey was shorter than previous weeks’ surveys.
    o End-of-program survey - included both scale questions and one open-ended question.

In addition, at the end of the program, a survey was administered to the instructors encouraging them to reflect on the program’s implementation, operation, and pre-defined goals.

PROGRAM OUTCOMES: ANALYSES AND RESULTS
PRE- AND POST-SURVEYS
Using pre- and post-surveys, students were asked to report their level of confidence and attitudes/perceptions toward several domains including STEM-related fields, collaborative work and problem solving.
All in all, surveys included 83 scale items: Confidence items (i.e., “Please rate how certain you are that you can do each of the things described below...”) ranged on a 0-10 scale and, attitudes/perceptions items followed a 7-point scale with higher numbers indicating more favorable attitudes/perceptions (reverse coded items were also used in the survey; these were re-coded prior to running the analyses).

The following protocol was used in conducting the analyses:

1. Negatively phrased/ reverse coded items were excluded from the analyses, as it was suggested by students’ response patterns that these items were confusing to them and therefore their validity should be questionable.
2. A few additional items were excluded on the basis of their content. These items, while made sense originally, did not fit conceptually with other items in their block.
3. Descriptive statistics was obtained to mitigate the risk of conducting data entry errors.
4. Within blocks of questions (e.g., students’ confidence working in teams, students’ attitudes toward STEM), Cronbach’s $\alpha$ reliability scores were calculated to examine the extent to which items belonged together. Reliability scores were calculated separately for pre- and post-items.
5. For blocks of questions which demonstrated high reliability values (above .60), averaged scores were computed per student to reflect the students’ pre- and post- program levels of confidence or attitudes/perceptions in the specific domain. Thus, each student had two scores (average pre-program and average post-program) per domain and it was feasible to conduct paired t-test comparisons to examine program outcomes.
6. For blocks of question which demonstrated low reliability values, average scores were not computed; rather, paired t-test comparisons were ran on the individual items.

RESULTS

In the pre/ post surveys students were asked about their attitudes and confidence levels with a variety of topics, such as learning STEM subjects and working in groups. These questions were based on the assumption that students had sufficient exposure to learning STEM, working on complex problems and collaborating with other students. Running the analyses, examining students’ responses to the end-of-program survey and exploring their answers to the open questions, this assumption turned out to be false. Students had no meaningful prior experience with these domains and, most likely, provided their answers to the pre-survey without having substantial knowledge of themselves under these situations.
Indeed, paired comparisons of the pre and post surveys revealed that none of the comparisons resulted in statistical significance in the desired direction. More specifically, the bulk part of the comparisons resulted in no statistical significant difference between students’ pre- and post-program’s confidence levels and attitudes/perceptions. Two comparisons indicated significant results in the opposite direction and one comparison was border-line significant in the opposite direction, as follows:

- Students’ attitudes and perceptions toward STEM: $M=6.02$ (pre), $M=5.64$ (post), $p=.03$
- Students’ confidence working in groups: $M=8.61$ (pre), $M=7.89$ (post), $p=.03$
- Students’ attitudes/perceptions toward group work: $M=5.44$ (pre), $M=5.10$ (post), $p=.06$

The end-of-program results (presented in the following section) suggested an opposing perspective. Following the presentation of these results, a discussion section, offering an integrative view of the results is presented.

**END-OF-PROGRAM SURVEY**

At the end of the program, students were administered a short end-of-program survey. Students’ responses to the end-of-program survey offered encouraging results. More specifically, most of the students felt that they had learned new things in each of the three subjects at the core of the program’s curriculum: physics, engineering, and chemistry. Furthermore, through participation in the program, students realized that these subjects have relevance to their everyday life. In addition, most students indicated an increased confidence in physics (85.7%), engineering (71%), and chemistry (64.7%). These outcomes are presented in the graphs below.
Finally, at the end of each week, students reflected on their collaborative work; specifically, whether or not, through the weekly activities, they had learned to better apply themselves in groups (first two weeks) or in a pair (third week). Results showed that activities appropriately addressed that goal. More specifically, most students agreed to the following statement: “Through this activity, I have learned how to better apply myself in a group / pair”, as can be seen in the graph below.

DISCUSSION
How might we settle the unexpected and somewhat contradicting results? In a way, the program was (almost) a first exposure for students to physics, engineering, chemistry and, certainly in a project-based problem solving setting. In addition, they hardly had any prior experience working in groups. At the beginning of the program, students were administered a pre-survey and were asked about their attitudes/perceptions and level of
confidence in STEM, collaborative work, and coping with complex problems. Having no substantial prior experience to guide them as reference, it may be that students responded to the survey based on their intuition or what they believed their attitudes and confidence toward each domain would be.

For example, students probably have been socially interacting in groups prior to joining the program, however, they had little opportunity (if at all) to engage in team building activities, where reaching consensus is crucial in order for the group to accomplish a desired outcome. Once exposed to these domains through participation in the program, students had the opportunity to put to test their beliefs and examine their true feelings toward the subject matters and different domains.

Support to this line of thought may be found in the instructors’ end-of-program surveys (see page 14), where they noted that students did not have much prior experience working in groups. Additional support may be tracked down in students’ comments to some open-ended survey questions. Specifically, on week 1 and week 2 surveys where students were asked to indicate the most challenging thing they encountered, the good things about the week’s activities and ways in which the activity may be improved. Thirteen (13) students wrote that being able to choose their own groups would improve the activity (e.g., “let people choose their own partners”; “don’t pick the groups for the students”). In addition, nine (9) students picked the group work as the most challenging aspect they encountered that week mainly, but not only, the need to come to an agreement (for example, “...the team cannot agree on one thing”; “… coming up with an agreement that the whole group agrees with and then cooperating on it”; “Working in a group; there is always 1 person that doesn’t show up and 1 person that hardly does anything, doesn’t listen to new ideas”). Though at times working in groups was frustrating to students, it was also a learning experience for them. Twenty-one (21) students listed their group work as one of the good things that happened on the first week (for example: “It built my patience for people”; “It made us work together”; “…learning to listen to others ideas, the power of cooperation”). Students also commented about their groups and the group activity in their responses to the week 2 survey though to a much less extent. This may be attributed to the robotics activity itself, being more prominent in their experience, or the educational excursion to the Navy Base (no educational excursion took place on the first week). It may also be the case that students learned how to better apply themselves in groups (as was also evident in their responses to the scale questions, see graph on page 9) and therefore had less of an intensive reaction to working in this setting. Taken together and considering one of the goals of the program was to have students develop their team work abilities and learn to appreciate the value of collaborative work, these results provide support of the project’s favorable outcomes.
PROGRAM IMPLEMENTATION AND OPERATION: ANALYSES AND RESULTS

STUDENTS’ PERSPECTIVES

CURRICULUM

Each of the three weeks of the program had a pre-defined theme; week 2 and week 3 also had accompanying educational excursions. At the end of each week students were asked to reflect on their week’s learning using a scale ranging from 1=fully disagree to 7=fully agree. As discussed in the section above, each of the weekly themes was covered and students felt they had learned new things in physics, engineering, and chemistry.

STUDENTS’ SATISFACTION WITH WEEK-SPECIFIC ACTIVITIES

At the end of each week students were asked to indicate the extent to which they agreed with the following statement: “I think this week’s activities should be kept in the program for next year”. As indicated in the following graph, students were pleased with, and saw the value of, the activities.

In addition, students were asked to reflect on their weekly educational excursion, particularly, the extent to which the trip was valuable, interesting, prompted their thoughts about their plans for the future, and whether it should be kept in the program for next year. A 7-point scale was used, with higher averages indicating more favorable attitudes. Averages per excursion are detailed in the table below.

<table>
<thead>
<tr>
<th></th>
<th>The Navy Base (Week 2)</th>
<th>CSUCI (Week 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valuable</td>
<td>4.65</td>
<td>5.06</td>
</tr>
<tr>
<td>Interesting</td>
<td>4.50</td>
<td>5.18</td>
</tr>
<tr>
<td>Promoted thoughts about the future</td>
<td>4.80</td>
<td>5.24</td>
</tr>
<tr>
<td>Should be kept in the program for next year</td>
<td>4.77</td>
<td>5.45</td>
</tr>
<tr>
<td>n</td>
<td>25-26</td>
<td>33-34</td>
</tr>
</tbody>
</table>

Note. No data were collected on the field trip to the Marine Center as it took place on the last day of the program.
LENGTH OF THE PROGRAM
Most students agreed with the length of the program (i.e., 3 weeks): $n=24$ stated the length was “just right”; $n=6$ thought the program was “too short”; and, $n=3$ found it to be “too long”.

STUDENTS’ OVERALL SATISFACTION WITH THE PROGRAM
At the end of the program students pointed out high satisfaction with the program. Particularly, 85.4% of the participants indicated that they would recommend other students to participate in the program.

"I would recommend the program to other students" ($n=34$)

<table>
<thead>
<tr>
<th>Fully disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neutral</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Fully agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0%</td>
<td>0.0%</td>
<td>2.9%</td>
<td>11.8%</td>
<td>11.8%</td>
<td>32.4%</td>
<td>41.2%</td>
</tr>
</tbody>
</table>

The positive perceptions of the students were also evident in their comments. Here are a few examples of students’ comments:
- I had fun in the program! 😊
- I thought it was fun & I spent some of my summer actually doing something rather than staying at home doing nothing.
- It’s a nice, fun, and educational program
- It was fun and interesting

INSTRUCTORS’ PERSPECTIVES
Instructors were asked to reflect on several topics, including but not limited to, the curriculum, educational excursions, and the goals of the programs. Their cooperation with the evaluation component along the way should be praised, and their responses to the end-of-the-program survey proved insightful and valuable. A summary of their perspectives follows.
CURRICULUM

- Week 1: Some students found it difficult to plan and approach the problem. This may also be a result of having a heterogeneous group of students, some of which who had no previous exposure to project design/tech class. For next year, it was suggested that providing students with some examples and limiting the supplies they may use (to keep them focused) may help.

- Week 2: Students had difficulties with the programming aspect of the activity and the use of sensors. Explaining the relevance of programming to robotics, and providing students with working examples, and/or a short programming activity prior to approaching the robotics task is recommended for next year.

- Week 3: Originally, the plan was to have a 4-day long of chemistry curriculum. Due to last minute schedule constraints with the educational excursions, only two days were devoted to chemistry. As a result, the various chemistry themes were not well linked.

EDUCATIONAL EXCURSIONS

- The Navy Base:
  - This trip was informative and valuable for students.
  - Splitting the large group of students to small groups, each includes about 10 students, may work better than having groups of 20 students each.

- California State University Channel Islands (CSUCI)
  - Having students explore a local university is an important experience for students. Instructors felt this educational excursion was successful since students were allowed to roam around and explore. Also, the IMAX movie students saw exposed them to engineering techniques utilized by NASA.
  - Instructors felt that the NASA climate change labs were below the level of the students.

PROGRAM’S GOALS

In general, instructors agreed that the program met its pre-defined goals. On a scale ranging from 0=goal was not met to 100=goal was fully met, their averaged ratings for meeting each goal were as follows:

<table>
<thead>
<tr>
<th>Goal</th>
<th>Averaged rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students experience science (i.e., physics, engineering, chemistry) through project-based work</td>
<td>97</td>
</tr>
<tr>
<td>Students develop their thinking and working in team processes, and learn to appreciate the value of collaborative work</td>
<td>87</td>
</tr>
<tr>
<td>Students build up their perseverance and develop a healthy approach to coping with complex problems</td>
<td>85</td>
</tr>
<tr>
<td>Students develop their planning skills</td>
<td>85</td>
</tr>
<tr>
<td>Increased students’ interest and motivation in learning and working in STEM</td>
<td>97</td>
</tr>
</tbody>
</table>
In addition, the instructors thought goals were appropriately and sufficiently defined to address students’ needs within the STEM framework. It was suggested that while having the fourth goal in place (“students develop their planning skills”) is important, it may be too difficult for the students as they come into the summer bridge program directly after the school year ends and they may be too tired of “seat work” activities. Also, (evaluator comment:) considering the relatively short length of the program and specifically that the fourth goal was mainly supposed to be addressed by Week 1 activities, a more appropriate goal would have been having students develop an awareness to the importance of planning one’s work process.

PROGRAM’S STRENGTHS
The program provided students with learning opportunities beyond their everyday classroom setting. More specifically, students learned new things, experienced working in small groups and problem solving, and were free to create real objects. In addition, through the educational excursions, students were exposed to different types of engineering jobs. Finally, a desired side effect of the program was having students develop relationships and familiarity among themselves and with the instructors. This, in turn, may help them develop identity as a cohort and trust with instructors, both of which may serve them well once they enter 11th grade. Being based at Oxnard College, the program allowed student to be exposed to the campus, its facilities and surrounding. This may be marked as an additional strength of the program.

OPERATION

- The instructors were pleased with the college setting, classrooms, materials, and transportation to the educational excursions, as well as the relationships developed with the STEM center and the assistance provided to them by the STEM center administrators.
- Instructors indicated that they worked well together.
- Instructors recognized the value of having the program run in a college setting for the benefit of the students.
- Week 1: Having a classroom with moveable tables might prove to be more beneficial.
- Week 2: It was recommended to have students work in groups of 2-3 students each (if the amount of Lego NXT kits permits) and not groups of 4.
- Educational excursions were originally planned to take place on Fridays. This plan was substantially revised due to scheduling issues. This had a direct effect on the length of the program and the coverage of content. Oxnard College was closed on Fridays during the summer and therefore instruction days were cut short. Also, instructors indicated that having the excursions on Fridays as end of the week events
would be better because it takes students some time to settle back into their classroom after having an outdoor activity.

- Students complained about the food (or lack of?)

**REPLICATION OF THE PROGRAM**

All instructors agreed that the program may be replicated. The following characteristics were identified as important for successful replication:

- Good communication and support from both the high school and the college.
- Instructors indicated that students should be selected for the program based on interest and motivation; however, at this point in time, since Project ASCENCION aims to expose all students to STEM and higher education, there is a value in creating interest and motivation among all students.
- Having students develop relationships with each other and with the instructors prior to the beginning of the program is NOT a necessity for successful implementation. It was found that students were able to socialize and make effective groups in a short amount of time.
- Balancing “fun” with learning opportunities, and creating interest and motivation through competitive activities is important.

**EVALUATION**

Instructors indicated that there were too many evaluation surveys and some were too long. It was suggested that, if time had allowed, sampling students for interviews might have proven to be more constructive.

**EVALUATION: LESSONS LEARNED**

7. Working closely with the instructors prior to the beginning of the program on the development of the evaluation component and tailoring the evaluation to the specific program goals and operation had an extremely high value.

8. Consider the length of the program in setting the goals. More specifically, it may be that developing students’ awareness (e.g., to important work habits, educational opportunities, etc.) and having students experience new things are more appropriate goals compared to the development of new skills and abilities.

9. Students should be surveyed less frequently, and more importantly, surveys should not be lengthy. This, of course, is a subjective call and should be informed by the overall number of surveys, ratio of open-ended questions to scale questions, amount of questions per category/table, etc.

10. In surveying students, do not use statements that are phrased on the negative side (i.e., reverse coded items). This confused the students and proved invalid.
11. In surveying students, minimize the use of open-ended questions. This increased the burden on students and, in hindsight, did not add much value to the evaluation.

12. Administration of end-of-program survey to instructors proved to be very important and beneficial. Their input can be directly integrated into next years’ programs.

13. As planning and implementation change during the course of a program, it is very important for the evaluator to be informed with developments and revisions in the program plan and update the evaluation materials accordingly.

14. Due to time constraints some surveys were administered by the instructors. While they were devoted to the evaluation, it is still recommended that all aspects of evaluation will be completed by the evaluator.

