NSF MSP: CEEMS Project Annual Report – 2012

Section 4. Evaluator's Report

The University of Cincinnati project team has completed the planning phase of the NSF MSP: CEEMS Project. Funding was received in October 2012 and the first Summer Institute for Teachers (SIT) began June 18, 2012. This evaluation summary focuses on progress made toward the project goalsand is organized around the evaluation questions identified in the NSF proposal. The overall question guiding this evaluation is: *"Does the design- and challenged-based instruction in science and mathematics leverage program activities to contribute to* ***gains in student achievement****?"*The main impacts associated with this overall evaluation question are gains in student achievement in mathematics and science based on achievement tests. During this initial planning year, these impacts could not be measured. The baseline data will be compiled September 2012 once the 2012 SIT participants return to their classrooms for academic year implementation. Instruments are being developed to measure outcomes, namely, teachers' increased content and pedagogical knowledge, fidelity of implementation associated with challenge-based and design-based learning, and student achievement via short cycle assessments associated with the curricular materialsgenerated during the annual SIT. Additional outputs are the courses being developed by UC faculty and taken by in-service teachers and pre-service teachers starting summer 2012 and undergraduate students starting in the 2012-2013 academic year.

During this initial planning year, a project plan and evaluation activities matrix was developed to guide the evaluation. Since the overall evaluation question is complex, individual evaluation sub-questions were associated with each project activity and benchmarks were identified. The matrix is a "living document" and it will be reviewed semi-annually with changes made if they are warranted. The matrix is shown in Table 4-B at the end of this evaluation section.

To help the project team continue to improve its processes, annual evaluation results are discussed overall,relative to the three major aspects of the CEEMS Project: the project implementation, research design, and project sustainability. The evaluative data interpretation questions associated with each aspect of the project are in Table 4-A.

**Table 4-A. CEEMS Project – Guiding Questions for Evaluative Data Interpretation**

| | |
|---|---|
| **Project Implementation** | • How consistent are the conducted project activities with the project design?<br>• What implementation concerns arise during the course of CEEMS and what solutions did the project team identify? |
| **Research Design** | • How effective is the research design in CEEMS?<br>• How well do the research activities address project goals? |
| **Project Sustainability** | • What aspects of the project team's decisions regarding design- and challenge-based instruction for supporting science and math learning were valid and sustainable after the funding ends?<br>• What aspects of CEEMS are portable to other learning environments? |

Overall, the CEEMS project is progressing as expected toward accomplishing its goals. The majority of the project activities completed in these past nine months focused on hiring project staff, planning the Summer Institute for Teachers (SIT), and recruiting the first cohort of in-service and pre-service teachers to participate in the SIT. Details of these project activities are detailed in the annual report's implementation matrixes.

**Project Implementation**

The project activities conducted to date have been consistent with the proposed project design. The project team has hired key personnel; a project director and administrative support; planned the 2012 SIT; and hired resource team members.

Due to a lag time in creating internal university accounts, the project director and administrative staff members were hired slightly later than expected. The project director began working part-time on the project in February; 100% of her efforts were devoted to the project beginning in May.This timing had implications for recruitment of teachers. For year one, less in-service teachers are participating in the SIT than projected (16 versus 20). While the project team met with administrators of all participating school districts to discuss recruitment of teachers, some interested, qualified teachers were unable to come to all weeks of the SIT due to scheduling conflicts. In future years, this issue will be minimized with recruitment scheduled to begin in September 2012 for the 2013 SIT. Then, more qualified teachers can take advantage of the opportunity by putting it on their summer schedule prior to other commitments. Recruitment of pre-service teachers is ongoing but there are 12pre-service teachers, 6 are relatively new graduates and 6 are considered career changers, that are taking CEEMS course during the SIT. These pre-service teachers were identified to take courses this summer and have additional financial support from the Woodrow Wilson Ohio Teaching Fellowship (WWOTF) project or the NSF Noyce Scholarship project.

Since we want to document changes in teacher content knowledge, attitudes, and behaviors in the classroom, a pre-post content knowledge assessment was developed for each course and an overall pre-post survey was developed that documents participating in-service teachers' current instructional practices that are associated with challenge-based and design-based learning. The survey has two batteries of questions listing the same challenged-based/designed-based learning practices. One battery of questions asks about participants' incorporation of these practices into instruction and the second battery of questions asks participants to indicate their level of confidence when using these instructional practices. The pre-survey was administered at the beginning of the SIT to all participants (n=16). Results were given to the project team. Highlights are summarized below.

- Survey results indicated that the most used practice was the explicit connection of class content to real world examples and applications (37.5% (6) of the participants used it regularly).
- The least used instructional practices were the explicit connection of class content to how people in STEM careers use their knowledge to address societal impacts (43.8% (7) of the teachers never used it) and guidance provided students to break complex global problems into their local and more actionable components (37.5% (6) of participants never used it).

