

Award 1347640-Annual Project Report

I. Accomplishments- What was done, What was learned?

What are the major goals of the project?

The expected outcomes from the STEM Professional Academy to Reinvigorate the Culture of Teaching (SPARCT) program continue to be (as noted in Y1):

- (1) Enhanced scholarship of teaching and learning (SoTL) by SPARCT faculty.
- (2) Improvement of evidence-based practices targeting the introductory STEM classroom.
- (3) Development of long-term FLCs in STEM instruction.
- (4) Development of professional peer-observation strategies for the STEM classroom.
- (5) Enhanced student learning in introductory STEM courses as a result of SPARCT faculty development.

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

Major Activities

Year 2 (2014-2015):

Aug. 2014 - April 2015.

Planning, Development, and Research. The first SPARCT Faculty Learning Community (FLC) series of monthly meetings and the second SPARCT STEM Summer Academy were developed and planned. Approximately bi-weekly 90 min. meetings with the planning team occurred during the academic year 2014-2015. The planning committee consisted of Drs. Frost (PI, Whitaker Center, Arts and Sciences), Serro (co-PI, College of Ed.), Greene (Sr. Personnel, College of Ed.) and Ms. McCulloch (e-learning specialist) in the fall. Mr. Rob Nichols (Mathematics, Arts and Sciences) joined the SPARCT planning team during Spring 2015 when Dr. Serro was on sabbatical. A minimum of 25 hours of planning meetings (does not include individual time outside meetings) has been documented. On September 4-5, 2014 our evaluator, Ludwika Goodson visited campus and met with all the SPARCT 2014 participants and the planning group to review our progress. Her report is attached.

During the course of the first year of SPARCT, at intervals, we asked the participants to reflect on their SoTL projects, their observations, and their experiences in the classroom with evidence-based practices. In year 1, we collected a total of five video segments. One of us (Dr. Greene) spent time transcribing the videos. A two hour meeting with all co-PIs and Sr. personnel was held December 4, 2015 to distribute the work for data analysis and discuss SPARCT Academy 2015. Faculty duties were distributed to work in three groups: 1) statistical analysis of student surveys; 2) qualitative analysis of video statements by SPARCT participants (transcribed by Dr. Greene); and 3) statistical analysis of faculty feedback from the academy and FLC meetings.

(1) Enhanced SoTL by SPARCT faculty.

All sixteen members of the SPARCT 2014 group engaged in a SoTL project in an introductory course they were teaching during the 14-15 academic year. The sixteen members of the SPARCT 2015 group have begun thinking about a SoTL project for the 15-16 academic year.

(2) Improvement of evidence-based practices targeting the introductory STEM classroom. Faculty were asked to consider using an evidence-based practice in their targeted classroom.

(3) Development of long-term FLCs in STEM instruction. During the past academic year, the SPARCT 2014 group met monthly as a faculty learning community. These sessions were to debrief about their projects and classroom observations.

Most sessions also featured a speaker as an extension of the SPARCT Academy professional development in teaching and learning.

(4) Development of professional peer-observation strategies for the STEM classroom. Faculty were asked to perform observations during both the fall and spring semesters. Each faculty member was asked to perform two observations (one in their discipline and one outside of their discipline) and be observed twice during each semester. Faculty were encouraged to consider selecting items from the RTOP protocol when having their classroom observed to focus the observer's attention on certain classroom items. Observers completed a one-page Strengths-Improvements-Insights form at the conclusion of their observation and provided a copy to the person they observed and to the SPARCT planning committee.

(5) Enhanced student learning in introductory STEM courses as a result of SPARCT faculty development. The SPARCT participant SoTL projects are directed toward understanding whether use of evidence-based practices enhances student learning in their introductory STEM courses. Some of the participants have presented this evidence.

May 2015.

The second SPARCT STEM Summer academy was held over 10 days with 36 hours of instructional time. All co-PIs and Senior personnel participated in at least one part of the academy as a presenter. (See attached SPARCT schedule 2015 for a list of topics including evidence-based practices.) There were 16 participants, from the following disciplines: Biology (4), Chemistry (4), Engineering (2), Geology (1), Environmental and Marine Sciences (2), Mathematics (2), Physics (1). This is a nice contrast to the SPARCT 2014 group with 16 participants from the following disciplines: Biology (0), Chemistry (1), Engineering (4), Geology (0), Environmental Sciences (2), Mathematics (7), Physics (2).

