

**AN EVALUATION  
OF THE MATHEMATICS AND SCIENCE  
PARTNERSHIP GRANT  
TO LAURENS SC SCHOOL DISTRICTS 55  
AND 56**

**(Laurens STEM 3: Project Based Learning)**

**October 1, 2015-Jan. 31, 2017**

**PREPARED FOR LAURENS SCHOOL DISTRICT 55**

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**March 31, 2017**

## **ACKNOWLEDGEMENTS**

We gratefully acknowledge the assistance of Laurens County School Districts 55 and 56 personnel who provided information through meetings, emails and discussions. We want to recognize the following individuals who made thoughtful contributions to this report.

Jody Penland  
Ginny Cartee  
Brenda Schrantz,

The teachers and staff of Laurens School Districts 55 and 56 who graciously gave their time for interviews and surveys.

## **EXECUTIVE SUMMARY**

Laurens County (SC) School District 55 received a three year Mathematics and Science Partnership (MSP) Grant from the SC Department of Education which ended on September 30, 2013. The District was successful in receiving another MSP grant which began on October 1, 2013 and ended September 30, 2016. This grant included Laurens District 56. An additional MSP grant (Laurens STEM 3: Project Based Learning) was received on September 1, 2016 to serve the two districts, originally to be funded for three years. When the Every Student Succeeds Act (ESSA) was passed in December, 2015, the MSP program was ended. The program funding was reduced to two years, but the programs are being continued over a 34 month period. Laurens 55 chose to use an option whereby the first “year” of the project would run from September 1, 2015 to January 31, 2017 and the second “year” from February 1, 2017 to June 15, 2018. This document is an evaluation of the first “year” of the grant.

By providing opportunities for teachers to experience and understand STEM instructional strategies and the interconnectedness among STEM disciplines, the project is designed to increase teacher content knowledge and create a cohort of teachers with advanced skills in project based instruction. The project provides opportunities for teachers to work in whole school and whole district vertical teams, work toward closing identified student achievement gaps, and implement a coherent and rigorous STEM curriculum. Approximately 120 teachers and 4000 students are served by the project.

The purpose of the evaluation is to provide information which will assist the project staff in meeting the goals of the project after the grant has ended and help assure the continuing improvement of the project. The evaluation includes a process evaluation, outcome evaluation, study of the impact of the project on student achievement and measurement of the federal GPRA. The design of the process evaluation is descriptive-exploratory. The design of the outcome evaluation and study of the impact are quasi-experimental.

Building on the success of former STEM projects, this project provides tiered professional development opportunities. This project is planned as a catalyst to help achieve each objective by providing teachers with opportunities to work with university STEM faculty to explore rigorous content, to provide professional development coaches as instructional leaders for vertical teams and to achieve districtwide articulation of a coherent and rigorous STEM curriculum. The project provides opportunities for a cohort of teachers to be trained in project based learning in order to help students apply knowledge and skills learned through experiences with real world problem. The project will also provide foundational experiences for all teachers working with STEM content. The tiers are:

Tier 1 - Universal district wide required professional development such as release time and required Tuesday After School professional developments, District PD Days and Instructional Coaching Activities (not counted as cohort participants)

Tier 2 - Self - Selected professional developments such as mini courses focused on STEM content, and pedagogy, One Day Summer STEM professional developments and a one day summer visit to Discovery Place (60 teachers)

Tier 3- Cohort Professional development to include Saturday Cohorts (20 math, 20 science, 20 engineering) for four Saturdays each semester and Summer STEM Extended Learning Experience, one week in the summer

During the 2015-2016 grant year, which includes the 2015-2016 school year, the summer of 2016, and the first three months of the 2016-2017 school year, 221 teachers and staff participated in professional development offered by the project. Of the 221 teachers and staff, 110 (49.8%) teach students in grades kindergarten through fifth (elementary), 41 (18.5%) teach students in grades six through eight (middle), and 41 (18.5%) teach students in grades nine through twelve (high). Fourteen (6.3%) taught ESOL or Special Education, nine (4.3%) served as instructional coaches, four (1.8%) are school administrators or district staff, and two did not identify the grade level taught.

In 2015-2016, there were approximately 6018 students enrolled in nine schools in Laurens 55 School District. More than half of the students in the district (55.7%) are White, 32.8% are African American, 10.9% are Hispanic, and 0.6% are of another race. Seventy percent of the students receive free or reduced price meals.

In 2015-2016, there were approximately 3,104 students enrolled in six schools in Laurens 56 School District. More than half of the students in the district (54.2%) are White, 40.1% are African American, 5.1% are Hispanic, and 0.7% are of another races. One hundred percent of the students receive free or reduced price meals.