- Survey results for SIT participants on the confidence scale indicated that they were not very confident in implementing these challenged-based/design-based practices.
- The instructional practice with the highest confidence level was still low with only 25% of the participants reporting being very confident in explicitly connecting class content to real world examples and applications.
- Almost forty-four percent of the participants reported being "not confident" in explicitly connecting class content to how people in STEM careers use their knowledge to address societal impacts;37.5% noted they were not confident in providing opportunities for students to take responsibility for the decisions they made about the processes used in solving complex problems.

Instances of non-usage of critical practices in challenge-based/design-based learning provide opportunities for Project CEEMS in the improvement of teachers' instructional practices. These areas where teachers reported the lowest levels of confidence in implementation provide the CEEMS project with opportunities to build teacher skills and confidence in using critical practices in challenge-based/design-based learning.

When planning the SIT, the project team identified a potential opportunity to improve instructors' CEEMS course development. Leveraging evaluation feedback from another University of Cincinnati teacher preparation program, WWOTF, the CEEMS project team provided A&S and Engineering faculty who were creating project courses with a professional development opportunity. These faculty and instructors were invited to attend four seminars. Each seminar was evaluated and a complete summary was given to the project team. Highlights of the seminar evaluation include the following:

- Overall, the evaluation results indicate that these seminars met the goal of supporting faculty in their development of the SIT courses. The responses indicated that the faculty had a common understanding of the CEEMS project and the project team's definition of challenge based learning and how design based learning fits into the framework. Examples of faculty definitions of challenged-based learning, by seminar, include.
    - *CBL requires a big idea to act as a framework and also inspiration for studying the context. As you get to the level of guiding questions, activities, and resources, these are taught in context with the challenge. This provides real-world context for the learning. (Seminar 1)*
    - *DBL [design based learning within challenged based learning framework] is like a highway map for students. They know where they will start and where they will end. (Seminar 2)*
    - *CBL - having students understand a problem, and design something that fits certain criteria to solve the problem, within certain guidelines, learning content in the process. (Seminar 3)*
    - *Challenge based learning in my course will have the characteristics of combining scientific knowledge with engineering skills. (Seminar 4)*
- The course syllabi developed as a product of these seminars clearly outline learning objectives for each course and fit together to create a cohesive curriculum that will contribute to the development of products that the participating teachers can implement in their classrooms during the 2012-2013 academic year.

- Results from the closed ended questions indicate that the seminars were well received; the seminars helped the faculty understand the CEEMS project; faculty anticipated that the information presented would be useful in their course development; and, the seminar activities supported their understanding.
- Seminars 1, 2, and 3 were opportunities for the project team to present grant and challenge-based learning information to the faculty.
  - Seminar 1 was the initial grant presentation and in seminar 2 these concepts were expanded upon and examples presented. These two seminars received the highest rating for understanding the project (mean of 3.89, out of 5, for both) and having activities support the information presented (mean and 4.00, out of 5, for both). Comments from the seminar 1 evaluation indicated that the faculty wanted more complete examples of utilizing challenge-based learning and the project team responded by emailing more complete examples to faculty. One faculty requested support; they wanted "feedback as to what is appropriate content-wise, equipment-wise, and ideas of how to integrate the engineering with the [content subject taught]."
  - Seminar 3 addressed concerns from the previous seminars ("seeing specific projects"; "more conversation among the instructors") and teamwork among students. Comments from the seminar 3 evaluation surveys indicated that the faculty appreciated the discussion related to student teamwork and examples but they still wanted more support in accessing students, creating rubrics and bringing content into the projects.
  - These concerns were discussed in the fourth seminar which had a different format. Logistics of pre-post participant assessments and faculty course assessments were discussed. Then, each faculty was given an opportunity to explain the challenge that will be included in their course and the fit between their course and others. The highest ratings for this seminar were for the activities and usefulness of the seminar (means of 3.67 and 3.33 out of 5, respectively).
- Table 4-B has the descriptive results for the common evaluation questions across all seminars.

**Table 4-B. Descriptive Results for Common Evaluations Questions**

| | Session 1<br>n=9<br>**Mean***<br>**(Std. Dev.)** | Session 2<br>n=6<br>**Mean***<br>**(Std. Dev.)** | Session 3<br>n=6<br>**Mean***<br>**(Std. Dev.)** | Session 4<br>n=3<br>**Mean***<br>**(Std. Dev.)** |
|---|---|---|---|---|
| **1. Please provide an OVERALL RATING for this seminar.** | 3.56<br>(.527) | 4.00<br>(.601) | 3.83<br>(.833) | 3.00<br>(.601) |
| **2. OVERALL, how would you rate this seminar in helping you understand the CEEMS project?** | 3.89<br>(1.095) | 4.00<br>(.894) | 3.83<br>(.753) | 3.00<br>(.632) |
| **3. OVERALL, the information presented will be USEFUL in my development of my CEEMS Summer Institute course.** | 3.78<br>(.983) | 3.83<br>(.983) | 3.67<br>(.816) | 3.33<br>(1.140) |
| **4. The seminar's activities helped me understand the materials presented.** | 3.89<br>(1.000) | 4.00<br>(1.000) | 3.60<br>(1.155) | 3.67<br>(.577) |

Scale: Five Points with 5 being most positive, 3 being a neutral response, and 1 being the most negative.