June 2015-August 2015

Laura Frost presented results from the first year SPARCT activities at the Science and Mathematics Teacher Imperative Conference on June 3, 2015 (See Products). The planning group did some debriefing and reflection on the SPARCT 2015 Academy during this time.

Specific Objectives

Y2-2015

Specific objectives of Y2 as they fall under the goals were as follows:

(1) Enhanced scholarship of teaching and learning (SoTL) by SPARCT faculty.

Objective 1 - Develop travel application guidelines to encourage SoTL presentations.

Objective 2 – Track participant progress through their SoTL projects via analysis of video reflections during the academic year.

Objective 3 – Record the number of presentations delivered by SPARCT participants

(2) Improvement of evidence-based practices targeting the introductory STEM classroom.

Objective 1 – Track participant progress through analysis of video reflections during the academic year.

(3) Development of long-term FLCs in STEM instruction.

Objective 1 –Attend monthly meetings to develop an FLC culture among SPARCT participants.

Objective 2 – Continue the SPARCT meetings during Year 2 and open presentations to all SPARCT participants (2014 and 2015).

(4) Development of professional peer-observation strategies for the STEM classroom.

Objective 1 – Track number of observations done during Fall and Spring semesters.

Objective 2 – Track participant feedback regarding observation via analysis of video reflections taken in Oct. 2014.

(5) Enhanced student learning in introductory STEM courses as a result of SPARCT faculty development.

Objective 1 – Request information from participants who travel to present their work regarding their student learning outcomes.

Significant Results:

Y2-2015.

(1) Enhanced SoTL by SPARCT faculty.

Objective 1. Travel guidelines were established by the planning committee and distributed to SPARCT participants at the January 2015 meeting.

Objective 2. Based on the qualitative analysis from the video transcripts, all sixteen members of the SPARCT 2014 group engaged in a SoTL project in an introductory course they were teaching during the 14-15 academic year. Those who completed research projects; projects which resulted in a conference presentation or a journal article, unequivocally articulated they would not have completed the project without the “impetus provided by the SPARCT experience” They did report they would “probably have implemented the intervention but would not have collected data or analyzed the data.” Most articulated that prior to SPARCT they were not aware of SoTL research nor did they consider the possibility of “doing research on teaching practices and the impact of those practices on student learning.” By the end of their experiences with SPARCT, half of the participants recognized the possibilities of SoTL as “educational research,” they regarded their classrooms as “laboratories,” and spoke in terms of developing a “broader view of research which provided them additional avenues for publication on the success of their classroom modifications.”

Objective 3. Of these sixteen faculty, six presented the results of their SPARCT SoTL projects in 2015 at professional conferences (see products), three additional faculty presented their findings at an FGCU Research Day, and one more sought further training in evidence-based practice (POGIL mathematics conference).

A total of 10/16 (62%) faculty engaged in SoTL activities directly resulting from participation in SPARCT. Four of the ten faculty are co-PIs or Sr. personnel on the WIDER grant.

Additionally, the planning team (Frost, Greene, McCulloch, Serro, and Goodwin-evaluator) delivered two SoTL presentations at the SoTL Commons Conference in March 2015 discussing the SPARCT program.

(2) Improvement of evidence-based practices targeting the introductory STEM classroom.

Objective 1. Based on the qualitative analysis from the video transcripts, all sixteen members of the SPARCT 2014 group integrated an evidence-based practice into their targeted course. The levels of integration ranged from making a minor change in their targeted course to a complete course redesign. The rationale for complete redesign was to free up class time for deeper student engagement in content application and to facilitate the use of EBP.

(3) Development of long-term FLCs in STEM instruction.

Objective 1. It became extremely difficult to identify a time that all faculty were able to meet for the monthly meetings. For this reason times varied so that all faculty could make some percent of the meetings.

Objective 2. SPARCT 2014 participants were invited to sessions during the May 2015 SPARCT academy that were included based on feedback from 2014. We are in the process of planning the SPARCT meetings for 2015-2016 and these opportunities will be advertised to all previous and current SPARCT participants.

(4) Development of professional peer-observation strategies for the STEM classroom.