Conclusions and Recommendations

The Pre-engineering summer bridge program serviced 39 Hueneme high school incoming 11th grade students. The three-week program focused on exposing students to physics, engineering, and chemistry through project-based learning and introducing students to the college surrounding and to employment opportunities in the STEM fields (primarily engineering). The program included hands-on, group activities, and aimed to increase students’ interest, motivation, confidence, and familiarity with STEM disciplines.

Data collected revealed some interesting results. While pre/post comparisons did not show statistical significant changes in students’ attitudes aligned with the pre-defined goals, encouraging and meaningful results emerged in the end-of-program survey. The contrasting results may be attributed mainly to students having no prior exposure to the different domains addressed by the summer bridge (for more details, please read the discussion section on page 10). Therefore, we may conclude that the program was a valuable experience to students as it exposed them to science, research-based learning, and collaborative work. These experiences, in turn, may greatly contribute to the preparation of students to 11th grade, and may increase the likelihood of students’ attending college and majoring in STEM.

The cooperation between the STEM Center at Oxnard College and Hueneme High School was recognized by the team of instructors as fruitful and critical for the success of the program. Suggestions for improvement were offered by the instructors and appropriate changes should be incorporated in the program for next year. It seems like the biggest drawback in implementation this year was the scheduling of the educational excursions. While the original plan was appropriate and would have allowed sufficient time for classroom activities, last minute changes on the part of the community partners created a “far from ideal situation” that later translated into less
classroom time and difficulty in maintaining learning continuity. It was further advised by the instructors that providing students with more cognitive tools to approach their tasks (e.g., examples, mini practice tasks before approaching the major task) may be needed. Finally, considering the summer bridge is housed within Oxnard College and that planning for college should begin as early as possible, it is advised to integrate college readiness and planning component into the program (perhaps instead of having an educational excursion to the Navy Base). This component, targeted at building students’ awareness to college, may include meetings with financial aid counselors, STEM faculty, and college readiness and planning advisors.

It is recommended that the program be replicated next year with minor changes to provide:

- Direct benefits – exposure to STEM.
- Indirect benefits – cohort building, team building and developing bonds/trust level with instructors.
- Replication potential for other high school-college partnerships.
- College exposure and readiness for high school students.
- Bridge gaps with STEM awareness, opportunities and educational preparedness
- Expose parents to the educational experiences and opportunities of their children and increase their involvement.

III. Bio-Tech Undergraduate Research Summer Bridge

Project “ASCENSION” is targeted at increasing the percentage of students who pursue educational and career pathways in STEM. Under the project, a 6-week Undergraduate Research Bio-Tech summer bridge program took place in the biology laboratory at Oxnard College (OC).

Two generations of Oxnard College students—those who are currently enrolled in OC (n=3), and OC transfers who are currently CSU/UC students (n=3)—were brought together to initiate and execute three research projects. The program enabled students to gain hands-on experience conducting research in a lab setting while fostering an educational community and capitalizing on its strengths.

Concentrating on both outcomes and implementation of the program, and considering students’ personal narratives, the program was evaluated using pre and post personal interviews. These interviews allowed both to capture the individual perspectives and to find common themes. Data indicated that the program successfully reached its goals: to have students develop their technical, academic, personal, and social skills as researchers, to increase their interest and motivation in STEM education and careers, and to enhance their market value as laboratory workers. It is worthwhile noting that the program was very meaningful to all student participants—the
OC students who were still deliberating on which pathway to choose and the CSU/UC students who had already transferred, committed to a path and made investments on it. This may be attributed to the inherited flexibility maintained in the program which provided each individual with opportunities to explore, learn and develop according to one’s needs. It further demonstrated that even after transferring to a four-year institution, students may greatly benefit from guidance and growth opportunities to support their chosen path.

Overall, the students felt strongly about the program, its implementation and operation. They declared much appreciation and could very easily count their benefits. These benefits, in turn, suggest potential impacts of the program far beyond the program’s stated goals. Students navigating their educational path with confidence and based on making informed decisions, is one example. The unique attributes of the program and their advantages were recognized; this knowledge may serve other education institutions and agencies in creating new programs.

Under Oxnard College’s Title V STEM grant (“Project ASCENCION”), a six-week summer bridge program focused on developing laboratory and academic skills was offered to three Oxnard College (OC) students and three CSU/UC students.

**STUDENTS’ CHARACTERISTICS**

Students were greatly diverse in their characteristics. In fact, the program was structured to adjust for, and capitalize on, their diversity.

Here is a short summary of students’ backgrounds:

- All students were either enrolled students at Oxnard College or CSU/UC students who transferred from Oxnard College.
- Students came from different familial backgrounds: Two students, for example, had their first career in the army prior to going back to school and are now parents; some students entered Oxnard College directly out of high school, but others did not originally plan to further their education and entered the college after a couple of years working outside.
- Students greatly varied in their previous research experience. While all of them had some experience working with the program’s professor (i.e., Dr. James Harber) in the biology lab in one setting or another (e.g. being a student in his class or doing directed study with him) prior to the initiation of the summer bridge program, some students had much more extensive experience doing laboratory work, including in other settings.
Students also varied in their plans for their future. These included the following:

- transferring to CSUCI and majoring in biology.
- obtaining a B.S. in biology with an emphasis in clinical laboratory from CSUCI.
- working in the health field, perhaps as a lab technician.
- obtaining a certificate as a clinical laboratory scientist.
- applying to a M.D.-Ph.D. program and becoming a medical researcher.
- graduating from UCLA with a B.S. in cellular-molecular-developmental biology.

CURRICULUM

During the course of the six-week program, students worked collaboratively on promoting three research projects. Each project was led by one of the three CSU/UC students and was at a different developmental stage, as the work on the projects was originated prior to the beginning of the summer bridge program. Thus, it was a structured framework for learning and experiencing. At the same time, much flexibility was promoted and kept by the professor and the students as the work on the projects was distributed among students depending on projects’ needs, as well as students’ interests and learning objectives. In fact, each work day began with a team meeting where the progress and needs on each project were shared among all. It was through these meetings that all students were kept on board with the progress made on each project—as well as challenges encountered by the researchers and new discoveries made by them, and were able to show their interest and offer their support. Even within the somewhat structured work plan for each day, all students contributed wherever and whenever possible.

In addition, a didactic emphasis was placed by the professor on discussing current events in research, discussing emerging technologies, reviewing general skills, and acknowledging the importance of grounding one’s research work in the literature.

PROGRAM GOALS

Centered in the biology laboratory at Oxnard College and facilitated by professor Dr. Harber, the program objectives were as follows:

7. Students develop **technical** skills needed from research lab works (e.g., following safety procedures, learning how to operate and use certain tools and machines).
8. Students develop **academic** skills needed from research lab works (e.g., reading manuscripts, conducting literature reviews).
9. Students develop **personal** skills needed from research lab works (e.g., perseverance, self-discipline).
10. Students develop social skills needed from research lab works (e.g., collaboration, asking for guidance, providing mentoring).

11. Increase students’ interest and motivation in STEM education and careers.

12. Students are more marketable as laboratory employees and research assistants.

These were defined as overarching goals for all students regardless of their academic advancement, research experience and aspirations. Yet, the manifestation of these at the individual level may vary depending on the student’s developmental stage and current needs.

**Evaluation**

**PROTOCOL**

The evaluation of the summer bridge program concentrated on two domains:

1. Mapping the implementation and operation of the program in order to:
   a. suggest points for improvement.
   b. recognize critical elements for program success and replication.
   c. better understand program’s strengths and outcomes.

2. Examining program outcomes at the individual level.

3. Recognizing and explaining unintended results.

Accordingly, data for the evaluation was collected via personal interviews with program participants on the first week of the program (i.e., pre-interviews) and the last week of the program (i.e., post-interview). Four different versions of protocol were created to accommodate the academic advancement of the student (i.e., OC vs. CSU/UC students) and the point in time when the interview took place (i.e., pre/post program).

**PROGRAM OUTCOMES**

*DEVELOPING TECHNICAL AND ACADEMIC SKILLS*

Through participation in the program students developed their technical and academic skills. This was made possible by the very nature of the program (i.e., researching in a lab) and the curriculum, and was greatly fostered by the empowering environment led by professor Dr. Harber and maintained by the students.

Students learned various technical skills: some general skills applicable to a work in a biology research lab (e.g., safety procedures, ordering and organizing supply), and others more specific to the projects they were involved with (e.g., stem culture). One of the CSU/UC students mentioned that even reviewing the more basic skills,
mainly for the benefit of the Oxnard College students, was good refresher for all. All students were very excited (and appreciative) of these learning experiences: The OC students, by the variety of their learning; and the CSU/UC students by the depth of it. Specifically, students’ development of their technical and academic skills was aligned with their proficiency levels such that the OC students were exposed to, and had hands-on experiences in a variety of tools and techniques (as they were involved in each of the projects), while the CSU/UC students went deeply into orchestrating their project and establishing their expertise. One of the fundamental examples was the distinct impact the program had on students’ thought processes. While the OC students learned how to approach a research project from its beginning and plan their daily work; the CSU/UC students learned to make decisions and navigate their study forward. Here are some examples:

- Planning the work and being resourceful were two major lessons for one student: “…Different ways of organizing yourself, prepare yourself in general, like researching a topic before you go into research... You learn to manage with what you have to make it work”. (OC student)
- The dynamic in the lab was “surprising” to another student, particularly the discovery of the amount of work and time that goes into planning and preparing for an experiment. The student further explained that in a regular college class all the materials and equipment are ready for use by the students. But through this program, the student realized how things operate and look at the beginning of the work when researchers have to prepare and execute their study. (OC student)
- One student learned “How to really choose the battles, where will we make the biggest impact, where will we have success, and where our limitations are.” Adding: “Before, I was so overwhelmed just doing the experiment, it all seemed so complicated... I feel like I just got to another level of understanding in science or my skills of researching”. And also, “Just being able to deal with the technical challenges each day is a huge skill.” (CSU/UC student)
- Another student learned that a good research design, and, accordingly, appropriate analysis of the results, are rooted in a well-developed understanding of the relevant research prior to taking any operational steps. (CSU/UC student)

One specific academic skill that the program aimed to address was the preparation of summative posters to be presented by the students in a professional conference in November 2012. Such posters usually present the research question (and its theoretical foundation), procedures and results. The importance of this learning for the students was evident in both interview sessions (pre and post) with the students. As it turned out, none of the students had a prior experience producing a poster; yet, it was recognized by the students as a desired experience. It is interesting to note the different perspectives students held:
For one, the importance of producing a poster lied in the opportunity to tell people about the work accomplished by the students and be a role model to others: “to show people – this is what I do, this is what you can do”. (CSU/UC student)

Another student had a similar thought but more from an institutional perspective: “we do all this stuff here, we really want to take it somewhere and show, like, OC is doing this science experiments; we are capable here”. (CSU/UC student). This vision was shared by another student who reflected on the poster by saying: “throwing OC’s name out there”. (OC student)

A student was also interested in having this as practice before fulfilling a departmental poster presentation requirement: “this is a really great way to get comfortable with that before I go and do that... anything to help ease the anxiety of learning next year will really help me”. (CSU/UC student)

And, “making an accomplishment” was also mentioned as a reason for wanting to prepare a poster (OC student)

Evidence for the empowering environment in the laboratory and its positive impact may be found in some of the students’ reflections. For example, one student talked about the difficulties encountered in the mastering of a certain lab technique and Dr. Harber’s encouragement: “I liked how he pushed me by saying – Don’t worry, if it’s bad we can do it again”. Another student gave as example of Dr. Harber’s encouragement after a long day of work in the lab at a somewhat isolated area: “He would say - What you are doing is a really important part... don’t feel like you are not part of the team because you are”. Students also mentioned the relationship among them as a source of empowerment: the OC students felt comfortable approaching the CSU/UC students with questions and requests for guidance, and they found the mentoring provided to them to be sound; the CSU/UC students felt empowered by taking a head lead over their project (more on this in the next section). Perhaps, the strongest evidence for the empowering environment might be the unanimous indication by all students that the work flow and work distribution in the lab went very well as they all worked as a team and helped each other.

Students’ reflections on their collaborative work are listed in the next section.

DEVELOPING PERSONAL AND SOCIAL SKILLS

Central to the work of a laboratory researcher, beyond the technical skills, are the researcher’s personal attributes and his/her ability to work as part of a team. In the post-interview sessions, students identified developing both sets of skills.

The CSU/UC students took the main responsibility over their projects. All three students were satisfied with the progress made on their projects - an indication to their successful management of their project’s resources and
endeavors. The students further experienced the opportunity to provide mentoring to the OC students. Differences in their approach to mentoring were evident, thus serving as an indication that each student had the opportunity to develop this capacity as they wished. Mentor 1 mainly supported the students when approached by them with questions. Mentor 2 focused on distributing the work and teaching the students the skills and techniques required for the work to be completed. The mentoring was sufficient to enable the student to perform and continue the work also in the absence of the mentor. Mentor 3 was more concerned with creating a supportive environment for the team by encouraging students to ask questions, keep face in the presence of failures and share their thoughts. The mentoring experience was most meaningful to Mentor 3 who discussed adding this “managerial skills” to the resume and could now envision taking a managerial position in a laboratory in the future (“it is not scary anymore”). Mentor 2 mentioned having the opportunity to experience mentoring as one of the values of the program.

Another social dimension in the program was the collaboration among students. Students had only good remarks regarding their mutual work in the lab:

- “Everyone contributed somehow to each other... no one was left behind”. (CSU/UC student)
- “Everyone knew what to do”. (OC student)
- “Students were exchanging ideas and coming up with more research questions. Projects started in one place and evolved”. (CSU/UC student)
- “Everyone has something they can learn from another person no matter what your position or experience is... in a collaborative setting we definitely share a lot”. (CSU/UC student)

Moreover, a sense of a “scholarly community” was built among group members to such extent that students perceived the continuity of their joint work and established relationships to extend beyond the completion of the program. Specifically, students were engaged in thinking about mechanisms that would enable them to continue the work on the projects during the course of the year. The OC students talked about the possibility of continuing their involvement in the projects through “directed study” with professor Dr. Harber and by returning to the program next summer. The CSU/UC students presented their hopes that the OC students would be able to continue and progress some of the research work after the summer and were planning on getting updates from the OC students and coming back to the lab sporadically throughout the year, depending on their availability.

The OC students noted the advice for their futures provided to them by the CSU/UC students (such as how to apply to different academic institutions and which courses to take) and said that they felt comfortable enough to contact the students in the future for further guidance.
Students’ technical, academic and social experiences in the lab had an impact on their personal growth. They indicated the following learning outcomes:

- Being resourceful: Working under constraints (e.g., materials and equipment); planning and managing resources.
- Staying flexible and being creative: Revising one’s work plan to adjust for changes, constraints and new discoveries.
- Problem solving.
- Working independently.
- Time management.
- Maintaining high motivation and managing frustration.
- Initiating.
- Taking responsibility.