The resource team will be providing critical support to the participating teachers during the upcoming academic year. The resource team structure was discussed at numerous executive committee team meetings and it was determined that a total of eight resource team members with varied skills working with all participants would be the most efficient use of resources for the first year. The project team modified its initial design because it proposed having the subgroups of the resource team assigned to specific schools based on geography. Recruitment of the resource team started with word-of-mouth recommendations from district representatives and educators in the area and snowballed to include recommendations from local professional organizations that had engineering outreach components. Five resource team members hired have discipline specific (science, math, technology) teaching experience and three resource team members have professional engineering experience with some public school mentoring or tutoring exposure. Having the team work as one group serving all teachers will enable the team to leverage all members' strengths. The geographical distances can be managed via email, web communication and video conferencing. The effectiveness of this resource team will be evaluated as the academic year progresses.

## Research Design

The research component of the CEEMS project is in the instrument development and planning stage. The research and evaluation teams have been granted approval from the University of Cincinnati Institutional Review Board. To minimize "over-surveying" participants, the research and evaluation teams have created a comprehensive data management system that will help coordinate data collection and data sharing. The first cohort of in-service and pre-service teacher participants have consented to participating in the evaluation activities and the majority have agreed to be contacted by the researchers if they are chosen to be part of the research study. The CEEMS research design is a case study and this methodology has the potential to obtain in-depth data related to how and why the project outputs and outcomes can be attributed to the project activities. Data collection instruments are currently being developed and will be piloted during the 2012-2013 academic year.

Evaluation of the research component will focus on how effective the research results are in helping the project team identify what supported and what inhibited the team's ability to attain project goals and to begin supporting the casual model. Effectiveness will be considered in terms of the outputs and outcomes (i.e., number of participants studied and what these participants do) and in terms of the research process itself (i.e., elements of a case study design, use of reliable and valid instruments, scientific evidence related to the project's theory of change). The change theory associated with this project includes the following: A) Give teachers PD on how to implement design-based and challenged-based instruction; B) Follow-up with school year support (administrative support, resource team members, others); C) Changes in teacher attitudes and behaviors; D) Student learning increases; E) Sustained change in teacher practices; which leads to F) Sustained increase in student achievement.

## Sustainability

While activities associated with long term project sustainability are not expected at this time, the CEEMS project has identified and developed a group of content and education faculty to provide instruction that is cohesive and directly related to the project goals of incorporating challenge-based learning and design-based processes into 7-12$^{th}$ grade units. These faculty members all reported understanding the goals of the CEEMS project and the courses will continue to be taught as the project progresses. These results were shown in the implementation section of this evaluation summary.

Additionally, the CEEMS project team is capitalizing on other NSF funded projects at the University of Cincinnati. For example, some pre-service teachers participating in the CEEMS courses are funded by WWOTF or NSF Noyce funds. One local teacher, who participated in UC's Research Experience for Teachers (RET) project, presented an example of her engineering design unit during a SIT professional development session. This will provide credibility that these challenge-based learning units can be created and successfully implemented in middle and high school classrooms.