Objective 1. 93% of the participants received at least one observation of their classroom during the year. 73% of the participants conducted at least one observation of another person's classroom. The number of observations conducted was much greater during the Fall semester than the spring with a total of 20 observations conducted and 22 observations made of participant classrooms. During the spring, only 9 observations were conducted while 9 classrooms were observed. Participants were only asked to conduct their SoTL project for one semester during the academic year and at least 6 participants chose to only conduct their project during a single semester which may account for the differences.

Objective 2. During October 2014, participants were asked to reflect on their Fall observations through a video reflection. Three strong themes emerged from the video interview data concerning observing peers. Participants gained new insights into students and their engagement, better understood the impact of situational factors on learning, and observed new ways to use evidenced based practices to enhance their teaching. Insights gained from being observed coalesced around the theme of confidence; confidence in their current practice and confidence that small changes make a big difference in student engagement.

Overwhelmingly, all participants articulated changes in perspectives regarding students; observing required them to become more aware of student behavior. They noticed positive aspects of students they did not have "time" to notice while they were teaching. Participants became aware of what students do and do not do during class, when students disengaged from the teaching cycle and why, and how to trust students to engage with their own learning. All participants shared changes they made in their classroom procedures and use of more engaging practices as a result of the observation cycle. All 2014 participants shared their newfound comfort with and respect for peer observations. The video observations suggest that the SPARCT program is having an impact on teaching culture for the participants.

(5) Enhanced student learning in introductory STEM courses as a result of SPARCT faculty development.

Objective 1.

Faculty projects included the following

- (1) examining student attitudes (Brooks & Huffman)
- (2) re-design of an introductory engineering course (Kunberger)
- (3) modifying and assessing homework methods in engineering mechanics (Lura)
- (4) senior team mentoring of freshman in introductory Computer Science (Gonzalez & Zalweski)

The SoTL projects are varied and demonstrate high engagement in SoTL by 6 of the 16 SPARCT 2014 participants.

Key Outcomes or Other Achievements:

Y2-2015

See attached results 2014-2015

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

The SPARCT program has allowed training opportunities for SPARCT participants who did not use travel funds for SoTL presentations. One math faculty participant attended a POGIL mathematics conference and one engineering faculty member used their funds to attend an ExCEED teaching workshop (ASCE). One participant will use their funds to purchase a chemistry demonstration cart and supplies.

How have the results been disseminated to communities of interest?

The SPARCT planning group and the evaluator delivered three talks during Y2 at the following conferences: SoTL Commons Conference, Savannah, GA and Science and Mathematics Teacher Imperative, New Orleans, LA. Additionally, Dr. Frost will deliver a poster presentation at the AAC&U STEM meeting in Nov. 2015 and Dr. Serro will participate in a panel discussion of WIDER initiatives at the Nov. Professional and Organizational Development Conference. The website has been updated with results information.

What do you plan to do during the next reporting period to accomplish the goals?

- (1) We continue to encourage SPARCT 2014 faculty with their SoTL projects as well as SPARCT 2015 participants who are embarking on their SoTL projects in the coming year.
- (2) SPARCT 2015 participants attend monthly Faculty Learning Community sessions during the upcoming academic year (2015-2016) we plan on discussing participant progress toward the use of evidence-based practices in their classroom.

During professional development portions when speakers are coming to campus, we will invite SPARCT 2014 participants to sessions that were not a specific part of their programming.

This year we had all the 2015 SPARCT participants to complete the Post-secondary Instructional Practices Survey (PIPS) prior to attending the SPARCT Academy and we will ask them to complete this again at the end of the academic year to measure any changes in their instructional practices during this year.

(3) SPARCT participants are encouraged to attend existing FLCs at the Teaching and Learning center after their SPARCT year. To date, four participants have engaged further with the Teaching and Learning center, one participating in a book club, one facilitating a book club, one participating in an FLC, and one facilitating an FLC.

(4) We continue the observations with the SPARCT 2015 group. We notice that our participation rates with the 2014 group are high, but not 100% and will provide incentives to participants to insure full participation as an expectation of SPARCT.

(5) SPARCT 2014 participants have reported their use of evidence-based practices and we expect that to translate into enhanced student learning in SPARCT courses. We will be surveying our participants in a final survey to examine this goal.