Laurens Districts 55 and 56 closely followed their implementation plan. The project provided all professional development called for in the plan. A total of 53 professional development events were provided to 221 teachers and staff. The 221 teachers and staff received 10,052 hours of professional development, for an average of 45.48 hours of professional development per participant

The project was implemented quite effectively. The project management team was flexible in adjusting specifics to achieve the planned activities of the project. All of the activities were achieved at or above the degree planned.

There has been a decline in the standardized test scores of students in both District 55 and 56 on standardized tests comparing the baseline year of 2014-2015 to the first year of the project of 2015-2016. In the case of Algebra End of Course tests, the decline is statistically significant. The program is, therefore, not meeting the objective of improving standardized test scores at this time.

It was not possible to report on the district's objective of narrowing the achievement gap between the state Annual Measurement Objective (AMO) and the average scale score for special needs students due to this data not being available from the state at the time of the writing of this report. Three of the five outcome objectives were met.

Initial analysis of the student control variables indicates that student effects account for approximately 11% of the variation in the 2016 PASS test scores for all students. Female

students had a score decrease of 4.2 points, which was not significant. Having an IEP or receiving free or reduced lunch significantly decreased scores. Students in middle school had a significant increase in scores.

Teacher participation in the district professional development activities versus Tier 3 participation had no influence on student scores. However, it is early in the project and change may occur as more opportunity for implementing knowledge gain and pedagogical change occurs.

It is recommended that the project staff continue the flexibility exhibited in the implementation of the project, that there be a review of the decline in student assessment scores, and that the districts continue to support the project.

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# INTRODUCTION

## The Purposes and Goal of the Project

Laurens County (SC) School District 55 received a three year Mathematics and Science Partnership (MSP) Grant from the SC Department of Education which ended on September 30, 2013. The District was successful in receiving another MSP grant which began on October 1, 2013 and ended September 30, 2016. This grant included Laurens District 56. An additional MSP grant (Laurens STEM 3: Project Based Learning) was received on September 1, 2016 to serve the two districts, originally to be funded for three years. When the Every Student Succeeds Act (ESSA) was passed in December, 2015, the MSP program was ended. The program funding was reduced to two years, but the programs are being continued over a 34 month period. Laurens 55 chose to use an option whereby the first “year” of the project would run from September 1, 2015 to January 31, 2017 and the second “year” from February 1, 2017 to June 15, 2018. This document is an evaluation of the first “year” of the grant.

By providing opportunities for teachers to experience and understand STEM instructional strategies and the interconnectedness among STEM disciplines, the project is designed to increase teacher content knowledge and create a cohort of teachers with advanced skills in project based instruction. The project provides opportunities for teachers to work in whole school and whole district vertical teams, work toward closing identified student achievement gaps and implement a coherent and rigorous STEM curriculum. Approximately 120 teachers and 4000 students are served by the project.

Building on the success of former STEM projects, this project provides tiered professional development opportunities. This project is planned as a catalyst to help achieve each objective by providing teachers with opportunities to work with university STEM faculty to explore rigorous content, professional development coaches as instructional leaders for vertical teams and to achieve districtwide articulation of a coherent and rigorous STEM curriculum. The project provides opportunities for a cohort of teachers to be trained in project based learning in order to help students apply knowledge and skills learned through experiences with real world problem. The project will also provide foundational experiences for all teachers working with STEM content.

The tiers for the professional development opportunities and the activities for the first year of the grant are:

Tier 1 - universal district wide required professional development - release time and required Tuesday After School professional developments, District PD Days and Instructional Coaching Activities (not counted as cohort participants)

- Grade band team professional development in STEM content knowledge. - November - February
- Engineering Practices Overview - January-May

Tier 2 - Self - Selected professional developments



- 16 mini courses focused on STEM content and pedagogy (6 each semester and 4 summer)
- One Day Summer STEM professional developments (Vernier, TI, Robotics, energy, etc.)
- 1 Day Summer visit to Discovery Place (60 teachers)

### Tier 3- Cohort professional development

- Saturday Cohorts (20 math, 20 science, 20 engineering) - 4 Saturdays each semester
- Summer STEM Extended Learning Experience - 60 teachers, 1 week in the summer Project

In addition to the tiers, it was also planned to provide professional development to administrators, Instructional Coaches and Master Teachers

- Six to math conferences
- Six to science conferences
- Four to Grade Band Specific Engineering professional development – (Engineering is Elementary, Engineering Everywhere and Engineering Adventures and Project Lead the Way)
- Professional developments specifically related to the project and the STEM focus
- PMT professional development – required by the State Department of Education and other professional developments specifically related to the project and the STEM focus

## Objectives of the Project

There are five objectives for the project. Each is an outcome objective. The objectives are:

**Objective 1:** During each year of the grant, Tier 3 teachers will increase their STEM content knowledge, particularly their specialized content knowledge, related to the SC College and Career Readiness Standards.