**INCREASED INTEREST AND MOTIVATION IN STEM EDUCATION AND CAREERS**

All student participants noted their interest in STEM, specifically biology and lab work at the beginning of the program. Thus, the impact of the program on students’ interest and motivation in STEM education and careers may be best described as “reinforcing” or “assuring”. Surprisingly, similar effect was also noted by the CSU/UC students who had more research experience and had advanced their educational (and occupational) paths prior to the initiation of the summer bridge program. One OC student, who planned to pursue a B.S. degree in biology looked at the CSU/OC students as role models and thus gained confidence in meeting this academic goal. Another OC student was more certain at the end of the program in his/her interest in becoming a lab technician; following the program, he/she was more aware of the different opportunities available to them and felt that due to experience gained by participation in the program they have one less barrier to overcome. The program helped a third OC student, originally interested in pursuing a B.S. in biology, to find a more specific niche of interest (i.e. bioinformatics). This student further recognized, though participation in the program, that he/she was falling short in their mathematic skills, that are so critical to successful functioning in the lab, and therefore plans to take more courses in math in the upcoming academic year. One CSU/UC student set as a goal to be admitted into a M.D.-Ph.D. program and become a medical researcher. This goal was not refined but the student felt the experiences gained throughout the program (e.g., leading a research project, managing others, preparing and presenting a poster) would provide a competitive edge. Another CSU/UC student, interested in pursuing a certificate in clinical laboratory scientist, mentioned still being interested in this as well as a new or more formed desire to look for a job in a lab. Finally, a third CSU/UC student, currently studying toward a B.S. degree and working in an
entry level position in a laboratory, indicated that as a result of participation in the program, he/she has a clearer vision of becoming a true researcher in a lab (i.e., initiating research and leading others and not merely assisting others on their projects).

**STUDENTS ARE MORE MARKETABLE**

Students felt strongly that this experience has boosted their resumes and increased their competitiveness in the field. They further believed that this experience, in turn, would assist them in finding paid jobs or internships in laboratories both in academia and the industry.

Time will tell whether or not the summer bridge program helped the students in securing jobs or internships. And still, many forces (e.g., the labor market, student’s availability, being able to secure work-grant money) and the interplay among them will determine the end result. Nevertheless, at this point in time, it is safe to claim that having students: a) gain confidence in their abilities; b) develop substantial motivation and targeted interest; c) enhance their resume with concrete skills and knowledge; d) foster their professional networks; and, e) have the ability to mentor others, would most definitely increase their competitiveness in the labor market and provide them with the tools to go about searching, applying for, and securing positions.

As an example, here is a narrative telling the story of Trish (for privacy reasons, the true name of the student will be kept confidential). Trish had just completed her first year at a UC campus, majoring in cellular-molecular-developmental-biology after transferring from Oxnard College with an A.A. in natural sciences. Prior to transferring, she spent almost four years at OC. During these years she worked with professor Dr. Harber as a lab assistant for two years and participated in the same summer bridge program last year, just before she transferred. Upon her arrival to the UC campus, Trish was able to secure work-study funds and found a job in a lab as an assistant. Later, as funds ran out, she was hired as an employee. Trish was told by her employer that her being comfortable in the lab played in her favor. She further mentioned that professor Dr. Harber assisted her in writing her resume (“He is always willing to help people especially if they put in the first effort and bring in the resume”).

Even after having gained all this experience and securing a job, she came back into the program this summer as she saw the great value it held for the students, she among them, and at the end-of-the-program she noted that she had learned more than what she thought she would. Some of the outcomes and quotes provided in this report are based on the interviews with Trish. Here is another quote: “This (i.e., the program) must be the most hands on that we can get. In internships at the UC, in the labs that I have taken, there were hardly any hands on.”

Trish also told me that if all goes well she should be graduating in a year. Her laboratory already discussed with

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These four outcomes were reviewed in previous sections of this report.
her the option of hiring her as a full-time employee upon her graduation. She chose to give the credit to professor Dr. Harber and the summer bridge program. But perhaps a more suitable example to illustrate the impact of the program would be her talking about the poster, saying that she will share the final product of the poster with her lab, thinking it might help her get the job offer.

PROGRAM OPERATION AND IMPLEMENTATION

STUDENTS’ OVERALL SATISFACTION WITH THE PROGRAM

All students were highly satisfied with the program and were all in agreement that they would recommend other students to participate in the program in the future. Furthermore, all students indicated they would like to join again next summer, if still in the area.

Students came into the program with various expectations including, but not limited to:

- Get hands-on laboratory experience; develop new skills and get exposure to new techniques; develop new skills.
- Explore educational and professional paths; explore interests.
- Learn from CSU/UC students about their institutions and different programs.
- Develop overall breath and depth of knowledge.
- Obtain experience working independently in a lab.
- Get the experience in creating a poster and presenting their work to others.
- Continue their pre-initiated research/ sustain research experience.
- Function as a role model and provide guidance and advice to other students.

In the post-interviews, students were reminded of their initial expectations and were presented with the following questions: “were your expectations met?” All students indicated their expectations were fully met. Only one CSU/UC student felt that her secondary expectation of thinking about potential pathways was not met. Also, one CSU/UC student hoped to fully complete the project by the end-of-the-program and this was not attained. Nevertheless, in a research setting it is often the case that things take unexpected turns and take more time than planned. The student showed awareness to this nature of research evolution and was very satisfied with what they were able to attain.
**PROGRAM’S GOALS**

At the beginning of the program, students were asked to reflect on the pre-defined goals for the program. They all agreed that the six pre-defined goals were appropriate and important. At the end of the program, students were asked to reflect on the pre-defined goals once again; they were all in agreement that all goals were met.

**OPERATION**

The program ran three times a week (in the afternoon hours), for six weeks. As previously mentioned, the students worked collaboratively with the aim of promoting all three projects. Flexibility was maintained by the professor and the students, and individuals’ learning greatly depended on the specific project and the motivation of the student. In addition, knowledge content was infused by the professor, in a constructive way, by providing students with reading materials and facilitating discussions around certain topics.

The flexibility maintained in the program was acknowledged by all students as beneficial. It helped build the relationships and team spirit, capitalized on students’ strengths and promoted the learning of the individuals. Its benefits may be further demonstrated using the following narrative: While working on one of the projects, the students came across an unexpected result. With the support of the professor, the OC students began working on a small research as a side project, investigating this unforeseen event. This had an immense effect on the students as it demonstrated to them the beauty and meaning of researching (i.e., making new discoveries) and allowed them to take responsibility over, and nourish, their own study.

Several students chose to reflect on the program by contrasting it to their classroom experiences. They indicated the program being something completely different than learning in a classroom setting. They further indicated that this setting enabled them to build meaningful and constructive professional relationships with one another, as well as to greatly extend their learning.

Students also provided only positive feedback about professor Dr. Harber (none of them could come up with any tip on how the professor may improve his functioning). Here are some of the things they mentioned about him: “Professor Dr. Harber really made a point to have the lab meetings. He slowed down and found ways to involve everybody in all projects” (CSU/UC student); Professor Dr. Harber did a pretty good job running the program... He made himself available; he communicated with all of us pretty well on a personal level and as a group in general... The project planning was also well, I mean, he guided us on how much time things will take” (OC student); “He knows what he is doing... I think he is doing a really good job” (OC student).
The CSU/UC students, for whom this was a second experience with the program, reflected on this year’s experience and noted its improvement compared to the previous year. One student felt that this year they were able to make much more progress. The following potential explanations where provided: a) students worked on projects that were initiated prior to the beginning of the summer bridge program (hence, no time was wasted on the initiation of projects); b) the clear responsibilities of the project leaders and the OC students; c) projects were interrelated to some extent.

It was not easy for students to come up with ideas on how this summer bridge program may be improved for next year. It is interesting to note, though, that all students indicated the challenge associated with working under equipment constraints, including the need to make do with limited supply, the work with old tools (e.g. slowly spinning centrifuge; old computer that often freezes), and the need to share equipment (e.g., one computer). In addition, one student would have liked to see an improvement in the administrative support provided to the program. The student felt they were rushed to fill in the hiring paperwork and pointed to the need in having better communication with the filming crew as it was not clear to the students if they would be able to get a copy of the footage to be used in their posters. In addition, one CSU/UC student mentioned that the OC students were not showing sufficient involvement in producing the poster. One reason for this might be the limited time students had left for this purpose. Another reason may be that since the CSU/UC students were uncertain on how to approach this assignment they were unable to provide guidance and direct the work of the OC students, who were probably even less confident. It may be that more time should be devoted to this task and more guidance should be offered by the professor. Finally, two of the CSU/UC students suggested the addition of high school students as a third tier in the program for next year. They thought it would not substantially hold back the progress on the projects (by having to spend some more time thought focusing on the more basic training); while, at the same time, it would greatly serve the community and the purpose of the program.

UNINTENDED RESULTS
Every program has the potential of producing unintended results. These may be short- or long-term results and either positive or negative in nature. Unintended results are unexpected outcomes. The summer bridge program had several unintended results, all are positive. Students showed continuous commitment to the project. At the end-of-the-program all students showed interest, to varying degrees, in continuing the work of the projects. OC students were thinking about doing “directed study” with professor Dr. Harber during the academic year, and CSU/UC students wanted to come back into the lab whenever they would find the time and join the program again next year. This commitment has impacts that extend much beyond the mere completion of the
research projects. It means that students have built and will continue to build their identity as researchers and their professional networks. It further means, that the OC students will be even more connected to the academic setting and their learning objectives and that the CSU/UC students will continue to spread OC’s name throughout. We can also indicate side benefits to students’ developing connections and building their professional network. These connections, in turn, will assist the OC students navigating their educational and career paths, increasing the likelihood that they will take more “right” turns and taking direct paths, rather than wasting valuable time wondering around. In addition, it increases their chances for securing employment in the future as in today’s job market it is a lot about having someone opening the door for you.

Conclusions and Recommendations

The Undergraduate Research Bio-Tech summer bridge program serviced three OC and three CSU/UC students. The six-week program enabled students to fully integrate into a research laboratory setting and develop a broad range of skills that will later serve them in their academic learning and employment in the STEM field. The program was unique as it exposed students to research as it unfolds in a real context and, thus, it enabled students to develop technical, academic, personal, and social skills.

Data collected through personal interviews with the participants indicated that students’ learning was meaningful as well as personal and tailored to the needs and interests of the students. This was attainable thanks to the work flexibility promoted and maintained by Dr. Harber and the students, as well as the professor’s commitment to his students’ developmental needs and learning objectives.

These outcomes, in turn, have much impact at the individual and institutional levels. At the individual level, students developed many skills that directly affected their levels of confidence, interest and commitment to research, their education, and their community, and may indirectly affect their educational and career pathways. It is important to note that the program had a major effect not only on the OC students, who may have made fewer steps in determining their paths, but also on the CSU/UC students, all of which are OC transfers, who had already made great investments committing to their chosen path. These students were able to further establish their identity as researchers and brought their skills to a next level, increasing their competitiveness in the playing fields they are currently attending. At the institutional level, the program provided OC with more committed students and created opportunities for spreading and strengthening the institution’s name and its capacity among its affiliates. For example, via the poster presentation in a conference (scheduled to take place in
November), students will share personal narratives. Furthermore, students’ sustained research may feed back into OC’s biology classrooms through their involvement in a directed study setting. And, OC as an institution will transfer highly qualified students into 4-year institutions.

Considering the successful implementation and most favorable outcomes of the program, it is recommended that the program run again each summer. It is further advised to consider the integration of high school students into the program as OC is committed to promoting high school students’ participation in higher education in the STEM fields and in light of the program’s success impeccably serving the developmental and educational needs of a diverse body of students. Furthermore, the program demonstrated the superb importance of creating educational communities that promote mentors and leaders. It is worthwhile taking this component into consideration in the development and implementation of educational programs.

IV. Oxnard College and ACE (Architecture, Construction & Engineering) School Summer Bridge

Under Project “ASCENSION”, an eight-day summer bridge program (over the course of 2 weeks) was tailored to the student population of the Oxnard Union High School District (OUHSD) ACE (Architecture, Construction & Engineering) Charter School. The summer bridge program aimed to expose students to hands-on project-based learning crossing the areas of mathematics, engineering, public administration, urban and GREEN planning, and financing. Furthermore, it aimed to increase students’ awareness to a variety of educational and career pathways. To achieve these aims, the bridge curriculum included classroom activities, educational excursions, and meetings with industry professionals and leaders, all within a college setting. Classroom presentations and project-based activities involved the following community and industry leaders:

- Brian Foote - City of Oxnard Urban Planning Manager
- Al Lowe – Al Lowe Construction Inc.
- Tim Triplett – Real estate mogul and expert in flipping homes
- Brendon McEneaney – City of Santa Monica, Green Building Program Advisor
- Carol Robinson – Landscape Architect and Designer

Accordingly, the themes and activities of the program were as follows:

Week 1 Theme: Exposure to the challenges and opportunities presented to urban planners.

Week 2 Theme: Exposure to the challenges and opportunities presented to those in the “house flipping” business.
Activities included designing the construction of a parcel of property in Oxnard and building a 3D model while taking into consideration materials and costs, meetings with professionals and taking educational excursions to tour GREEN buildings in Santa Monica and house flipping renovation work in Ventura County.

Concentrating on both program outcomes and implementation of the program, the evaluation contained many components and perspectives. Results indicated that the program successfully exposed students to multiple aspects of the engineering construction field and the large variety of educational and career pathways available to them. Specifically, data analyses revealed the following outcomes:

- Increased awareness to a variety of academic and career pathways.
- Increased understanding of the engineering construction field and its components.
- Increased interest in STEM.

Overall, students and professors had a very positive perception of the program—its implementation and operation.

Concerned with the development of summer bridge exemplary prototypes, the program was further evaluated for its feasibility of replication across settings and partnerships. With minor adjustments, this program has good potential for replication. Lessons learned include scheduling the program to initiate immediately following the end of the school year (to address the low turnout rate of participants), and further developing the integration of mathematical concepts and applications into project-based classroom learning.

Under Oxnard College’s Title V STEM grant (“Project ASCENCION”) and in cooperation with the SAGE foundation, an eight-day summer bridge program was delivered to Oxnard Union High School District (OUHSD) ACE Charter School’s students. The program focused on providing students with opportunities to experience project-based classroom learning within a college setting in the engineering construction field, particularly, urban architectural design and GREEN projects.

**STUDENTS’ CHARACTERISTICS**

- All students, but one, belonged to the ACE charter school. Students’ grade level varied as follows: 2 students were incoming 10th graders, 2 students were incoming 11th graders, 5 students were incoming 12th graders, and one student had just graduated high school. One additional student, an incoming 9th grader, is homeschooled by his parents.
The ACE Charter School serves a heterogeneous group of students, including students from different familial backgrounds and surrounding neighborhoods, as well as students with varying degrees of engineering knowledge, and educational and career aspirations.

Students were selected to participate in the program by school professionals based on an application process facilitated by the STEM center at Oxnard College.

Students’ previous experience with computers and specifically Google sketch was recommended for successful participation in the program.

PROGRAM GOALS
Centered at Oxnard College and facilitated by two of the college’s distinguished professors—Marlene Dean from the Math Department and Christiane Mainzer from the Science Department—the program aimed to achieve the following five goals:

1. Students experience engineering construction through project-based work.
2. Students develop awareness to a variety of academic and career pathways.
3. Increase in students’ educational and career aspirations.
4. Students develop their understanding of the “bigger picture” of engineering construction and the various components it entails.
5. Increase in students’ motivation to develop an educational pathway and/or career plan.
6. Increased interest in STEM.

CURRICULUM
Working in groups of 2-3 members, students were asked to plan and execute (by building a 3-D model) an engineering construction design for a vacant lot in Oxnard. Activities were planned to address different aspects of an engineering construction design including, but not limited to, considering usage/purpose, taking measures, choosing materials and techniques, calculating costs and planning budget. The learning of the students was further stimulated through meetings with industry professionals and hearing about their educational and career pathways, as well as going on two educational excursions - to see GREEN projects in Santa Monica and to see the flipping of houses in Ventura County. Groups had the opportunity to present their designs and demonstrate their learning to a panel of distinguished judges (some of which the students have met during the course of their two-week activity) including, among others, the EVP of Oxnard College, director of the STEM grant, owner and manager of a distinguished construction company in Ventura County, Ventura County Sheriff, an architect specializing in landscape design and specialists in the area of house flipping. This celebration event took place on the last day of the program; students’ families were invited to participate.
PROTOCOL

The aim of the evaluation was twofold: (a) to measure program outcomes with respect to pre-declared goals; (b) to provide insight into program implementation and its operation. Accordingly, several surveys were administered as follows:

- Pre-post survey to students – the same survey was administered twice; on the first day of the program and at the end of the program.
- End-of-program survey to students - included both scale questions and a couple open-ended questions.
- End-of-program survey to professors – included open-ended questions; aimed to prompt the professors to reflect on the program’s implementation, operation, and pre-defined goals.