**Table 4-B. UC CEAS NSF MSP – Project CEEMS: Project Plan and Evaluation Activities**

<table>
<tr><td colspan="4"><u>OVERALL EVALUATION QUESTION:</u> “Does the design- and challenged-based instruction in science and mathematics leverage program activities to contribute to gains in student achievement?”</td></tr>
<tr><th>Project Activities</th><th>Benchmarks</th><th>Evaluation Activities</th><th>Timing</th></tr>
<tr><td colspan="4"><u>GOAL 1</u>: Improve 7-12th grade science and math achievement to prepare for and increase interest in college study in engineering or other STEM careers</td></tr>
<tr><td colspan="4">Objective 1.1. Reduce achievement gap among diverse student populations including race, ethnicity, SES, gender and disability.</td></tr>
<tr><td rowspan="3">Activity 1.1. Provide professional development for in-service and pre-service teachers through engineering courses, content specific courses, and pedagogical workshops and coaching. This will indirectly lead to changes in student achievement.</td><td rowspan="3">• Benchmark 1.1. Achievement gap reduced by 5%</td><td colspan="2"><u>Evaluation Question 1.1.</u> To what extent has the achievement gap been reduced?</td></tr>
<tr><td>• Collect local student achievement data<br>• Collect standardized test data for students</td><td>• September 2012<br>• September 2013<br>• September 2014<br>• September 2015</td></tr>
<tr><td>• Disaggregate the achievement data by school district, building, classroom, and student demographics</td><td>• Fall 2012<br>• Fall 2013<br>• Fall 2014<br>• Fall 2015</td></tr>
<tr><td colspan="4">Objective 1.2. Increase student engagement, awareness, and attitudes towards STEM based learning environments and careers</td></tr>
<tr><td rowspan="4">Activity 1.2. Provide professional development for in-service and pre-service teachers through engineering courses, content specific courses, and pedagogical workshops and coaching. This will indirectly lead to changes in student attitudes and behaviors.</td><td rowspan="4">• Benchmark 1.2. Students demonstrate increased interest in STEM-based fields and careers via course selection and career plans, via a pre-post gain in self-reported interest level</td><td colspan="2"><u>Evaluation Question 1.2.</u>To what extent have students demonstrated increased interest in STEM-based fields and careers?</td></tr>
<tr><td>• Survey students to determine STEM attitudes, career aspirations, and learning experiences associated with the project</td><td>• Beginning and End of Each Academic Year - 2012-2013; 2013-2014; 2014-2015</td></tr>
<tr><td>• Review of observational data of students in participating teacher’s classrooms collected as part of the research</td><td>• End of Each Academic Year – given to ESC by Research Team - 2012-2013; 2013-2014; 2014-2015</td></tr>
<tr><td>• Track students advanced course selection and post-secondary educational or career choices</td><td>• End of Each Academic Year - 2012-2013; 2013-2014; 2014-2015</td></tr>
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<tr><td colspan="4">Objective 1.3. Increase students’ knowledge in STEM areas</td></tr>
<tr><td rowspan="3">Activity 1.3. Provide professional development for in-service and pre-service teachers through engineering courses, content specific courses, and pedagogical workshops and coaching. This will indirectly lead to changes in student knowledge.</td><td rowspan="3">• Benchmark 1.3. Student math and science achievement scores increase 5% to 10% annually compared to the baseline achievement data.</td><td colspan="2"><u>Evaluation Question 1.3.</u>To what extent do student math and science achievement scores increase compared to baseline data.</td></tr>
<tr><td>• Collect local student achievement data<br>• Collect standardized test data for students</td><td>• September 2012<br>• September 2013<br>• September 2014<br>• September 2015</td></tr>
<tr><td>• Review student artifacts</td><td>• End of Each Academic Year – given to ESC by Research Team - 2012-2013; 2013-2014; 2014-2015</td></tr>
<tr><td colspan="4"><u>GOAL 2</u>: Develop math and science teacher knowledge of engineering and the engineering design-and-challenge instruction process through explicit training and classroom implementation support.</td></tr>
<tr><td colspan="4">Objective 2.1. Prepare for Summer Institute for Teachers and other licensure pathways by designing courses and hiring resource team.</td></tr>
<tr><td rowspan="2">Activity 2.1a. Design team create the material for SIT summer program</td><td rowspan="2">• Benchmark 2.1a. Creation of SIT</td><td colspan="2"><u>Evaluation Question 2.1a</u>. Were the project activities conducted to create the SIT consistent with the plan? If changes were made, why?</td></tr>
<tr><td>• Document review and content analysis of SITplanning records and curricular materials<br>• Work with Engineering, A&S and Education faculty to develop questions related to content and pedagogy; Pre-surveys will be distributed when participants are identified.  Post-surveys will be administered annually</td><td>• Collect data in Winter and Spring<br>• Updated June 2013<br>• Updated June 2014<br>• Updated June 2015</td></tr>
<tr><td rowspan="2">Activity 2.1b. Hire personnel for Resource Teams</td><td rowspan="2">• Benchmark 2.1b. Resource team personnel are hired and working with SIT participants.</td><td colspan="2"><u>Evaluation Question 2.1b</u>. What supports are provided by the resource team and what impact does it have on activities and lessons?</td></tr>
<tr><td>• Review minutes from Executive Committee meetings<br>• Review project hiring</td><td>• Summarized June 2012<br>• Updated June 2013<br>• Updated June 2014</td></tr>
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<tr><td></td><td></td><td>documentation<br>• Interview resource team members to get their perception of what they are doing.<br>• Survey teachers about support provided to them by the resource team</td><td>• Updated June 2015</td></tr>
<tr><td colspan="4">Objective 2.2. Offer Summer Institute for Teachers.<br>i. Effectively train 385 7-12th grade science or math teachers in the use of math or science instructional practices using engineering as a context for guided design and challenge based inquiry and project based learning<br>ii. Indirectly impact 200 in-service teachers through SIT dissemination activities<br>iii. Through direct and indirect impact of project activities, 50-75% of each school district's science and math teachers actively engaged<br>iv. Increase participating teachers' use of design and challenge based instruction utilizing engineering concepts<br>v. Increase teachers' knowledge of STEM based fields and careers, so they can better guide students into career pathways</td></tr>
<tr><td rowspan="2">Activity 2.2a. Summer Institute for Teachers (SIT)</td><td rowspan="2">• Benchmark 2.2a1. Attendance record—100% of teachers attend 90% of PD training</td><td colspan="2"><u>Evaluation Question 2.2a1</u>. What was the attendance rate of the SIT?</td></tr>
<tr><td>• Review SIT attendance records</td><td>• August 2012, August 2013, August 2014, August 2015</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">• Benchmark 2.2a2. 100% of teachers positively react to professional development.</td><td colspan="2"><u>Evaluation Question 2.2a2</u>. What impact did the SIT have on teacher's math and science instructional practices, attitudes, and beliefs?</td></tr>
<tr><td>• Survey teachers related to STEM attitudes, career recommendations, and teaching practices associated with the project<br>• Survey of teachers to determine reaction to professional development and curricular materials expected usefulness<br>• Conduct interviews with a sample of teachers annually</td><td>• Pre-post Current Instructional Practices Survey – June 2012, May 2013, May 2014 for first SIT participant cohort; similar timing for later cohorts<br>• Course evaluations –completion of each course<br>• End-of-SIT Survey –August 2012, August 2013, August 2014, August 2015<br>• Teacher interviews – May 2013,</td></tr>
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<tr><th>Project Activities</th><th>Benchmarks</th><th>Evaluation Activities</th><th>Timing</th></tr>
<tr><td></td><td></td><td></td><td>May 2014, May 2015</td></tr>
<tr><td rowspan="2">Activity 2.2a3. Summer Institute for Teachers (SIT) – Guided academic year in-class implementation</td><td rowspan="2">• Benchmark 2.2a3-1. 100% of teachers participate in the academic year in-class implementation<br>• Benchmark 2.2a3-2. SIT participants offer professional development to other teachers in their district. At least twenty additional teachers will be impacted indirectly.<br>• Benchmark 2.2a3-3. Other teachers view challenge-based learning units developed by SIT participants and posted on CEEMS website.<br>• Benchmark 2.2a3-4. Attendance at STEM Conference<br>• Benchmark 2.2a3-5. Track attendees at professional development offered by SIT participants<br>• Benchmark 2.2a3-5. 100% of teachers demonstrate a positive gain in pedagogy as determined by the modified RTOP<br>• Benchmark 2.2a3-6. 100% increase in content knowledge according to post-assessment and as measured by significant gain scores with $p \leq 0.05$<br>• Benchmark 2.2a3-7. 100% of teachers indicate positive beliefs</td><td colspan="2"><u>Evaluation Question 2.2a3</u>. What impact did the SIT guided academic year in-class implementation have on teacher’s math and science instructional practices, attitudes, and beliefs?</td></tr>
<tr><td>• Survey teachers related to STEM attitudes, career recommendations, and teaching practices associated with the project.<br>• Review project documentation of PD activities conducted by SIT participants to others teachers in their district<br>• Review attendance records for STEM Conference<br>• Review website usage annually<br>• Review results of observations conducted by the project team<br>• Conduct interviews with a sample of teachers annually</td><td>• Pre-post Current Instructional Practices Survey – June 2012, May 2013, May 2013 for first SIT participant cohort; similar timing for later cohorts<br>• End of Each Academic Year Research Results, given to ESC by Research Team- 2012-2013; 2013-2014; 2014-2015<br>• Teacher Interviews – May 2013, May 2014 and May 2015<br>• Document review of PD conducted by SIT participants, STEM Conference and Website Usage – July 2013, July 2014, July 2015</td></tr>
</table>