II. Products - What has the project produced?

Brooks, C.D.; Huffman, T. (2015). *Changing Teaching Practices to Influence Attitudes and Success in Mathematics*. SoTL Commons Conference. Savannah, GA.

Frost, L.; Greene, J.; McCulloch, E.; Serro, L. (2015). *Vertical and Horizontal Assessment of a STEM Professional Development Academy Using Videos*. SoTL Commons Conference. Savannah, GA.

Frost, L. (2015). *SPARCT: A Faculty Development Program Focusing on Introductory STEM Courses*. Science and Mathematics Teacher Imperative (SMTI) Conference. New Orleans.

Geiger, C.; Kunberger, T. (2015). *From Catch-all to Clarity: Revising a First-Year, Multidisciplinary Introductory Course*. ASEE 122nd National Conference. Seattle, WA.

Gonzalez, F.; Zalewski, J. (2015). *FAST Learning: Follow Accomplishments of Senior Teams*. ASEE 122nd National Conference. Seattle, WA.

Goodson, L.; Frost, L. (2015). *Developing and Evaluating a STEM Professional Academy and SoTL Culture*. SoTL Commons Conference. Savannah, GA

Lura, D.J.; Badir, A.; O'Neill, R. (2015). *Homework Methods in Engineering Mechanics*. ASEE 112nd Annual Conference. Seattle, WA.

Zalewski, J.; Gonzalez, F. (2015). *FAST Learning: A New Didactic Method in Software Engineering*. EDUCON 2015, IEEE Global Engineering Education Conference. Tallinn, Estonia.

The website has been updated to include archived information on the SPARCT program results presented last year.

III. Participants & Collaborating Organizations – Who has been involved?

Here I listed all co-PIs, senior personnel as well as Jackie Greene, Elspeth McCulloch, and Rob Nichols.

This area asks for nearest person month worked. A person month is defined as 160 hours. So, if I thought someone put in more than 80 hours over the course of Y2, I gave them a 1. At present, Jackie has a 2 while Laura and Elspeth received a 1 and everyone else has a zero. Attendance at the SPARCT Academy was 36 hours which everyone gets. If you feel you put in more than double that to raise your total over 80 hours, I will raise your person month to 1. This area also outlines the activities that you were involved with, so even if you have a zero listed, whomever reads this will know that you participated, just not more than 80 hours.

What other collaborators or contacts have been involved?

We had four visitors provide sessions during the SPARCT 2014 academic year professional development
Ms. Ludwika Goodson, Instructional Design, IUPUI - *Identifying Levels of Learning in Assessments*
Dr. Scott Lewis, Chemistry, Univ. S. FL - *Testing what we teach - Assessments*
Dr. Dannelle Stevens - Portland State University - *Academic writing workshop*
Dr. Shawn Weatherford, St. Leo University - *SCALE-UP classroom use*

We had two visitors during the SPARCT academy in May 2015.
Dr. Shawn Weatherford, St. Leo University - *SCALE-UP Classroom use*
Dr. Wayne McCormack, Univ. of FL - *Team-Based Learning Workshop*

IV. Impact – What is the impact of the project? How has it contributed?

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

Describe how findings, results, techniques that were developed or extended, or other products from the project made an impact or are likely to make an impact on the base of knowledge, theory, and research and/or pedagogical methods in the principal disciplinary field(s) of the project.

Impact on Principal Disciplines (STEM faculty development).

In the field of introductory STEM instruction, all 16 SPARCT 2014 participants have introduced an evidence-based practice into their chosen introductory course as a result. All participants gained knowledge in pedagogical methods and indicated through our qualitative analysis that they were able to put this knowledge into practice. The observations were well received by the participants and also made an impact on the participant's own pedagogical practice. Based on the number of faculty in the cohort and the number of SoTL projects produced, SPARCT had the largest impact in mathematics and engineering. Two mathematics and all four engineering participants presented SoTL projects.

As of this report, we have completed two sessions of the SPARCT summer academy with our proposed two cohorts completed. There are ~130 STEM faculty at the university who are in departments where STEM introductory courses are taught. Thirty-two of these faculty participated in SPARCT. If all goes as planned this year, this represents 25% of STEM faculty population at FGCU. According to the Diffusion of Innovation Theory, at the end of this year, we will have reached well into the Early Adopters area which should have a significant effect on culture change.