PROGRAM OUTCOMES: ANALYSES AND RESULTS

INCREASED AWARENESS TO A VARIETY OF ACADEMIC AND CAREER PATHWAYS

At the end of the program students were asked whether or not the program assisted them in developing awareness of the different educational and career pathways available to them. Their response pattern was supportive of this pre-defined goal, as presented in the following graph.

![Program Helped Develop Awareness of ... (N=11)](image)

Additional evidence to the increase in students’ awareness for the pathways available to them may be found in their responses to a question asking them about the kind of job they would like to have in 10 years. Four students indicated having an idea for their desired job at the beginning of the program (pre survey); and according to the post survey, three additional students were able to indicate a desired job at the end of the program. These included the following jobs: environmental engineer, contractor/engineer, and architect/engineer.
Finally, reflecting on their experiences with the educational excursions and guest speakers, most students indicated that both the excursions and the meetings with professionals from the industry greatly prompted their thinking about their plans for the future. The following table presents their responses.

<table>
<thead>
<tr>
<th></th>
<th>Green Buildings in Santa Monica</th>
<th>Flipping of houses in Ventura County</th>
<th>Meeting people from the industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
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<tr>
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<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Agree</td>
<td>6</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

**INCREASED EDUCATIONAL AND CAREER ASPIRATIONS**

The program had a positive effect on students’ aspirations: Most students noted that they may, as a result of their participation in the program, consider pursuing higher educational and career goals than what they previously had in mind.

**INCREASED UNDERSTANDING OF THE ENGINEERING CONSTRUCTION FIELD AND ITS COMPONENTS**

Through meetings with industry professionals and going on educational excursions, students had the opportunities to expand their understanding of the many and diverse aspects encompassed under the engineering construction field. Findings indicated that the program had a meaningful effect on students’ understanding of the field. These results are presented in the following graph:
In addition, \( n = 10 \) students (91%) agreed, to some extent, with the following statement: “The field trip to see Green Buildings in Santa Monica enhanced my understanding of the various jobs that exist in the engineering construction field”; and, \( n = 9 \) students (82%) agreed with the same statement when were asked about their experience with the flipping of houses educational excursion. Moreover, students (\( n = 10, 91\% \)) found the encounters with the industry professionals to also be beneficial to them in this domain. Results are presented in the following graph.

**INCREASED INTEREST AND MOTIVATION IN STEM**

In the pre/post survey, students were asked about their interest in STEM. Most of the students (\( n = 9 \)) indicated an interest in at least one of the subjects included under the STEM field, while \( n = 2 \) students were uncertain of
their interest. By the end of the program, the interest of these two students in STEM was formed. All students indicated an interest in STEM in their post survey responses. Furthermore, at the end of the program, all students (n=1 was missing) noted that their interest in at least one of the STEM disciplines increased as a result of participating in the program.

![Increased Interest in STEM (N=10)](image)

**PROGRAM IMPLEMENTATION AND OPERATION: ANALYSES AND RESULT**

**STUDENTS’ PERSPECTIVES**

**CURRICULUM**

Program curriculum was perceived by the students to be highly relevant to their academic development.

![Program was Relevant to the Academic Development of the Student (N=11)](image)

Furthermore, infused with project-based activities, educational excursions and the meetings of professionals from the industry, the program helped students envision themselves continuing their education beyond high school as well as their future as professionals.
STUDENTS' SATISFACTION WITH THE EDUCATIONAL EXCURSIONS AND GUEST SPEAKERS

Students were asked to reflect on their educational excursions, particularly, the extent to which the trip was valuable, interesting, well organized, and should be kept in the program for next year. A similar question was also presented to them related to their experience with the professionals for the industry. Students’ high satisfactions with each component are displayed in the following graphs. Their satisfaction with the educational excursions also was stated in their responses to one of the open-ended questions. Specifically, all students listed the educational excursions as one of their top three favorite activities.
LENGTH OF THE PROGRAM

Most of the students (64%) thought the length of the program (i.e., eight days) was “just right”, while 36% of the students found it to be too long.

STUDENTS’ OVERALL SATISFACTION WITH THE PROGRAM

Students were highly satisfied with the program. When presented with a 5-point scale, all of the students agreed with the following statements:
I. “The program should run again next year, for the benefit of other ACE students”

II. “I would recommend other students to participate in the program”

Several students also wrote a few words describing their feelings toward the program. These included the following:

- “I’ve enjoyed the experience”
- “This program was awesome!”
- “I think it was fun and interactive. I just wish it could start a few minutes later”
- “It was a good program, but we were rushed too much”
- “It was fun”
PROFESSORS’ PERSPECTIVES
Professors were asked to reflect on several topics, including but not limited to, the curriculum, educational excursions, and the goals of the programs. Their responses to the end-of-the-program survey proved insightful and valuable as detailed in the next sections.

CURRICULUM
Professors felt that the curriculum was appropriate, but that the delivery of the curriculum should be altered. Specifically, it was identified that activities should be broken into smaller segments as it was challenging for students to approach a big project. Providing students with some more guidance/modeling may also serve to mitigate the challenge.

EDUCATIONAL EXCURSIONS
- GREEN construction in Santa Monica – professors perceived the excursion to be highly successful for the following reasons:
  - The city of Santa Monica is committed to GREEN construction and sustainability of the environment in urban landscaping, and thus directly links to the curriculum of the program.
  - The tour guide was very patient and knowledgeable.
  - For many students this was a first opportunity to visit the city.
- Flipping houses in Ventura County –
  - The objective of the excursion was to expose students to important aspects of consideration when “house flipping” with the purpose of increasing the value of the property. These considerations include, for example, project planning and budgeting, and return-on-investment. The learning was critical given the nature of the project assigned to the students (i.e., planning and designing a construction project).
  - Based on this year’s experience, the professors advised that this tour be scheduled after students had the opportunity to work on related activities in the classroom and have had some preparation modeling their project.

PROGRAM’S GOALS
Professors felt the goals for the program were met, especially having students develop awareness of the different educational and academic pathways available to them.
PROGRAM’S STRENGTHS

The main strength of the program was recognized by the professors as the “experimental learning” opportunity the students were exposed to and its connections to their educational experiences and planning for their futures. Furthermore, students were exposed to different career pathways via invaluable meetings with professionals working in various jobs in the industry. It was through these meetings that students had the opportunities to learn from experienced and successful others and be inspired by them to work hard, produce a quality of work, demonstrate high motivation, and show perseverance in the presence of difficulties, to name a few.

OPERATION

According to the professors, the program ran efficiently. However, it was recommended to consider scheduling the program to start earlier in the summer as it may result in a higher turnout rate. Moreover, professors mentioned the challenge involved in balancing between sophomore and senior participants and advised the program to recruit incoming 11th and 12th graders only, as some of the performance demands were too high on the younger students. Furthermore, it was recommended by the professors that snack time be integrated into the schedule and that lunches provided by the program include pizza less frequently.

REPLICATION OF THE PROGRAM

The structure of the program—project-based learning infused with meetings with professionals and industry leaders and educational excursions—proved beneficial. Through hands-on experiences, students learned to apply, and the utility of, theoretical academic concepts such as mathematics, engineering, and finance, and the personal stories of inspiring professionals helped bring meaning to the students’ educational endeavors. Thus, this format of the summer bridge program may be successfully replicated across fields of interest. Furthermore, the complete developed program (form and content) also has the potential of being replicated across schools and groups of students. However, as noted by the professors, the program takes advantage of students’ familiarity with “Google Sketch” and “Power Point”. This skill set may not be sufficiently developed among other students (evaluator note: perhaps the program can be adjusted to accommodate students with no such prior knowledge).
EVALUATION: LESSONS LEARNED

1. Some of the questions in the pre/post survey, while made sense in the developing stage of the survey, did not provide insight. Consider revising the survey for next year.

2. Working closely with the professors prior to the beginning of the program on the development of the evaluation component and tailoring the evaluation to the specific program goals and operation had an extremely high value.

3. Administration of end-of-program survey to professors proved to be very important and valuable. Their input can be directly integrated into next years’ programs.

4. As planning and implementation may change during the course of the program, it is very important for the evaluator to keep informed with developments and revisions in the program plan, and update the evaluation materials accordingly.

Conclusions and Recommendations

Targeted at students coming from Oxnard Union High School District (OUHSD) ACE (Architecture, Construction & Engineering) Charter School, the ACE-SAGE-OC STEM summer bridge program focused on building a bridge between students’ classroom-learning and post-graduation educational and career pathways. To achieve this goal the program was based at Oxnard College and the curriculum was founded on three complementing components: project-based classroom learning, educational excursions, and inspirational meetings with professionals and industry leaders.

Data collected demonstrated that the program achieved its pre-defined goals. More specifically, analyses revealed increases in students’ educational and career aspirations and in their awareness to a variety of STEM pathways. Increased interest in STEM was also evident. These outcomes, in turn, may increase the likelihood of students’ making more informed educational decisions, attending college, majoring in STEM and obtaining a college degree within a shorter period of time.

Students and professors’ reflections on the operation of the program indicated that the program was well planned and properly delivered. The professors were able to indicate points for improvement, mainly in offering students with more activity scaffolding. It is also recommended to schedule the program immediately following the end of the school year since families often travel during the later weeks of the summer break. Nevertheless, since the program was very successful serving a small number of students perhaps it would be worthwhile reconsidering the desired group size.
Considering the successful implementation and most favorable outcomes of the program, it is recommended that the program run again next summer. The effective format of the program—integrating hands-on learning activities, educational excursions, and meetings with professionals—may serve as a guide to other educational agencies and partnerships in developing summer bridge programs. The program in its current curriculum (i.e., content) may also be successfully replicated across settings and populations, though it is advised to think about the framing of the program when targeting schools that have less emphasis on engineering construction, as well as the revising of the curriculum to successfully accommodate for students with no prior experience with the Google Sketch tool.

III. TUTORING AND MENTORING PROGRAMS

Project “ASCENSION” Oxnard College (OC), in cooperation with California State University Channel Islands (CSUCI), University of California at Santa Barbara (UCSB), and Oxnard Union High School District (OUHSD) set as one of its goals to increase the numbers of Hispanic students who pursue a STEM (Science, Technology, Engineering, and Mathematics) degrees and/or careers. Accordingly, the STEM Center at OC provides its students with a manifest of services and different programs tailored to address the specific needs of the students, supporting them throughout their academic path.

Among others, the Center offers its students tutoring services in Mathematics and Science. These services were evaluated for their effectiveness and with the aim of developing a working framework and template to be replicated for the evaluation of similar tutoring and mentoring programs at different settings on the Oxnard College campus.

The process of evaluation has proven to be iterative in nature and it is still undergoing changes and improvements. In particular, one research question was initially placed at the center of the evaluation (i.e., the effectiveness of the tutoring) and through the process many other relevant questions were exposed and addressed. At this point in time, we are continuing the evaluation of the program and further questions still need to be addressed.

This interim report presents the overall framework for the evaluation, the different evaluation activities and the interim results and actions. Furthermore, the report details the additional research questions that were developed and addressed along the evaluation process and provides recommendations on how to improve the tutoring services provided by the STEM Center, as well as how to further develop the process of evaluation to address the questions that were currently left unanswered.
The STEM Center services have been evolving and currently provide tutoring services for all of the STEM coursework on campus. Tutors are CSU Channel Islands students who work approximately 20 hours per week as per the cooperative partner agreement with CSUCI under the current STEM grant from the Department of Education.

Two main goals were set for the evaluation: (1) to create a framework for an evaluation of tutoring services, a framework that can later be used in the evaluation of similar services in other settings, and; (2) to evaluate the effectiveness of the tutoring services provided by the Center. With these two goals in mind, the evaluation process was initiated. One evaluation research question was directing the way at the beginning of the evaluation process: “To what extent are the Center’s tutoring services effective?” It soon became apparent that this kind of evaluation is an iterative process.

THE FRAMEWORK

Specifically, the evaluation process involved the following activities:

1. Defining and redefining the purpose(s) of the evaluation and its research question(s).
2. Identifying the stakeholders.
3. Identifying domains for evaluation.
4. Collecting data from stakeholders and in regard to the different evaluation domains using various means.
5. Analyzing data and reaching interim conclusions and recommendations.
6. Revising the services based on recommendations.
7. Rephrasing evaluation purpose(s) and questions, and revisiting steps 2 through 7.

In spite of the ordered-list presentation of the various activities, the model better represents the complex reality of this type of evaluation. Put differently, information gathered throughout the process served to inform following steps in the process, as well as to revisit preceding steps. Then, each step in the sequence was operationalized in the evaluation and its meaning for the overall evaluation was reviewed.
EVALUATION ACTIVITIES

Evaluation purpose(s) and research question(s).

As previously mentioned, originally, the evaluation had two purposes (to create a framework for an evaluation of tutoring services; to evaluate the effectiveness of the tutoring services at the STEM Center), and one research question (“To what extent are the tutoring services at the Center effective?”).

Along the process of evaluation, additional research questions were exposed:

1. How can the effectiveness of the services be measured?
2. How is effectiveness defined by different stakeholders?
3. What factors contribute to the effectiveness of the services? (How can effectiveness be enhanced?)

Furthermore, each of these questions branched out to create additional multiple questions.

Stakeholders

The following stakeholders were identified:

- Students.
- Tutors (and their supervisor at CSUCI).
- Faculty.
- The STEM Center administrators.
- The tutoring services at the college’s library.

Domains for evaluation

The following domains for evaluation were identified:

1. Service utilization.
2. Tutors’ training procedures.
3. Services branding (what differentiates the Center’s services from those at the library?).
4. Services outreach.
5. The relationships between faculty and tutors.

Data collection

Data were collected via various means, depending on the stakeholders and evaluation domains.

1. Personal interviews were conducted with the following stakeholders:
   a. All STEM Center’s tutors \((n=4)\) and one tutor at the library who works under the STEM grant \((n=1)\).
   b. Some of the math and science faculty \((n=6)\).
   c. The CSUCI tutor coordinator \((n=1)\).
2. The general log-in tracking system at the STEM Center was examined and assessed for its functionality in tracking the utilization of the service.

3. The current forms administered to the students before and after a tutoring session (i.e., “pre-tutorial assessment” and “post-tutorial evaluation and feedback”) were examined and assessed for their functionality in tracking utilization of, and student satisfaction with the service.

4. A meeting was conducted with the library tutoring center’s supervisor and a copy of their training materials was obtained for review.

5. An attempt was made to locate written training materials used by CSUCI for the training of the STEM Center’s tutors. No substantive materials were found.

INTERIM RESULTS AND ACTIONS

The tracking system

It was found that while the tracking system may be beneficial in keeping track of the STEM Center (Center) usage in general, it does not serve well in providing information that is specific to the tutoring services at the Center. Specifically, one major issue was recognized: the system, in its current design, is unable to differentiate among the different activities students are engaged with in the Center. Accordingly, the tracking system was revised. It now captures information about the specific cause for a student’s visit at the Center. Consequently, reports can now be generated to reflect on the utilization of the service across multiple dimensions. In particular, the following information is captured: student ID, date, time, length of service (may be calculated based on the log-in and log-out times), the specific course (which was reviewed in session). The operation of the revised tracking system began on November 5, 2012.