| **<u>OVERALL EVALUATION QUESTION:</u>** *"Does the design- and challenged-based instruction in science and mathematics leverage program activities to contribute to **gains in student achievement**?"* | | | |
|---|---|---|---|
| **Project Activities** | **Benchmarks** | **Evaluation Activities** | **Timing** |
| | and attitudes<br>• Benchmark 2.2a3.8. 90% of teachers will increase their knowledge of STEM based fields and careers. | | |
| Activity 2.2b. Recruit 20 in-service teachers to participate in the SIT annually | • Benchmark 2.2b. Recruit 20 teachers to participate in SIT 7-week summer program annually | **<u>Evaluation Question 2.2b</u>**. *Were the project activities conducted to recruitthe expected number of SIT participants consistent with the plan? If changes were made, why?* | |
| | | • Review project team recruitment efforts<br>• Review course enrollment<br>• Pre-service teachers course evaluations<br>• Faculty assessments of courses | • June 2012<br>• January 2013<br>• June 2013<br>• January 2014<br>• June 2014<br>• January 2015<br>• June 2015 |
| **Objective 2.3.** Create MCIEE licensure pathway | | | |
| Activity 2.3a. Create Masters in Curriculum and Instruction (CI) degree with Engineering Education (MCIEE) – advanced degree for in-service teachers | • Benchmark 2.3a. Creation of MCIEE licensure track | **<u>Evaluation Question 2.3.a</u>**. *Were the project activities conducted to create the MCIEE licensure track consistent with the plan? If changes were made, why?* | |
| | | • Document review and content analysis of MCIEE licensure track planning records and curricular materials<br>• Pre-service teachers course evaluations<br>• Faculty assessments of courses | • June 2012<br>• January 2013<br>• June 2013<br>• January 2014<br>• June 2014<br>• January 2015<br>• June 2015 |
| Activity 2.3b. Recruit 5 in-service teachers per year into MCIEE program | • Benchmark 2.3b. Recruit 5 in-service teachers per year into MCIEE track. | **<u>Evaluation Question 2.3.b</u>**. *Were the project activities conducted to recruit the expected number of MCIEE in-service teachersconsistent with the plan? If changes were made, why?* | |
| | | • Review project team recruitment efforts<br>• Review course enrollment | • June 2012<br>• January 2013<br>• June 2013 |