Prior to SPARCT, FGCU's teaching and learning center had offered professional development to faculty in the form of a Course Design Academy (CDA). Over a three year period, 60 faculty participated in this program, 17 of these were STEM faculty, 11 during the first offering in 2011. Seven of the seventeen STEM faculty are co-PIs/Sr. personnel on this WIDER grant. The SPARCT programming fills a need for STEM faculty professional development.

What is the impact on other disciplines?

Describe how the findings, results, or techniques that were developed or improved, or other products from the project made an impact or are likely to make an impact on other disciplines.

The SPARCT model for faculty development has included co-PIs and senior personnel from FGCU's teaching and learning center. Some of the practices that have been developed for this programming have been transferable to faculty outside of the STEM disciplines. Additionally, we have brought speakers to campus for SPARCT that were able to interact with other faculty at the university during their time on campus.

FGCU currently has 513 faculty. Since the inception of the Course Design Academy in 2011, 105 faculty have participated. 21 of those faculty are STEM faculty with 11 faculty participating in both SPARCT and Course Design Academy. Six of these 11 are co-PIs or Sr. Personnel on this proposal. These two programs have affected ~25% (126/513) of all the faculty at the university since 2011. During the time period of the SPARCT grant, 43 faculty participated in CDA (3 of which were STEM faculty) and 32 STEM faculty participated in SPARCT. One faculty member participated in both programs. Over the past two year period, these two complementary programs have affected 14% (74/513) of the FGCU faculty. SPARCT has been able to almost double the professional development capacity for Faculty Development.

What is the impact on the development of human resources?

For example, how has the project:

- *provided opportunities for research and teaching in the relevant fields;*

- *improved the performance, skills, or attitudes of members of underrepresented groups that will improve their access to or retention in research, teaching, or other related professions;*
- *developed and disseminated new educational materials or provided scholarships; or*
- *provided exposure to science and technology for practitioners, teachers, young people, or other members of the public?*

We see the impact of SPARCT on teaching by the sixteen 2014 participants through their engagement in evidence based practices, observation, reflection, and involvement by the majority in SoTL research (see attached results document). Additionally, the planning committee members have developed in the area of faculty development to a great extent through the offering of this program.

What is the impact on physical resources that form infrastructure?

SPARCT examines the appropriate use of Student-Centered Active-Learning Environment with Upside-down Pedagogies (SCALE-UP) classrooms. We are engaged in conversations with academic leadership regarding the appropriate allocation of this resource. It is likely that SPARCT will make an impact on allocation in the future as more faculty are made aware of appropriate use.

What is the impact on institutional resources that form infrastructure?

It is the intention of the PI, as STEM Center director, to continue delivering versions of the SPARCT program that have been developed after the grant period has ended because it appears to be a successful model for STEM faculty development. Academic chairs and deans have been made aware of the successes of the program by the PI and support these efforts.

What is the impact on information resources that form infrastructure?

SPARCT video reflections of the participants are being delivered to the participants themselves as short YouTube segments. To our knowledge, this represents a new model for faculty reflection and development in teaching.

What is the impact on technology transfer?

Nothing to report.

What is the impact on society beyond science and technology?

The success of the SPARCT Academy impacts the full university faculty.

The SPARCT Academy presenter, Dr. Wayne McCormack, president of the Team-Based Learning (TBL) Collaborative, delivered a team-based learning workshop to the SPARCT 2015 participants. FGCU faculty participants in a Course Design Academy and faculty in the College of Health Professions were introduced to TBL during his visit through a one-hour seminar. In the upcoming year, we look forward to bringing Cognitive Scientist, Dr. Mark McDaniel to campus to engage with SPARCT faculty and with the larger public.

V. Changes/Problems

Changes in approach and reasons for change.

Nothing to report.

Actual or Anticipated problems or delays and actions or plans to resolve them

Y2-2015

We filed for a no-cost extension during 2014-2015 allowing us to complete two full SPARCT programming cycles.

Changes that have significant impact on expenditures.

Nothing to report.

Significant changes in use or care of human subjects.

Nothing to report.

Significant changes in use or care of vertebrate animals.

Nothing to report.

Significant changes in use or care of biohazards.

Nothing to report.