Note: It is highly important that the Center’s employees verify that students log-in and log-out each time they visit the Center.

Student satisfaction survey

Two short evaluation surveys to be filled in by the students were in place. In the process of the evaluation, it was identified that the value of the survey was questionable for multiple reasons. For example: (1) surveys are administered and collected by the tutors so students’ willingness to respond and/or their responses may have been influenced by the lack of anonymity; (2) the extent to which data was analyzed and used to reflect back on the services was unclear; (3) information collected by the surveys was very limited in scope.

It was, therefore, decided to replace these surveys with one online survey administered through “Survey Monkey”. The development of the new survey was guided by several considerations:
1. The interest in collecting information on multiple aspects including, but not limited to the student’s background information, collegiate advancement, motivation to attend the service, and satisfaction with the service.

2. The need to assure student anonymity.

3. The motivation to have data captured by a system so that no manual entry of data was required.

4. The will to reach as many students as possible.

5. The understanding that serviced students belonged to one of two main groups: “repeat clients” and “newcomers” and, the realization that the services may be evaluated from both perspectives.

The new survey includes a “skip logic” argument (question 8 in the survey) which allows to distinguish between “newcomers” (questions 9-15) and “repeat clients” (questions 16-20) and to assign different questions to each group. A computer station at the Center was designated for the administration of the survey. At the end of their tutoring session, students are directed to the computer by their tutor and asked to provide feedback of their experiences.

Survey launch date was set for: 12/3/12.

Note: It is important that tutors would notify the students about the survey at the beginning of the tutoring session so that students could plan their time accordingly.

Branding

One of the main concerns mentioned by faculty was the confusion surrounding the level of tutoring offered to the students and the differentiation between the services offered by the Center and those offered by the library. This, in turn, suggested a broader concern: what is the Center’s targeted population and does it differ from the served population? Moreover, the following areas for further evaluation were recognized:

- Should the Center offer assistance with lower level mathematics courses?
- Is it true that the tutors at the STEM Center are more qualified than those at the library? This is a shared perception by faculty and tutors; however, it turned out that some of the tutors at the library graduated from a 4-year institution and some obtained a graduate degree.
- Do the hours of operation at each location contribute to the confusion? Apparently, there is no complete overlap in the hours in which services are provided in each location. In particular, the STEM Center offers tutoring during lunch time (12-4pm), when the library services are closed; the library’s tutoring services operate in the evenings when the STEM Center closes at 4:30 pm (at this point, on some days and in specific subjects, tutors from the STEM Center provide tutoring services at the library); and, there are some
hours during the day that tutors in specific STEM subjects are not available at the STEM Center but may be available at the library.

- Is there an added value for STEM students to attend the Center? It was suggested by some faculty that the Center may serve a vital role in the professional development of students as it is a space for students to interact and build a network of support.

Due to the confusion, faculty differ in their practices in regard to directing their students to tutoring: While some faculty recommend to their students to attend tutoring in one specific location (depending on the level of the class: lower level to the library, and higher level to the STEM Center), others are not certain as to where to send their students. Furthermore, it may be that the students make their decision on which location to attend based mainly on the hours of operation and availability of tutors on specific times. This speculation needs to be looked at more closely, as at this point in time, no input from the students was gathered.

**Outreach**

Faculty and tutors felt that the Center’s tutoring services need to be better communicated to the served population (*note: input from students has not been obtained yet)*.

Information regarding the tutoring services at the Center is disseminated to the students in various ways. These include sending an informative email directly to all the STEM students (approximately 800) that are on the Center’s emailing list (however, only STEM students that had previously registered at the Center are on the list), sending an informative email to faculty and department heads with a request to bring the Center’s services to the attention of their students, notifying OC counselors of the services via email and presentations at their monthly meetings, listing tutoring hours on the message board just outside the Center as well as posting the schedules on the STEM website [www.oxnardcollege.edu/stem](http://www.oxnardcollege.edu/stem). Some faculty post the schedule on the message boards outside their classrooms and/or lists the services in their syllabi. Regarding the last point, faculty mentioned that since the tutoring schedule is only publicized after the first week of class, they cannot list the specific schedule in their syllabi.

Furthermore, while most professors bring the services to the attention of the students they do not personally take any steps to assure students are utilizing the services. An exception is one faculty member who sends her students to obtain a signature from a tutor for a corrected assignment. By enforcing this act, the faculty assures students become aware of the service. Another professor came up with an idea during the interview: to build an individual tutoring program for students in-need in cooperation with the professor, student, and tutor (a form of “tutoring prescription” for remediation).
**Hours**
Currently, tutoring at the STEM Center takes place Monday through Thursdays during the Center’s opening hours (0830-1630), but services are not continuous throughout the day for all STEM coursework. After 4:30pm, STEM tutoring services take place within the library’s tutoring center setting. The following challenges were recognized:

- There are times during the day when tutoring for a specific subject may not be offered;
- Math tutoring is in high demand, more than any other STEM subject;
- Tutors are not utilized 100% of the time. Especially at the beginning of the semester, there are days and hours in which tutors are not occupied with students (this claim appears to be more valid for the biology and chemistry tutors). *Note*: this claim is based on unstructured observations by the evaluator; a more valid picture may be obtained through the analysis of data captured by the tracking system.

**Tutors training program**
Some of the CSUCI tutors received some training in the past, prior to their start date. However, at the moment because there has been some changing of “personnel oversight” for tutors at CSUCI, there is no formal training program for the tutors. More specifically, tutors need to receive training before their start date and receive ongoing training during the year.

**Faculty-tutor relationship**
Currently, there is no system in place for establishing and maintaining relationships between faculty and tutors. Tutors may be familiar with the faculty and their teaching methods, to some extent, if they previously took courses at OC. These relationships were defined by both faculty and tutors as acquaintance rather than professional relationships aimed to foster effective tutoring and student success.

Both faculty and tutors agreed that establishing relationships may benefit the tutoring sessions and the students as tutors would be more prepared to address the specific needs of the students and would be able to spend less time orienting. Both sides agreed that tutors should, at the very least, possess copies of relevant syllabi. Tutors were less certain on the type of relationship to be established with faculty. Faculty, on the other hand, were able to better articulate the components of the desired relationships including having an introductory meeting, ongoing email exchange and tutors attending the classrooms at least every once in a while. It was evident that some professors based their vision on the Supplemental Instruction (SI) model that was successfully implemented in the past.
Study resources

It was found that tutors have no access to the material taught in class, such as textbooks, work sheets, access to any online tools used by the faculty, or class syllabi. As a result, tutors based their instruction on the materials the students brought with them to the session. Oftentimes, students did not bring the textbook just the homework assignment with them. This made it more difficult for the tutors to make the connection between previous learning and current learning and demonstrate to the student the fit of the new topic to the bigger picture. It also extends the time it might take for tutors to orient themselves to the material.

Recommendations and Next Steps

The evaluation of the tutoring services at the STEM Center is still undergoing changes and modifications to improve services. Additional information needs to be collected before final conclusions about the effectiveness of the services and recommendations may be made with high confidence. Nevertheless, data collected and analyzed thus far was sufficient to inform some changes in the system and to further direct the process of evaluation. One of the main issues recognized was the need to better monitor the services and make use of data collected to inform practices. For this purpose the tracking system and student satisfaction survey were revised.

Another central issue identified by this evaluation was the “disconnect” between the different stakeholders. In particular, disconnects were identified between:

- Services and the served population.
- Tutors and faculty.
- Tutors and their access to course materials.
- Faculty and the services.

Accordingly, the following next steps are recommended:

1. The evaluation of the tutoring services should be an on-going process and be led by the STEM Center’s administrators.

2. Data regarding the utilization of the services as well as students’ satisfaction should be collected, analyzed, and serve to inform practices. In particular, data captured by the revised tracking system and new student satisfaction survey system should be analyzed within a few weeks of systems’ implementation to monitor the new systems and verify data are collected in a satisfactory manner. Data should then be analyzed routinely, at the end of each semester, to provide concrete feedback on the services.
3. Facilitate a discussion among stakeholders to better understand and define the STEM tutoring services’ objectives, commitment, and targeted population (and how to better address the OC student population). This discussion should be grounded within a bigger framework, the branding of the services, and in particular, address the following question: should the services at the STEM Center be differentiated from those provided at the library and in what ways (if at all)?

4. Increase student awareness of the services. This may be reached through different venues; each venue needs to be thoughtfully considered:
   - Establish a referral process in which students will be referred to tutoring by their professors.
   - For under-performing students, consider making it mandatory for students to attend tutoring services for a minimum of certain number of hours a semester.
   - Build an individualized tutoring plan for student’s in-need. This act should be initiated by the faculty and planned in cooperation among the three parties: the faculty, student, and tutor.

These acts will expose students to the services and have them experiment with the services and evaluate the value of the services for them. At the same time, it might not be appropriate to force students to show up for tutoring (using any one of these venues) considering students might not have the opportunity to attend tutoring due to scheduling conflicts or other personal obligations.

5. Tutoring hours and availability should be scheduled to maximize service utilization by students. The following actions are recommended:
   - The CSUCI coordinator should make an effort to finalize the tutoring schedule before the first day of class, such that faculty will be able to list a detailed schedule in the syllabi. This may be difficult to do given that the tutors are also students at CSUCI and are still arranging their academic schedules.
   - Tutoring hours should be set in accordance with course schedules such that:
     - Tutoring in specific courses will not be scheduled at the same time as the class is being offered.
     - Tutoring for specific courses will be scheduled just before and/or after class.
   - As long as need has yet to be proven (based on the tracking system), there is no much added value in scheduling more than one tutor per subject at any given time. It is recommended that the Center spread-out tutoring hours as much as possible throughout the week.
   - Add additional STEM tutors in the evening hours at the Library. This may be especially important if the STEM Center aims to provide its students with a constructive learning environment in which they are encouraged to network and collaborate with their peers.

6. Establish and maintain relationships between faculty and tutors. At the very least, the following actions are recommended:
Conduct a personal meeting between the parties before the beginning of the semester. This setting will allow the parties to become familiar with one another.

Encourage faculty to share with the tutors their course syllabi, their expectations from their students, and their teaching philosophy, among others.

Faculty and tutors should exchange emails and use this medium to communicate whenever necessary.

Consider having tutors visit the classrooms every once in a while both in order to present themselves to the students and to keep updated with course curriculum.

Tutors should have access to course websites (if available to students). This action item should be addressed with the aid of the IT department at OC.

7. The STEM Center should be equipped with relevant study resources for tutors.

- Relevant textbooks should be available for tutors. These may be obtained through the following venues:
  - From the Library
  - Purchase them
  - Contact the publisher and request for copies (publishers usually supply free copies for TAs)

It is important to verify relevant textbooks are available at the beginning of each semester.

- Tutors should have access to faculty websites where course materials are posted.

8. Encourage faculty to provide ongoing feedback about the services. There are two related ways to approach that:

- Set a STEM Center person-of-contact for faculty and ask them to email/call this person with any questions or feedback. Empower the contact person to take action as needed.

- Create a “reporting system” (a sort of a short form) for faculty to alert them of any situation with the tutoring services or a specific tutor that requires special attention.

9. Establish a training program for tutors. At this point, it has yet to be addressed by the evaluation how this will be best addressed.

10. Finally, following is a list of additional questions that were raised through the process of evaluation but, at this moment, have not been addressed:

- What is the objective and commitment of the STEM Center tutoring services? For example, should tutors only focus on teaching content, or should they offer a wider perspective and aim to develop students’ study skills as well?
Should the Center strive to have its tutors be more proactive in their approach to students and in addressing students’ needs? What does it mean to have a proactive tutor? (For example, perhaps the tutor should encourage the student to develop a study plan together).

What might be the advantages of promoting group tutoring? (For instance, students learn the value of peer support and learning communities). Should the Center create the setting for group study time under the guidance of a tutor?

Should the Center expand the tutoring of additional STEM subjects? (e.g. Geology).

What characteristics might the tutoring services want to (and can) “borrow” from the SI model?

IV. PROFESSIONAL DEVELOPMENT AND PARTNERSHIP-BUILDING ACTIVITIES

A monthly scheduled professional development program was initiated in October 2011 called the STEM Stew, held in the STEM Center. It is held every second Friday and all STEM grant stakeholders are invited to attend. Attendees include Faculty, Staff, Administrators and Counselors from Oxnard College, CSU Channel Islands, UC Santa Barbara and Oxnard Union High School District.

The intent of the STEM Stew is to provide the venue for collaboration, relationship-building and professional development. Presenters included a presentation on “Ethical and Practical Implications of being an HSI Institution, “The System of Evaluation”, “Contextualized Learning”, “Outcomes of the Summer Bridge Programs”, “Project CAN DO Updates”, “Instructional Technology and Design and How It Can Help You” to name a few.

We also make sure to include monthly grant project updates and leave time for round-table discussions and impromptu sharing of information to strengthen communication and reinforce “thinking outside of the box”.