**<u>OVERALL EVALUATION QUESTION:</u>** *"Does the design- and challenged-based instruction in science and mathematics leverage program activities to contribute to* ***gains in student achievement****?"*

| Project Activities | Benchmarks | Evaluation Activities | Timing |
|---|---|---|---|
| | | • Pre-service teachers course evaluations<br>• Faculty assessments of courses | • January 2014<br>• June 2014<br>• January 2015<br>• June 2015 |
| Activity 2.3c. Recruit 20 pre-service teachers per year into the MCIEE program | • Benchmark 2.3c. Recruit 20 pre-service teachers per year into MCIEE track. | **<u>Evaluation Question 2.3.c</u>**. *Were the project activities conducted to recruit the expected number of MCIEE pre-service teachersconsistent with the plan? If changes were made, why?* | |
| | | • Review project team recruitment efforts<br>• Review course enrollment<br>• Course evaluations<br>• Faculty assessments of courses | • June 2012<br>• January 2013<br>• June 2013<br>• January 2014<br>• June 2014<br>• January 2015<br>• June 2015 |
| **<u>GOAL 3</u>**: Recruit engineering undergraduates as science or math teachers through involvement in teaching experiences with younger college students and in the schools and then a succinct licensure program. | | | |
| **Objective 3.1.** Create Education Pathway with Licensure for Engineering (EPLE) majors | | | |
| Activity 3.1a Create Education Pathway with Licensure for Engineering (EPLE) pathway | • Benchmark 3.1a. EPLE pathway is created. | **<u>Evaluation Question 3.1a</u>**. *Were the project activities conducted to create the EPLE pathway consistent with the plan? If changes were made, why?* | |
| | | • Document review and content analysis of EPLE pathway planning records and curricular materials<br>• Course evaluations<br>• Faculty assessments of courses | • January 2013<br>• June 2013<br>• January 2014<br>• June 2014<br>• January 2015<br>• June 2015 |
| Activity 3.1b. Make an ACCEND program option available in CEAS | • Benchmark 3.1b. ACCEND program is available in CEAS. | **<u>Evaluation Question 3.1b</u>**. *Were the project activities conducted to create the ACCEND program consistent with the plan? If changes were made, why?* | |
| | | • Review official UC CEAS documentation | • January 2013<br>• June 2013<br>• January 2014 |