In addition, several partners have been established to contribute to the success of this grant as seen in the following matrix.
<table>
<thead>
<tr>
<th>Name of Partnership</th>
<th>Purpose</th>
<th>Expected Outcome</th>
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<tbody>
<tr>
<td><strong>Oxnard Union High School District (OUHSD)</strong></td>
<td>• Increase student success in STEM collaborative projects and systems</td>
<td>Increase the number of STEM college-ready students coming to Oxnard College</td>
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<td></td>
<td>• Develop project-based learning opportunities</td>
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<td>• Roadblock Summits to identify and remediate graduation/college readiness barriers</td>
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<tr>
<td><strong>Hueneme High School</strong></td>
<td>Develop and Implement</td>
<td>Increase the number of STEM college-ready students transferring to OC</td>
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<td></td>
<td>• Tutoring Programs</td>
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<td></td>
<td>• Pre-Engineering Summer Bridge Programs</td>
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<td>• Marine Science Summer Bridge Programs</td>
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<td></td>
<td>• Algebra Academies</td>
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<td></td>
<td>• Parent Nights</td>
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<tr>
<td><strong>Ace Charter School (Architecture, Construction, Engineering)</strong></td>
<td>Increase student success in STEM – collaborative projects and systems</td>
<td>Increase the number of STEM college-ready students transferring to OC</td>
</tr>
<tr>
<td><strong>Engineering Academy Advisory Board</strong></td>
<td>Provide feedback, develop innovative STEM program partnerships, network with STEM industry</td>
<td>Networking with educational institutions &amp; Industries to develop job internships and job placement opportunities for students.</td>
</tr>
<tr>
<td><strong>SAGE Publications Inc.</strong></td>
<td>Cooperative Funding of STEMinar Project – Academic &amp; Career pathway development and project based learning (STEM)</td>
<td>Increased student career opportunities and awareness, focused educational plan development for Junior and Senior High School Students as well as first year OC STEM students</td>
</tr>
<tr>
<td></td>
<td>ACE – OC Summer Bridge Program</td>
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</tr>
<tr>
<td><strong>California State University, Channel Islands (CSUCI)</strong></td>
<td>Increase OC STEM student transfers to CSU/UC system</td>
<td>Increase numbers of students pursuing STEM educational pathways and careers. Increase graduation rates.</td>
</tr>
<tr>
<td></td>
<td>• Cooperative STEM grant projects</td>
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<tr>
<td></td>
<td>• Tutoring</td>
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<td></td>
<td>• Peer Mentoring</td>
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<td></td>
<td>• Summer Bridge</td>
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<tr>
<td>CSUCI-OC Faculty Integrated Cooperative Student Projects</td>
<td>Create transitional experiences and develop project-based learning experiences to support student success.</td>
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<tr>
<td><strong>Summer Undergraduate Research Program at UCSB (INSET)</strong></td>
<td>The Student Internships in Nanosystems Science, Engineering and Technology (INSET) Program at the California Nanosystems Institute and the NSF Center for Nanotechnology in Society (CNS) at UCSB offer social science, humanities, science, or engineering majors an 8-week social science research experience. Interns are matched with a mentor and gain first-hand experience investigating the societal impacts of nanotechnology in a dynamic, collaborative research environment. Interns also attend weekly meetings, special seminars and develop presentation skills.</td>
<td>Enhance STEM learning experiences, industry networking, create transitional experiences and develop project-based learning experiences to support student success. Increase OC STEM student retention and transfer rates.</td>
</tr>
<tr>
<td><strong>Mathematics, Engineering, Science Achievement (MESA)</strong></td>
<td>Enhance educational experiences for OC and OUHSD STEM students. Increase student awareness and participation in STEM fields of study via: Science Fairs, Parent Workshops, Afterschool Activities, STEM competitions</td>
<td>Increase the number of OUHSD STEM college-ready students coming to OC. Increase the number of OC STEM students transferring to CSU and UC Institutions.</td>
</tr>
<tr>
<td><strong>MESA Central Coast Regional Alliance</strong></td>
<td>Strategic initiative to foster greater collaboration across MESA centers within our region, greater coordination of program and resourcing activities, and to leverage greater support for our programs through strategic fundraising.</td>
<td>Increased STEM Resources available to OC and OUHSD students. Increased learning opportunities for students. Increased number of students entering into the STEM fields of study. Increased student success, retention and transfer.</td>
</tr>
<tr>
<td><strong>Department of Education</strong></td>
<td>2011 HSI STEM and Articulation Cooperative Grant Awarding totaling $6,000,000</td>
<td>Increased STEM Resources available to OC and OUHSD students. Increased learning opportunities for students. Increased number of students entering into the STEM fields of study. Increased student success, retention and transfer.</td>
</tr>
<tr>
<td>Organization</td>
<td>Activities</td>
<td>Benefits</td>
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<tr>
<td>Oxnard –Hueneme Boys and Girls Club of America</td>
<td>Collaborative STEM projects and tutoring, afterschool and weekends</td>
<td>Increase numbers of students pursuing STEM educational pathways and careers. Increase graduation rates. Create transitional experiences and develop project-based learning experiences to support student success.</td>
</tr>
<tr>
<td>NAVFAC – Naval Facilities Engineering Command</td>
<td>Industry Integration - job shadowing opportunities for students, student internships, workshop presentations etc.</td>
<td>Increased career expectation awareness, enhanced STEM educational experience via project-based learning (OUHSD and OC students)</td>
</tr>
<tr>
<td>International Brotherhood of Electrical Workers (IBEW)</td>
<td>Industry Integration - job shadowing opportunities for students, student internships, workshop presentations etc.</td>
<td>Increased career expectation awareness, enhanced STEM educational experience via project-based learning (OUHSD and OC students)</td>
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<tr>
<td>SunPower Corporation, Systems</td>
<td>Industry Integration - job shadowing opportunities for students, student internships, workshop presentations etc. Green Activities/Projects</td>
<td>Increased career expectation awareness, enhanced STEM educational experience via project-based learning (OUHSD and OC students)</td>
</tr>
<tr>
<td>SEMTECH</td>
<td>Industry Integration - job shadowing opportunities for students, student internships, workshop presentations etc.</td>
<td>Increased career expectation awareness, enhanced STEM educational experience via project-based learning (OUHSD and OC students)</td>
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<tr>
<td>JR Design Engineers</td>
<td>Industry Integration - job shadowing opportunities for students, student internships, workshop presentations etc.</td>
<td>Increased career expectation awareness, enhanced STEM educational experience via project-based learning (OUHSD and OC students)</td>
</tr>
<tr>
<td>Patton Group Education Technology Consultants</td>
<td>Industry Integration - job shadowing opportunities for students, student internships, workshop presentations etc.</td>
<td>Increased career expectation awareness, enhanced STEM educational experience via project-based learning (OUHSD and OC students)</td>
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</table>
V. UNDERGRADUATE RESEARCH PILOT PROJECTS – Planning and Implementation

Deliverables: AY 12/13 Project Plan (Discipline Specific- Biology)

<table>
<thead>
<tr>
<th>Summer 12 Work Plan</th>
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</thead>
<tbody>
<tr>
<td>June 2012</td>
</tr>
<tr>
<td>• Project Timeline</td>
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<tr>
<td>• Project Outline</td>
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<tr>
<td>• Supplies &amp; materials</td>
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<thead>
<tr>
<th>Activities</th>
<th>Fall 12</th>
<th>Person(s) Responsible</th>
<th>Spring 13</th>
<th>Person(s) Responsible</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom Enrichment Activities</td>
<td>Mini-lecture</td>
<td>Norris</td>
<td>Class Field Trip</td>
<td>Chapman</td>
<td>• Experiential learning</td>
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<td></td>
<td>Class field trips</td>
<td>Partners</td>
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<td>Partner</td>
<td>• Student Retention</td>
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<td>• Student Success</td>
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<tr>
<td>UG Research Projects</td>
<td>Research Specific Project</td>
<td>Buckley &amp; Research Partners</td>
<td>Research Specific Project</td>
<td>Buckley &amp; Research Partners</td>
<td>• Possible Publication (acknowledgment)</td>
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<td>• Acquired Research skills</td>
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<td>• Attendance and presentation</td>
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<tr>
<td>UG STEM Transfer Readiness</td>
<td>Professional Conference/ Symposium</td>
<td>Buckley Norris Newby &amp; Research Partners</td>
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<td>• Career Pathways</td>
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<td>• Research Topics</td>
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<td>• Presentation skills</td>
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<td>• Career Networking</td>
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<tr>
<td>University Life</td>
<td>Peer Outreach workshops that support transfer readiness</td>
<td>Project Coordinator</td>
<td>Industry panel of former CI STEM alumni &amp; Faculty</td>
<td>Project Coordinator</td>
<td>Knowledge of STEM Majors &amp; Career Pathways</td>
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<td>• Exposure to university life</td>
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<td>• Awareness transfer process</td>
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<td>Peer Outreach workshops that support transfer readiness</td>
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<td>Project Coordinator</td>
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<td>CI Campus Tour &amp; Student Resources</td>
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# Deliverables: AY 12/13 Project Plan (Discipline Specific-Chemistry)

## Summer 12 Work Plan

<table>
<thead>
<tr>
<th>June 2012</th>
<th>July 2012</th>
<th>August 2012</th>
</tr>
</thead>
</table>
| • Project Timeline  
  • Project Outline  
  • Supplies & materials | • Implementation Plan | • Final Project Plan  
  • Expected Outcomes  
  • Project Budget |

## Activities

<table>
<thead>
<tr>
<th>Clsroom Enrichment Activities</th>
<th>Fall 12</th>
<th>Person(s) Responsible</th>
<th>Spring 13</th>
<th>Person(s) Responsible</th>
<th>Outcomes</th>
</tr>
</thead>
</table>
| • Mini-lecture on the NMR at OC | Simone | | | | • Experiential learning  
  • Student Retention  
  • Student Success |
| • Class trip to CI NMR Lab | Yong | • Industry Field Trip | Simone | | |
| UG Research Classroom Lectures | • Class Lecture: Introduction to Research  
  • Projects | Simone | • Class Lecture: Introduction to Research Projects | Simone | • Exposure to research opportunities  
  • Student Success |

## University Life

| • Peer Outreach workshops that support transfer readiness | Project Coordinator | • Industry panel of former CI STEM alumni & Faculty | Simone/Project Coordinator | • Knowledge of STEM Majors & Career Pathways |
| • Peer Outreach Mini-Sessions 10-15 minute sessions that occur 2-3 times throughout the semester | Project Coordinator | • Peer Outreach Mini-Sessions 10-15 minute sessions that occur 2-3 times throughout the semester | Project Coordinator | • Knowledge of the transfer process to a 4-year. |
| | | • CI Campus Tour & Student Resources | Project Coordinator | • Exposure to university life  
  • Awareness transfer process |
VI. PARTNERSHIP ACTIVITIES WITH CSU CHANNEL ISLANDS

- Initiated OC STEM student transfer services needs assessment to inform the development of the Outreach Peer Mentor Program
- Developed and implemented Outreach Peer Mentor in-class mini-presentations and one-on-one mentoring to increase awareness of transfer assistance outreach services
- Implemented a pre/post STEM Tutor Assessment Tool to measure student efficacy, satisfaction, and tutor performance to inform continuous improvement efforts
- Solidified collaborations with other CI STEM grant projects to facilitate OC student interest in STEM Majors, careers, and post-baccalaureate educational opportunities Hired 4 CI STEM tutors who provide services at the Oxnard College STEM Center
- Hired 2 Outreach Peer Mentors who provide services at the Oxnard College STEM Center
- Hired 1 Community College Outreach Coordinator dedicated to OC students
As a collaborative partner in the first year of Project ASCENSION, CSUCI coordinated successful planning, development and implementation efforts for three key activities:

1. Selection of two CI discipline-specific STEM faculty to work on OC-CI collaborative undergraduate research projects integrated in course curriculum for biology/environmental studies, chemistry and math/engineering.
2. Recruitment and management of CI students to serve as STEM tutors/mentors in the Oxnard College STEM Center.
3. Provide OC with CI student Outreach Peer Mentors to assist OC STEM students with transfer and educational planning information and activities.

**Oxnard College and CSU Channel Islands Faculty Exchange**

In coordination with the Oxnard College (OC) Project Director two CI discipline-specific STEM faculty were selected from Chemistry and Biology to work with OC faculty on the integration of classroom enrichment activities and undergraduate research projects. To inform the development of curricular planning activities in Fall 2011 CSU Channel Islands (CI) faculty consulted on curricular materials for the grant project and reviewed relevant resource book materials to inform their recommendations for hands-on research activities to be incorporated into the STEM courses at OC.

In Spring-Summer 2012, CI faculty participated in an intensive planning process with OC faculty to develop a collaborative activity implementation plan. The implementation plan includes class research projects, enrichment activities, classroom presentations and working cooperatively as a team with OC STEM faculty. The outcome of these collaborative efforts resulted in the development of discipline specific activity implementation plans that also integrated STEM Outreach and University Life activities.

**STEM Tutors**

Four STEM student tutors from CI were recruited and hired to serve OC STEM students in the areas of mathematics, chemistry, anatomy, microbiology, and biology. CI students selected for STEM tutor positions come from diverse educational pathways, have exposure to STEM research experiences, and extensive experience working with STEM faculty at CI. Three of the STEM tutors hired are former Oxnard College transfer students and two of them participated in the STEM Summer Research Institute at CI while they were Oxnard College Students. One of the STEM tutors is currently in the Mathematics Master Program at CI. Given their diverse backgrounds, all of the STEM tutors serve as role models for OC STEM students interested in pursuing baccalaureate degrees in STEM majors.

STEM tutors were provided with an orientation and weekly check-in meetings. The future plan for training STEM tutors is to collaborate with Project ACCESSO (CI HSI STEM grant) and offer monthly collaborative tutor trainings. These trainings will include discussions about challenges, best practices, how to manage challenging students, small group facilitation, effective listening, student learning styles, Socratic questioning, and scenario/role playing to model effective tutoring techniques. In addition, a bi-annual STEM Tutor-OC Faculty Exchange meeting is planned in order to facilitate communication between faculty and tutors and to convey expectations regarding tutoring services.

A pre/post STEM Tutor Assessment Tool was implemented to measure student efficacy, satisfaction, and tutor performance in order to inform continuous improvement efforts. An overall evaluation of the tutoring program was conducted and included interviews with the tutors, the community college outreach...
coordinator and a sample of OC STEM faculty. As a result, a new survey tool was developed and will be accessible online for OC STEM students to complete. Data that will be captured via the online evaluation tool includes: numbers of first time and repeated clients, time of the day, time spent with the tutor, subjects addressed, whether the session was individual or group, why student chose to attend tutoring, satisfaction with tutor, performance of tutor and student efficacy.

**STEM Outreach Mentors**

Two Outreach Peer Mentors from CI were recruited and hired in order to provide assistance, information and services for OC STEM students in the transfer process. Both Outreach Peer Mentors are communications majors with experience and background in interpersonal communication, public speaking and developing/delivering presentations. One of the Outreach Peer Mentors has also had previous experience working with the university outreach department at CI.

Outreach Peer Mentors were provided with an orientation and bi weekly outreach meetings. They were also provided with a training program that included the following topics: transfer admissions (in collaboration with Project ACCESSO), university culture transfer resources/website, and SB 1440 and AB 540 legislation. The Outreach Peer Mentors and Community College Outreach Coordinator met with the OC transfer advisor in order to discuss the coordination and delivery of services. The partnership between the OC transfer center and the STEM Center outreach program will continue to be fostered with the hopes that the transfer center will refer STEM students to the STEM Center for transfer assistance.

The Outreach Peer Mentors provided in class mini presentations (10-15 minutes) on transfer information and resources based on a curriculum and website developed by the CI university outreach department. Approximately 12 in class presentations were delivered in chemistry, biology, geography and mathematics courses. Presentations were also made to the OC chemistry and physics student clubs. Outreach Peer Mentors were also available in the OC STEM Center Mondays through Thursdays between 9 am and 4:30 pm for one on one transfer mentoring and assistance. The plan for the future is to supplement these outreach activities with a series of STEM Outreach days developed in collaboration with the CI LSAMP program. These STEM Outreach days will provide opportunities for OC STEM students to participate in STEM related activities at CI, including: student panels, faculty presentations and research application workshops.

Outreach services were informed by a needs assessment survey tool that was developed and administered to OC STEM students in order to determine the type and delivery of transfer services needed. Data will continue to be collected along these lines in order to inform the continuous development of the outreach program and services. An online outreach evaluation tool was also developed in order to better understand the extent to which the one on one mentoring is utilized and the purpose it serves for students. Specific data captured includes: type, duration and frequency of transfer assistance. In order to strengthen the outreach program, marketing materials and information regarding outreach and transfer services were developed and distributed around the OC campus and electronically to students in the OC STEM database.

In order to strengthen both the tutoring and outreach program the Community College Outreach Coordinator has had a series of meetings with key staff at OC, including: the transfer advisor and the LRC tutoring coordinator. In addition, presentations on services were delivered to OC STEM faculty at the STEM Stew meeting and OC counselors at the counseling in service meeting. These meetings and presentations will continue in order to strengthen partnerships and coordinate services at OC.
VII. PARTNERSHIP ACTIVITIES WITH UC SANTA BARBARA

UCSB institutional partners and programs that participated in the ASCENSION (HSI-STEM) initiative in Year One included MESA, the Center for Science Education Partnerships and the Office of Education Partnerships. This past year has been an exceptionally productive one, as new partnerships were explored and older ones were strengthened.

- Math, Engineering, Science Achievement (MESA):
  - Coordinate MESA Program in the Oxnard area high and intermediate schools; provide undergraduate student mentorship to community college students and MESA participants; provide students and their families with college going workshops including college admissions, financial aid, and test preparation information services; and individual student advising.

- Oxnard College Title V STEM and Articulation Grant
  - Increase participation of Oxnard College HSI-STEM students in (STEM related) UCSB summer bridge programs, field trips, career days, faculty mentored events, and admissions workshops geared towards successful transfer pathways to the university.

- Center for Science and Engineering Partnerships (CSEP):
  - Partnership coordination and development, reporting, budget management, and provide data collection, analysis and reporting services in support of project evaluation.