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<tr><td></td><td></td><td></td><td>• June 2014<br>• January 2015<br>• June 2015</td></tr>
<tr><td colspan="4">Objective 3.2. Develop and teach ten courses outlined in the proposal</td></tr>
<tr><td rowspan="2">Activity 3.2a. Develop and teach ten courses</td><td rowspan="2">• Benchmark 3.2a-1. As determined through self-report surveys, in-service teachers working with undergraduate engineering students will have an increased knowledge of STEM based fields and careers so they can better guide students in career pathways.<br>• Benchmark 3.2a-2. All undergraduate engineering students can use design and challenged based instruction utilizing engineering concepts as demonstrated by the course artifacts.<br>• Benchmark 3.2a-3. 95% of students report that the program made them prepared to teach science and math in 7-12th grade classrooms as demonstrated by course evaluations and surveys</td><td colspan="2"><u>Evaluation Question 3.2a</u>. What impact did the course have on EPLE participant's math and science instructional practices, attitudes, and beliefs?</td></tr>
<tr><td>• Course evaluations<br>• Faculty assessments of courses<br>• Review research activities related to classroom observations of these engineering students<br>• Review licensure documentation<br>• Annually survey or interview undergraduate students related to their experience in the program<br>• Annually survey in-service teachers working with these engineering students</td><td>• End of Each Academic Year – given to ESC by Research Team – 2012-2013; 2013-2014; 2014-2015<br>• End of Each Academic Year research results, given to ESC by Research Team – 2012-2013; 2013-2014; 2014-2015<br>• Course evaluations administered at the completion of each course; results sent to project team regularly to facilitate continuous improvement efforts<br>• Faculty Course Assessment survey completed at the after each course is taught; results sent to project team regularly to facilitate continuous improvement efforts</td></tr>
<tr><td colspan="4">Objective 3.3. Recruit undergraduate engineering students for the ELPE pathway</td></tr>
<tr><td rowspan="2">Activity 3.3a. Recruit 10 per year engineering undergraduate students into the EPLE track beginning in 2012-13.</td><td rowspan="2">• Benchmark 3.3a-1. Recruit 40 undergraduate engineering students into program<br>• Benchmark 3.3a-2. 75% of the</td><td colspan="2"><u>Evaluation Question 3.3</u>. Were the project activities conducted to recruit the expected number of EPLE engineering undergraduate studentsconsistent with the plan? If changes were made, why?</td></tr>
<tr><td>• Review project team recruitment</td><td>• January 2013</td></tr>
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<tr><td colspan="4"><u>OVERALL EVALUATION QUESTION:</u> “Does the design- and challenged-based instruction in science and mathematics leverage program activities to contribute to gains in student achievement?”</td></tr>
<tr><th>Project Activities</th><th>Benchmarks</th><th>Evaluation Activities</th><th>Timing</th></tr>
<tr><td></td><td>recruited students get Ohio Adolescent to Young Adult math or science teaching license and master’s degrees.</td><td>efforts<br>• Review course enrollment<br>• Course evaluations<br>• Faculty assessments of courses</td><td>• June 2013<br>• January 2014<br>• June 2014<br>• January 2015<br>• June 2015</td></tr>
<tr><td colspan="4"><u>GOAL 4</u>: Recruit career changers to be science or mathematics teachers through succinct licensure programs.</td></tr>
<tr><td colspan="4">Objective 4.1. Recruit career changers to be science or mathematics teachers</td></tr>
<tr><td rowspan="2">Activity 4.1a. Create Engineering Education Pathway for Career Changers (EEPCC)</td><td rowspan="2">• Benchmark 4.1a. EEPCC pathway is created.</td><td colspan="2"><u>Evaluation Question 4.1a</u>. Were the project activities conducted to create the EEPCC pathway consistent with the plan? If changes were made, why?</td></tr>
<tr><td>• Document review and content analysis of EEPCC pathway planning records and curricular materials<br>• Course evaluations<br>• Faculty assessments of courses</td><td>• January 2013<br>• June 2013<br>• January 2014<br>• June 2014<br>• January 2015<br>• June 2015</td></tr>
<tr><td rowspan="2">Activity 4.1b. Develop and teach ten courses outlined in the proposal</td><td rowspan="2">• Benchmark 4.1b-1. All career changers can use design and challenge based instruction utilizing engineering concepts<br>• Benchmark 4.1b-2. In-service teachers working with career changers will have an increased knowledge of STEM based fields and careers so they can better guide their students in career pathways<br>• Benchmark 4.1b-3. 95% of career changers report that the program made them prepared to teach science and math in 7-12th grade classrooms</td><td colspan="2"><u>Evaluation Question 4.1b</u>. What impact did the course have on EPLE participant’s math and science instructional practices, attitudes, and beliefs?</td></tr>
<tr><td>• Course evaluations<br>• Faculty assessments of courses<br>• Review research activities related to classroom observations of these students<br>• Review licensure documentation<br>• Annually survey or interview students related to their experience in the program<br>• Annually survey in-service teachers working with these students</td><td>• End of Each Academic Year – given to ESC by Research Team – 2012-2013; 2013-2014; 2014-2015<br>• End of Each Academic Year research results, given to ESC by Research Team – 2012-2013; 2013-2014; 2014-2015<br>• Course evaluations administered at the completion of each course; results sent to project team regularly to facilitate continuous improvement efforts</td></tr>
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<tr><td></td><td></td><td></td><td>• Faculty Course Assessment survey completed after each course is taught; results sent to project team regularly to facilitate continuous improvement efforts</td></tr>
<tr><td rowspan="2">Activity 4.1c Recruit career changes with an undergraduate engineering, math, or science degree.</td><td rowspan="2">• Benchmark 4.1c-1. Recruit 5 career changers per year into program.<br>• Benchmark 4.1c-2. 90% of the recruited career changers get Ohio Adolescent to Young Adult math or science teaching license and master's degree.</td><td colspan="2"><u>Evaluation Question 4.1c</u>. Were the project activities conducted to recruit the expected number of EEPCC studentsconsistent with the plan? If changes were made, why?</td></tr>
<tr><td>• Review project team recruitment efforts<br>• Review course enrollment<br>• Course evaluations<br>• Faculty assessments of courses</td><td>• January 2013<br>• June 2013<br>• January 2014<br>• June 2014<br>• January 2015<br>• June 2015</td></tr>
<tr><td colspan="4"><u>GOAL 5</u>: Build a collaborative sustainable education licensure STEM degree-granting infrastructure that will positively impact the entire region.</td></tr>
<tr><td rowspan="4">Activity 5.1. Faculty in CEAS, CA&S, and CECH will all work to create the ten courses outlined in the proposal</td><td rowspan="2">• Benchmark 5.1a. Faculty in CEAS, CA&S and CECH are working together to create, promote and sustain the programs</td><td colspan="2"><u>Evaluation Question 5.1a</u>. Were the project activities conducted to promote collaboration among facultyconsistent with the plan? If changes were made, why? Were these sustained over time?</td></tr>
<tr><td>• Review minutes from Executive Committee meetings and attend meetings when appropriate<br>• Survey project team and key personnel to determine Project Sustainability annually</td><td>• Ongoing meeting minute review<br>• August 2012<br>• August 2013<br>• August 2014<br>• August 2015</td></tr>
<tr><td rowspan="2">• Benchmark 5.1b. By mid-year one, recruitment has begun and it continues annually</td><td colspan="2"><u>Evaluation Question 5.1b</u>. Were the project activities conducted to recruit participantsconsistent with the plan? If changes were made, why? Were these sustained over time?</td></tr>
<tr><td>• Review minutes from Executive Committee meetings and attend meetings when appropriate<br>• Survey project team and key</td><td>• Ongoing meeting minute review<br>• August 2012<br>• August 2013<br>• August 2014</td></tr>
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| **OVERALL EVALUATION QUESTION:** *"Does the design- and challenged-based instruction in science and mathematics leverage program activities to contribute to **gains in student achievement**?"* | | | |
|---|---|---|---|
| **Project Activities** | **Benchmarks** | **Evaluation Activities** | **Timing** |
| | | personnel to determine Project Sustainability annually | • August 2015 |
| | • Benchmark 5.1c. By end of year one, all courses and pathways are developed and they are reviewed annually | **Evaluation Question 5.1c**. *Were the project activities conducted to create the courses and pathwaysconsistent with the plan? If changes were made, why? Were these reviewed and sustained over time?* | |
| | | • Review minutes from Executive Committee meetings and attend meetings when appropriate<br>• Survey project team and key personnel to determine Project Sustainability annually | • Ongoing meeting minute review<br>• August 2012<br>• August 2013<br>• August 2014<br>• August 2015 |
| Activity 5.2. Project team will build upon existing partnerships already occurring at UC and funded by NSF, Ohio Board of Regents and Woodrow Wilson Foundation | • Benchmark 5.2a. By end of year two, all pathways have participants and these numbers are sustained. | **Evaluation Question 5.2**. *Were the project activities conducted to continue recruitmentconsistent with the plan? If changes were made, why? Were these sustained over time?* | |
| | | • Survey project team and key personnel to define systemic change for IHE and K-12 educational systems<br>• Annually, interview administrators at other teacher education licensure granting institutions in the region to gain their assessment and interest in beginning similar programs or referring potential students to this program | • August 2012<br>• August 2013<br>• August 2014<br>• August 2015 |
| Activity 5.3. Project team will work with Ohio Board of Regents to get these licensure programs recognized. | • Benchmark 5.3a. Ohio Board of Regents grants licensure to these participants if they successfully complete requirements. | **Evaluation Question 5.3**. *Were the project activities conducted to obtain OBR licensure for these participantsconsistent with the plan? If changes were made, why? How many participants successfully completed these requirements?* | |
| | | • Review minutes from Executive Committee meetings and attend meetings when appropriate | June 2015 or when available |