- Office of Education Partnerships (OEP):
  - Partnership coordination and development, reporting, budget management, and provide data collection, analysis and reporting services in support of project evaluation.
**OC- UCSB PROGRAM HIGHLIGHTS for (2011-12)**

**MESA Schools Program:**

**Partnership Development:** Key meetings and presentations to increase visibility of MESA and other STEM-related campus and community resources

- Meetings with administrators for five local high schools (Channel Islands, Hueneme, Oxnard, Pacifica, and Rio Mesa High Schools), plus three feeder middle schools (Frank, Fremont and Haydock Intermediate Schools).
- MESA, in connection with Oxnard College STEM Center staff, representation on Engineering Academy Advisory Board, Hueneme High School – quarterly throughout academic years.
- Higher Education Week, MESA presence (tabling) and presentations at Oxnard Union High School District schools, partnering with UCSB’s Early Academic Outreach Program – Fall and Spring 2011-12.
- Classroom and MESA club presentations at partner high schools – throughout Academic Year 2011-12
- OUHSD Superintendent meeting to discuss MESA Program site agreements for 2012 and STEM EXPO 2012 - 8/7/12.
- MESA Central California Coast Regional Alliance meeting including UC Office of President MESA Statewide Office, Oxnard College (STEM Center), Cal Poly SLO (MESA), Allan Hancock College (MESA), Ventura College (MESA), Santa Barbara City College (MESA) and UC Santa Barbara ASCENSION (HSI-STEM) Partners – 12/15/2011.

**Direct Services:** Direct services have been delivered to high school students, families, and teachers (MESA Advisors) through the following activities.

- Over 20 STEM project workshops to prepare for MESA competitions – throughout the academic year.
- Development of MESA elective period for MESA Students at Haydock Intermediate for Fall 2012.
- Preparation and coordination (with MESA staff and advisors) of approximately 500 students for competing in MESA Days: Science & Technology MESA Day at UCSB (3/3/2012), and approximately 110 students MESA Regional Finals at UC Santa Barbara (4/28/2012).
- UC Success Nights for UC-eligible graduating seniors (and families) at Rio MESA High School – 5/2/12.
- Assistance with college applications and personal statements.
- Volunteer outreach of STEM students from UCSB, VC, and OC.
- Group sessions on academic planning and STEM career preparation – throughout academic year.
- Direct student and instructional support – MESA Activity Days - for Oxnard High School Algebra Academy, including campus visit (7/26/2012) to UCSB (with MESA Engineering Program student guides & panelists), Summer 2012.
- MESA provided webinars for Advisors and MESA participants, including Prosthetic Arm Competition Rules for MESA Day 2013 (9/26/2012), Guest Speaker Diana Gomes of the California High Speed Rail Project,
participating in the MESA Professional Development Series (9/28/2012), and Mousetrap Car competition rules overview (9/29/2012).

- Fall planning and coordination of MESA STEM EXPO at Oxnard College, on Saturday October 20, 2012.
- MESA College Day at University of Southern California, with college-preparation & STEM studies workshops, and opportunities for high school students to interact with representatives from 30 U.S. colleges & universities – including University of California campuses, California State Universities, other state college systems, and private colleges. Oxnard College STEM students participated as mentors/chaperones for attending high school students – 10/27/2012.

**MESA Advisors (school-site teachers) received direct support through:**

- UCSB MESA co-hosted a statewide Virtual MESA Academy for Science and Mathematics Educators (MASME), using distant-learning technology and onsite demonstrations. Local Oxnard MESA teachers from Hueneme HS, Pacifica HS, Channels Islands HS, and Haydock Intermediate explored innovation in science, technology, engineering, mathematics (STEM) curricula and inquiry-based instruction. 7/27-28/2012.
- Assistance to MESA Advisors and administrators to prepare & coordinate students for MESA Days: Science & Technology MESA Day at UCSB (3/3/2012) and MESA Regional Finals at UC Santa Barbara (4/28/2012).
- Rollout of MESA Program enrollment forms (pilot program) for student tracking and program management.
- Increased availability of resources, including curriculum support, STEM supplies and materials.
- Guidance on competitions, events, and protocols.
- Increased communication, readily available responses for inquiries and concerns.
- MESA Fall Advisor meetings facilitated by MESA staff.
- Volunteer and undergraduate mentorship of Oxnard College volunteer students and Ventura College MESA/SHPE students facilitated by Oxnard MESA coordinator.
STEM Expo on the Oxnard College Campus - Evaluation

Executive Summary

Under Project “ASCENSION,” a one-day engineering and college readiness event took place at Oxnard College. The event served 7th through 12th grade students and their parents at junior high and high schools in Oxnard, Ventura, and Santa Paula. Aiming to increase students’ interest and motivation in STEM disciplines, the event exposed students to science through project-based engineering activities. During these project-based engineering activities, students experienced aspects of the engineering design process, including developing initial project designs, testing them using problem solving and critical thinking, and subsequently revising their initial project designs—all of which are skills desired in STEM disciplines. Also, students learned about preparation for attendance at colleges and universities; in particular, how to apply for institutions of higher education and for financial aid.

Concentrating on both event implementation and improvement, the STEM Expo was evaluated using surveys and multiple perspectives. Student and parent survey responses were assessed in this preliminary report; however, staff and volunteers’ feedback will be analyzed and included in a later version of this report. Results indicated that the students and parents tended to respond favorably to all components of the event. Also, the students and parents made some comments on how to improve the event, including having more workshops and better organization. Additionally, the evaluator provided other recommendations on how to improve data collection and reporting for future events and programs.

Background

Under Oxnard College’s Title V STEM grant (“Project ASCENCION”), a one-day engineering and college readiness event was held at Oxnard College. Prior to participating in the STEM Expo event, students were already affiliated with the MESA program. The Science, Technology, Engineering, and Mathematics (STEM) Expo is one of many events that is hosted by the Mathematics, Engineering, Science Achievement (MESA) Program. MESA’s stated mission is as follows: “To create opportunities for educationally disadvantaged students, especially those from groups with low participation rates in college, to prepare for and enter professions requiring degrees in engineering and other mathematics-based scientific fields.” Through their MESA advisors, students and their parents were offered the opportunity of participating in the STEM Expo event.
EVENT GOALS
Centered at Oxnard College, the STEM Expo event was facilitated by the MESA Coordinator - Eliseo Gonzalez - and by the Assistant MESA Director - Phyllis Brady. The event intended to achieve the following four goals:

6. Students experience engineering through project-based work.
7. Students develop their abilities related to critical thinking and problem solving through engaging in the engineering design process.
8. Students and parents learn about applying for college and for financial aid.
9. Students increase their interest in and motivation to learn more about STEM topics and higher education.

ENGINEERING WORKSHOPS
Engineering workshops followed the engineering design process and the learning of the students was fostered by their ability to test and revise their initial project designs. Engineering workshops included the activities below:

- Stick Together
- Gliders
- Mouse Trap Cars
- EggXpress
- Build a Speaker
- Reaction in a Bag/Ice Cream
- Prosthetic Arm
- Gumdrop Dome
- Kimoto Flyer

PROTOCOL
This evaluation will provide information to help to improve this event in future years. Thus, this evaluation is a formative process evaluation - formative in the sense that the evaluation is being conducted for the purpose of program improvement and process in the sense that the evaluation will examine the event’s implementation, but not the effectiveness of the event.

This evaluation measures the event’s implementation through the administration of surveys to the three categories of participants: staff (from full-time paid staff to university student volunteers), students (seventh through twelfth grade students involved in the MESA program), and parents of the MESA students. The surveys include both closed-ended (i.e., Likert-scale items, multiple choice) and open-ended response questions and statements. The staff, student, and parent survey results will suggest ways in which the event can be subsequently improved and will offer evidence of what went well, what did not go well, and reasons behind the perceived successes and shortcomings of the event. A descriptive analysis of the Likert-scale items will disclose participants’ general impressions of the event and specific views towards different components of the event, as well as their feelings of
learning, attitudinal, and anticipated behavioral changes due to event participation. Open-ended questions and statements elicit responses that can be used for both implementation and event improvement.

Student and parent responses are analyzed in this report, and staff responses will be included in a later version. In addition, a Spanish version of the parent survey was distributed during the STEM Expo event; however, none of these surveys were returned.

EVENT PERCEPTIONS: ANALYSES AND RESULTS

STUDENT SURVEYS: LIKERT-SCALE ITEM RESPONSES

Using surveys, students were asked to report their attitudes/perceptions toward several components of the STEM Expo event, including the opening ceremony, registration process, workshops (both engineering and college readiness), transit between the workshops, and time with College Staff Mentors. In addition, students self-reported their likelihood of using the skills acquired during the event, their perceived learning in the workshops, and their excitement of attending college.

20 scale items were analyzed on a 1-5 Likert scale, with a response of 1 indicating that the student strongly disagreed with the statement and a response of 5 signifying that the student strongly agreed with the statement. Also, students had the option to respond not applicable (N/A) to these statements.

The following protocol was used in conducting the analyses:

7. Multiple responses were excluded from the analyses, as it suggests that these items were confusing to the students and therefore their validity should be questionable.
8. Blank items were removed from the data set and these observations were coded as missing.
9. Not applicable (N/A) responses were also not analyzed, since the purpose of this evaluation is to determine students’ perceptions of the event in order to evaluate its implementation and propose improvements for the future.

RESULTS

In the surveys, students were asked about their perceptions of different components of the STEM Expo event, learning that occurred during the workshops, and anticipated attitudinal and behavioral changes resulting from participation in the event. The questions about learning in the engineering workshops were based on the assumption that students had sufficient exposure to proceeding through the steps of the engineering design process, including engaging in critical thinking and revising their initial project designs. The descriptive analyses of the Likert-scale statements indicated that students had overall positive perceptions of the event.
Students tended to report that they learned about the engineering design process and how to apply for college. Also, the findings suggested that students saw the value of the activities and would apply the skills they learned after the event.

Below is a table of the descriptive statistics findings. The variables are the item names found in the survey, but some item names were shortened to ease the analysis. \( N \) represents the number of observations (i.e., the number of responses meeting the inclusion criteria - see above). Minimum and maximum are the lowest and highest scores, respectively. The mean is the average of all included responses and the standard deviation shows the variation in the data.

**Descriptive Statistics**

<table>
<thead>
<tr>
<th>Variables</th>
<th>( N )</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The information presented in the workshops was clear</td>
<td>188</td>
<td>2.00</td>
<td>5.00</td>
<td>4.3670</td>
<td>.72272</td>
</tr>
<tr>
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<td>5.00</td>
<td>4.4149</td>
<td>.75869</td>
</tr>
<tr>
<td>The materials in the workshops were useful</td>
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<td>4.5294</td>
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<td>1.00</td>
<td>5.00</td>
<td>4.5435</td>
<td>.71537</td>
</tr>
<tr>
<td>I am more excited about going to college now</td>
<td>183</td>
<td>1.00</td>
<td>5.00</td>
<td>4.2896</td>
<td>.86333</td>
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<tr>
<td>I can see myself using the skills I learned during the workshops</td>
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<td>5.00</td>
<td>4.1868</td>
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<tr>
<td>The engineering workshops helped me understand initial designs</td>
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<tr>
<td>I see usefulness of hands on activities to help me with projects</td>
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<td>Statement</td>
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<td>Mean</td>
<td>Standard Deviation</td>
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<td></td>
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<td>--------------------------------------------------------------------------</td>
<td>-----</td>
<td>------</td>
<td>--------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I will refer to the information AB 540 admissions financial aid</td>
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<tr>
<td>The STEM Expo day overall was well organized</td>
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<td>5.00</td>
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<td></td>
</tr>
<tr>
<td>It was easy for me to get registered</td>
<td>182</td>
<td>1.00</td>
<td>5.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It was easy to get to and from the different workshops</td>
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<td>5.00</td>
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</tr>
<tr>
<td>The opening ceremony was fun</td>
<td>184</td>
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<td>5.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I learned how to improve my projects designs engineering wkspss</td>
<td>183</td>
<td>2.00</td>
<td>5.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I learned how to implement the Engineering Design process</td>
<td>171</td>
<td>1.00</td>
<td>5.00</td>
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<td></td>
</tr>
<tr>
<td>I saw the value of designing projects in the engineering wkspss</td>
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<td>5.00</td>
<td></td>
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<tr>
<td>AB 540 admissions financial aid workshops taught me</td>
<td>136</td>
<td>1.00</td>
<td>5.00</td>
<td></td>
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<tr>
<td>The time with the College Staff Mentors was valuable to me</td>
<td>176</td>
<td>2.00</td>
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<td>Valid N (listwise)</td>
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<td></td>
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</table>

As displayed above, the mean of all of the items except for one - the opening ceremony was fun - was higher than 4. The open-ended response results (presented in the following section) supported the Likert-scale item response findings, but also provided information on how to improve the STEM Expo day and the specific workshops attended. Following the presentation of these results, a discussion section summarizes and integrates the key findings (see page 19).

**STUDENT SURVEYS: OPEN-ENDED RESPONSES**

Students also responded to open-ended questions and statements asking them about their overall impressions of the event and the workshops, including what went well and what could be improved. Specifically, students wrote down their perceptions of their favorite part(s) of the day, their favorite part(s) of the workshops, how the day could be improved, how the workshops could be improved, how the registration process could be improved, and why they went to the specific workshops they participated in during the day. Since this evaluation is focused
on event implementation and improvement, common and unique responses from students on how to improve various components of the event are highlighted below.

- **How could the day be improved?** Many students indicated that they would have liked more workshops or more time in the workshops. Other students wanted less time in the individual workshops so that they could participate in more activities. In addition, there were responses about the quality/quantity of food during lunchtime. There were also comments about the perceived lack of organization of the event. Some students noted the general absence of organization, but other responses were more specific. For example, a few students discussed not knowing where to go, the need for more helpers, and the opening ceremony could have been better. A unique example was one student pointed out that the competitions during the STEM Expo event did not follow MESA Day rules. Some students said that the day could not be improved because it was fine already. Below are some typical responses from the students (misspellings are preserved):
  - more workshops
  - More time for workshops
  - Faster workshops would be nice. Instead of only 2 sessions, some students might prefer to go to more than two.
  - more workshops, more snacks, less time in one individual workshop
  - more food
  - better food
  - The day could have been a bit more organized.
    - more staff/helpers
    - Making the lectures smaller.
    - Opening ceremony could be more interesting
    - The day could have been improved by them announcing the competition groups and directing where we were to go.
  - The actual rules can be put into place for the completion. They did not use the same rules as MESA Day would
  - The day cannot be improved

- **How could the workshops be improved?** Most of the students’ responses to this question involved having more workshops, more materials, more time, more examples, more explanations, more help, more teaching, more prizes, or more fun; however, some students advocated for less time. A few other students
indicated that they would have benefitted from a smaller class size. There were a small number of responses about the type of activity, with some students supporting hands-on and others informational-type workshops. A couple of students wanted more information that could be used in preparation for MESA Day. A unique example was one student recorded that he/she would have liked to be challenged further. Also, there were some comments about the structure of specific workshops, such as the recommendation to have the glider activity outside and to shorten the length of the gumdrop dome activity. Like the responses to the question about improving the STEM Expo day, several students commented that the workshops needed no improvement. Below are some frequent and unique examples of comments from the students:

- More of them
- More materials
- longer time for improvement
- give more examples
- more explanations
- If they do more to help "show you how to do it".
- Workshops can be improved by teaching us more.
- Give more treats, prizes.
- Try making the activities more fun. I was kinda bored.
- smaller groups
- They need to be more information-based. They should not just be hands-on activities only. I wanted to know more.
- The workshops, especially the Prosthetic Arm, needs to have more information especially for those want to compete in MESA Day.
- more advanced ideas/designs
- For the glider workshops, there was lots of balsawood trash from the sandpaper, so I think the workshop should have been outside.
- Make them shorter because some did not require the full time like in the Gumdrop dome.
- They are already good enough

- How could the registration process be improved? Most of the students said that the registration process went well or was fine the way that it was. There were also many blank or N/A responses, indicating that these students likely did not feel that improvement was needed. These results are dissimilar to the students’ responses about improving the STEM Expo day and the workshops, where they offered many different suggestions for improvement. Some students mentioned that there could have been better
organization; in particular, students discussed having the schools’ information ready to go, having a table for every school, and having signs. In addition, a few students thought that the registration process could have gone more smoothly, including the process being faster, creating more lines for students to register, having more volunteers to help out, and assigning students to the correct workshops that they signed up for. Below are some representative and individual writing samples from the students’ surveys:

- Registration process was good :).
- it was easy enough
- A little more organized with the moving around
  - Have the school info at ready
  - If they have a table for every school ready
  - have signs
- make process quicker and easier
  - Faster timing
  - Two lines for one school
  - more people working to register us faster
  - You could have gave people the right workshops they wanted.

The students’ open-ended responses suggest that there is room for event improvement. For instance, many student comments indicated that the STEM Expo day would have been better with at least one more workshop. In addition, during the workshops, lots of students indicated that they would have liked more time, more materials, more examples, more help, and more fun. There were also specific recommendations made on how to improve the registration process.

In terms of the staff’s implementation of this event, there were mixed sentiments expressed about the level of organization. On the one hand, students said that more helpers/volunteers would have been useful, the food could have been more ample or better, the opening ceremony could have been more interesting, and the registration process could have been faster and easier. On the other hand, there were many student responses where they articulated how great the event was, suggesting that the level of organization was at least satisfactory. Students wrote these positive comments both in the favorite part(s) of the day/workshop sections, as well as in the improvement sections. In addition, the absence of responses on how to improve various aspects of the day indicates that many of these students tended to feel at a minimum that the event went smoothly. These findings will be further summarized in the discussion section.
PARENT SURVEYS: LIKERT-SCALE ITEM RESPONSES

Using surveys, parents were asked to report their attitudes/perceptions toward several components of the STEM Expo event, including the opening ceremony, registration process, workshops (college readiness), transit between the workshops, and time with College Staff Mentors. In addition, parents self-reported their likelihood of using the skills acquired during the event, their perceived learning in the workshops, and their excitement of promoting the importance of college to their children.

14 scale items were analyzed on a 1-5 Likert scale, with a response of 1 indicating that the parent strongly disagreed with the statement and a response of 5 signifying that the parent strongly agreed with the statement. Also, parents had the option to respond not applicable (N/A) to these statements.

The following protocol was used in conducting the analyses:

1. Multiple responses were excluded from the analyses, as it suggests that these items were confusing to the parents and therefore their validity should be questionable.
2. Blank items were removed from the data set and these observations were coded as missing.
3. Not applicable (N/A) responses were also not analyzed, since the purpose of this evaluation is to determine parents’ perceptions of the event in order to evaluate its implementation and propose improvements for the future.

RESULTS

In the surveys, parents were asked about their perceptions of different components of the STEM Expo event, learning that occurred during the workshops, and anticipated attitudinal and behavioral changes resulting from participation in the event. The descriptive analyses of the Likert-scale statements indicated that parents had overall positive perceptions of the event. Parents tended to report that they learned about how to apply for college. Also, the findings suggested that parents would apply the skills they learned after the event.

Below is a table of the descriptive statistics findings. The variables are the item names found in the survey, but some item names were shortened to ease the analysis. \( N \) represents the number of observations (i.e., the number of responses meeting the inclusion criteria - see above). Minimum and maximum are the lowest and highest scores, respectively. The mean is the average of all included responses and the standard deviation shows the variation in the data.
### Descriptive Statistics

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The information presented in the workshops was clear</td>
<td>6</td>
<td>4.00</td>
<td>5.00</td>
<td>4.6667</td>
<td>.51640</td>
</tr>
<tr>
<td>The information in the workshops was useful</td>
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<td>4.00</td>
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<td>.54772</td>
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<tr>
<td>The materials in the workshops were useful</td>
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<td>5.00</td>
<td>4.6667</td>
<td>.51640</td>
</tr>
<tr>
<td>The presenters were willing to answer questions</td>
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<td>5.00</td>
<td>4.8000</td>
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</tr>
<tr>
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<td>I am more excited about promoting the importance of college</td>
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<td>5.00</td>
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<td>.54772</td>
</tr>
<tr>
<td>I can see myself using the skills I learned during the workshops</td>
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<td>4.00</td>
<td>5.00</td>
<td>4.6667</td>
<td>.51640</td>
</tr>
<tr>
<td>I will refer to the information AB 540 admissions financial aid</td>
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<td>The STEM Expo day overall was well organized</td>
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<td>It was easy to get to and from the different workshops</td>
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<td>AB 540 admissions financial aid workshops taught me</td>
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Valid N (listwise) 3
As displayed above, the mean of all of the items except for one - the opening ceremony was fun - was higher than 4. This result is similar to the student data findings. However, in contrast to the student results, the means were even higher for the parents. Excluding the one item, all of the means were 4.5-5 in value. These findings suggest that the parents had very positive views of the STEM Expo day and will refer back to the information they learned in the future. The open-ended response results (presented in the following section) supported the Likert-scale item response findings, but also provided information on how to improve the STEM Expo day and the specific workshops attended. Following the presentation of these results is a discussion section that incorporates the main findings for students and parents (see page 19).

PARENT SURVEYS: OPEN-ENDED RESPONSES
Parents also responded to open-ended questions and statements asking them about their overall impressions of the event and the workshops, including what went well and what could be improved. Specifically, parents wrote down their perceptions of their favorite part(s) of the day, their favorite part(s) of the workshops, how the day could be improved, how the workshops could be improved, how the registration process could be improved, and why they went to the specific workshops they participated in during the day. In addition, the parents responded to two more open-ended questions than the students: 1) What workshops, activities or trainings would you like to see for your son or daughter over the course of the next year? and 2) What workshops, activities or trainings would you like to see for yourself over the course of the next year? Since this evaluation is focused on event implementation and improvement, common and unique responses from parents on how to improve various components of the event are highlighted below. Also, their recommendations for additional workshops, activities or trainings are presented as well.

- How could the day be improved? Half of the parents (3 out of 6) did not provide an answer to this question. Two of the remaining three parents said that the day’s organization could have been better. The last parent believed that more students should have participated in the competitions. Below are the three responses received for this question:
  - better organization & leadership for kids to understand where & what they are doing.
  - Organize kids workshops better because kids went wherever not where they originally signed up so some were full & they weren’t able to participate in their original choices
  - Get more kids in the competitions
- How could the workshops be improved? Two parents left this question blank and one more wrote N/A. The other three parents provided comments. Two parents thought the workshops were good or great.
The last parent remarked about the information in the workshops (specific response is below and is vague as to what about the information could be improved). Below are the three responses received for this question:

- they were great!
- They're good
- Information -

- How could the registration process be improved? Parents provided brief or no responses to this question. Two parents left the question blank and another two wrote N/A. The remaining two responders indicated that the registration process was fine. The two specific responses are typed below:
  - no problem
  - OK

- What workshops, activities or trainings would you like to see for your son or daughter over the course of the next year? Parents provided brief or no responses to this question. Like the question about the registration process, two parents left the question blank and another two wrote N/A. The remaining two responders indicated that they would like more workshops, activities or trainings for their children, but they were not specific as to which ones or what kinds. Their responses are typed below:
  - Yes
  - any & all available

- What workshops, activities or trainings would you like to see for yourself over the course of the next year? Two parents left the question blank and one more answered N/A. The other three parents indicated that they would like more workshops, activities or trainings for themselves. One of these parents was more specific in his/her response and requested more information about financial aid and college admissions. The three parent responses are listed below:
  - Yes.
  - more like this.
  - Continued info on financial aid & help getting them to college/university

The parents’ open-ended responses suggest that they believe that the event overall went well and that they would appreciate similar events for their children and themselves in the future. Some parents did comment on the organization and leadership of the event - these are areas in which the event could be improved. Also, one parent would have liked more students involved in the competitions. Since the STEM Expo day is preparation for those students participating later in MESA day, allowing more students to be involved and to compete is a good recommendation to improve this event next year.
It should be noted that some parents also attended the engineering workshops, even though these activities were designed for the students. One parent wrote that he/she attended the reactions/egg drop activities. When asked why he/she went to those particular workshops, the parent responded: sounded good - kids were interested. Although not many parent surveys were returned, some staff members commented that parents did attend the engineering workshops with their children. This occurrence has implications for event implementation and improvement (see discussion section below). Specific responses from staff members and volunteers (other than a few from the Assistant MESA Director in the discussion and limitations sections) will be included in a later version of this report.

DISCUSSION

Both students and parents tended to have favorable perceptions of the STEM Expo event as measured by the student and parent evaluation forms. The means of the Likert-scale items of the surveys were high (above 4 for students and at or above 4.5 for parents) with the exception of the item “the opening ceremony was fun.” After the event, I talked with the Assistant MESA Director and she said that she told the MESA Coordinator to keep the opening ceremony as short as possible so that the students could proceed to the workshops. In light of this information, this result is less surprising, given that some students strongly disagreed with the statement.

In examining the Likert-scale item survey results, it became apparent that students overall did not understand the N/A (not applicable) column. This response category was intentionally put into the Likert-scale items of the survey so that students were not forced to respond 1 to 5 (1 = Strongly Disagree, 5 = Strongly Agree) to activities that they did not participate in. For example, students may have attended two engineering workshops and so should have the option to choose N/A for the items on the college readiness workshops (i.e., AB 540, Financial Aid, Admissions). The same goes for students that attended two college readiness workshops - they should be able to select N/A for the engineering workshop items since they were not a part of these activities. However, the majority of the students did not make this distinction and answered all of the items by circling a number from 1-5. This is a limitation of the survey results, which will be discussed in further detail in the next section of this report.

An examination of the open-ended responses indicated that students tended to advocate for more workshop sessions, with many citing that they wanted to participate in more activities - e.g., three of them. The large number of students that checked the “not enough activities” response box to the prompt “The STEM Expo day had” substantiates this - 57 out of 188 student surveys returned had this response marked (one observation with
multiple answers was excluded). In addition, both students and parents commented that organization of the event could have been better.

**BARRIERS AND LIMITATIONS**

There were some limitations that affect the interpretation of the survey data. Only six parents returned the parent STEM Expo evaluation forms and they were all from the English version of the survey. Since many more than six parents attended the event, their responses may not reflect the sentiments felt by the larger group of parent participants. In a discussion with the Assistant MESA Director after the event, she made the suggestion that perhaps the MESA Coordinator should have spoken in Spanish to the parents during the opening ceremony. This could have increased the number of parent surveys returned, in particular the forms in Spanish. Also, as mentioned above, some parents decided to attend the engineering workshops along with their children. The engineering workshops only had student evaluation forms in the survey packets and no parent evaluation forms. Thus, it is likely that most of these parents did not have the opportunity to fill out a survey. It is unclear how the one parent respondent that went to the engineering workshops obtained a parent survey form.

Also, student surveys were returned in packets that did not correspond to either workshop that they attended. For example, students indicated on their surveys that they went to the Glider and Mouse Trap Car workshops, but their surveys were returned in the Reaction in a Bag packet. It would be helpful to keep the surveys in the correct packets for reporting purposes. For instance, student responses could be analyzed at the group level (e.g., according to the workshops they attended) rather than only at the whole aggregate level.

Another barrier had to do with the inability to distinguish the relative contributions of the two workshops on the students’ learning, attitudes, and behaviors. If students participated in more than one engineering or more than one college readiness workshop, then their answers to the engineering and college readiness Likert-scale items cannot be interpreted at the individual workshop level. That is, if a student attended the Prosthetic Arm and Build a Speaker engineering workshops, then it is unclear which one workshop, an unequal combination of the two workshops, or an equal combination of the two workshops influenced their responses to items such as “The stick together, gliders, mouse trap cars, EggXpress, reaction in a bag/ice cream making, build a speaker, prosthetic arm, gumdrop dome, and Kimoto flyer activities helped me to understand ways to approach my initial designs.” Thus, the responses to these items cannot be ascribed to individual workshops, unless the student recorded that he or she attended one engineering workshop and one college readiness workshop during the day.
Conclusions and Recommendations

The STEM Expo event served 7th through 12th grade students and their parents from Ventura County. 189 students and 6 parents completed and returned the evaluation survey forms. The one-day event focused on exposing students to the engineering design process through project-based learning and on providing information to students and parents about college applications and financial aid. The engineering activities during the event were hands-on and provided opportunities for students to construct and reconstruct their projects. The college readiness activities imparted important knowledge onto students and parents about navigating the track to higher education. The workshops were designed in part to meet the goal of increasing students’ interest in and motivation to learn more about STEM topics and higher education.

Analysis of the data collected suggested that students and parents tended to be satisfied with the different components of the event and many reported positive learning experiences, attitudes, and future anticipated behaviors due to participation in the event, as measured by certain Likert-scale item statements. The open-ended responses also tended to be favorable, although students and parents believed that certain improvements could be made in subsequent events. Therefore, it is reasonable to conclude that the event was a worthwhile experience for students and their parents as it provided students with opportunities to engage in engineering processes and students and parents to learn about higher education and financial aid. Participation in an event like the STEM Expo may contribute to more intermediate outcomes, such as increasing student interest in STEM and in higher education, and may be a factor in the achievement of more distal outcomes, such as increasing the rates of students applying for college, attending college, and majoring in STEM fields.

To improve the implementation of this event and similar ones in the future, some recommendations are made below. Also, there are suggestions to improve the data collection and reporting process that will better assist in the evaluation.

- To aid in data reporting, try to put the surveys online (e.g., through Survey Monkey) for students, parents, and staff. This would assist both in data collection and in data analysis. For data collection, the online entry would ensure that participants respond to each question appropriately (once for Likert-scale items; have to provide an answer for each open-ended response question). For data analysis, since the responses are digital, this reduces the time spent by the evaluator in conducting the evaluation; specifically, in manually entering the responses into spreadsheets.
• Another possibility for data collection is using clickers for the Likert-scale items at the end of the event and handing out shorter surveys with the open-ended response questions to capture overall impressions of the event.

• To better assess the specific impact(s) of each individual workshop on students and parents, I suggest providing exit cards at the conclusion of each workshop or changing the end of event survey to include workshop-specific questions. For example, I recommend altering the current general wording of an item of the survey (e.g., “I learned how to improve my projects' designs in the engineering workshops”) to something that could be linked to a particular workshop (e.g., “I learned how to improve my projects' designs in the first engineering workshop that I attended”). Towards the end of the current version of the survey, students are instructed to circle the workshops that they went to; instead, the survey should be slightly modified to have the students mark “first” or “second” besides each workshop in the order that they attended them.

• Parent evaluation forms should go in the packets for all of the workshops. The parent surveys were only put in the envelopes for the college readiness workshops, but not for the engineering workshops; however, even though parents did not participate in building projects during the engineering workshops, they did sometimes attend their children’s workshop sessions.

• Staff should make an announcement about the importance of the completion of the surveys in both English and in Spanish. The announcement was made during the opening ceremony in English only. No Spanish version of the parent evaluation forms were returned, which may have been in part due to a lack of awareness or understanding of the importance of survey completion.

• A theory of action, or logic model, should be created for the MESA program in order to better assess the implementation of the program, as well as to determine whether the program is meeting its intended goals and objectives. Without a theory of action, this evaluation is in a sense “ungrounded” - there is no theoretical scheme available to judge whether the program is running according to plan. The responses obtained in the surveys should be compared to this theoretical model of how the program should work. In the absence of such a model, it is difficult to draw conclusions that could address weaknesses of the program. Also, a summative, or outcomes evaluation cannot be properly conducted without a theory of action.