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<tr><td></td><td></td><td>• Annually, interview administrators at other teacher education licensure granting institutions in the region to gain their assessment and interest in beginning similar programs or referring potential students to this program<br>• Review documentation pertaining to licensure submission and decision by OBR</td><td></td></tr>
<tr><td rowspan="4">Activity 5.4. Dissemination of materials and results.</td><td rowspan="2">• Benchmark 5.4a. Launch a website to provide centralized points of access for dissemination of project information and lesson materials.</td><td colspan="2"><u>Evaluation Question 5.4a</u>. What is on the CEEMS website? Who is using it? How is it being used?</td></tr>
<tr><td>• Review CEEMS project website usage<br>• Survey project team and key personnel to determine Project Sustainability annually</td><td>• June 2013<br>• June 2014<br>• June 2015</td></tr>
<tr><td rowspan="2">• Benchmark 5.4b. Research presented at professional conferences and in peer-reviewed publications</td><td colspan="2"><u>Evaluation Question 5.4b</u>. What activities are being conducted by the researchers and project team to disseminate the CEEMS project materials and results?</td></tr>
<tr><td>• Document project related research publications and presentations authored by project team members<br>• Document project related research publications and presentations authored by research team members<br>• Document project related research publications and presentations authored by</td><td>• End of Each Academic Year Research Results, given to ESC by Research Team- 2012-2013; 2013-2014; 2014-2015<br>• Document review of PD conducted by Research and Project Team members – July 2013, July 2014, July 2015<br>• Survey – June 2013, June 2014, June 2015</td></tr>
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| **<u>OVERALL EVALUATION QUESTION:</u>** *"Does the design- and challenged-based instruction in science and mathematics leverage program activities to contribute to **gains in student achievement**?"* | | | |
|---|---|---|---|
| **Project Activities** | **Benchmarks** | **Evaluation Activities** | **Timing** |
| | | participating teachers<br>• Survey project team and key personnel to determine Project Sustainability annually | |
| | • Benchmark 5.4c. Participants serve as presenters at the STEM annual conference and professional development workshops | **<u>Evaluation Question 5.4c</u>**. *What activities are being conducted by the project participants to disseminate the CEEMS project materials and results?* | |
| | | • Review STEM conference agenda and evaluation results<br>• Review project documentation related to academic year PD workshops<br>• Conduct interviews with a sample of teachers annually | • End of Each Academic Year Research Results, given to ESC by Research Team- 2012-2013; 2013-2014; 2014-2015<br>• Teacher Interviews – May 2013, May 2014 and May 2015<br>• Document review of PD conducted by SIT participants and STEM Conference – July 2013, July 2014, July 2015 |