**Objective 2:** During each year of the grant, teachers will implement at least one project based learning activity within each unit of study to provoke student's application of new knowledge in a problem-solving context.

**Objective 3:** During each year of the grant, the percentage of students who score met or above on the math state assessment will improve by an average of 2% as measured by the state assessment.

**Objective 4:** During each year of the grant, the percentage of students' teachers who score met or above on the science state assessment will improve by an average of 2% as measured by the state assessment

**Objective 5:** During each year of the grant, the average scale score for subgroups (African American, special education, LEP, and subsidized meals) teachers will narrow by 5 points.

## **Study of the Impact of the Project on Student Outcomes**

To determine the efficacy of the project, a comparison study will be conducted. The study will compare the classroom observations and student assessment outcomes of the three tiers of teachers.

### **GPRA**

In addition, the project seeks to meet the Government Performance and Results Act (GPRA) measures established by the federal government for MSP grants. These are:

1. GPRA Measure 1: The percentage of teachers who significantly increase their content knowledge in mathematics and science, as reflected in project-level pre- and post-assessments.
2. GPRA Measure 2: The percentage of students in classrooms of MSP teachers who score at the basic level or above in state assessments of mathematics or science.
3. GPRA Measure 3: The percentage of students in classrooms of MSP teachers who score at the proficient level or above in state assessments of mathematics or science.
4. GPRA Measure 4: The percentage of MSP projects that report using experimental or quasi-experimental design for their evaluations.
5. GPRA Measure 5: the percentage of MSP projects that use experimental or quasi-experimental design for their evaluations that are conducted successfully and that yield scientifically valid results.

## **Purpose and Contents of the Evaluation**

The purpose of the evaluation is to provide information which will assist the project staff in meeting the goals of the Laurens STEM 3: Project Based Learning project and help assure the continuing improvement of the project. The evaluation includes a process evaluation, outcome evaluation, and measurement of the federal GPRA. The design of the process evaluation is descriptive-exploratory. The design of the outcome evaluation is quasi-experimental.

# METHODOLOGY

## Evaluation Design

The findings of the evaluation of the previous Laurens 55 Phase 2 MSP Grant have been applied to plan and improve performance, as well as help the project managers in modeling teachers' professional development opportunities. The evaluation builds upon the successes of the previous evaluations and expands its scope to determine if the project is impacting teacher pedagogy and if those changes lead to changes in student academic achievement.

Using an action research approach, the evaluation is a continuous process with the evaluators providing information to the program, the administrators of the grant, and key staff. The information can be used to improve the program and is intended to assure success. The written evaluation consists of three parts: a process evaluation, an outcome evaluation and a study of the impact of the project on student achievement

### Process Evaluation

The process evaluation consists of five steps: The implementation was divided into its constituent tasks and subtasks. Each task and subtask was assigned measurement methods. Quantitative data was entered directly into the MSP GEMS® information system described below, and the necessary data elements were included in the system. Qualitative data was gathered through surveys, interviews of project staff, teachers and instructors, and observation of Saturday classes and the summer collaborative week.

The final step is to answer the following questions: 1) How do the activities conducted compare to the activities proposed? 2) How well does the actual timeline match the proposed timeline? 3) What impact did any changes to the plan have on the project's ability to achieve the objectives? This was an ongoing process with continuous communication of findings to the grant team. The communications were conducted through scheduled face-to-face meetings, telephone conferences, and other direct contacts as necessary. Most importantly, the real-time reports produced by the MSP GEMS® provided on-going management, benchmark and similar information available to the project managers and teachers at an appropriate level at any time they chose to access it.

### Outcome Evaluation

The outcome evaluation compares the planned outcomes to the actual outcomes using specific methods for measurement.

Objective	Method for Measurement
Objective One: Tier 3 teachers will increase their STEM content knowledge, particularly their <i>specialized content knowledge</i> , related to the SC College and Career Readiness Standards.	Course specific pre-posts for Tier 3

Objective Two: Teachers will implement at least one project based learning activity within each unit of study to provoke student's application of new knowledge in a problem-solving context.	Classroom Observation
Objective Three: The percentage of students who score met or above on the math state assessment will improve by an average of 2% as measured by the state assessment..	Comparison of 2014-2015 state math assessment to 2015-16 scores.
Objective Four: The percentage of students of who score met or above on the science state assessment will improve by an average of 2% as measured by the state assessment, Palmetto Assessment of State Standards (PASS) or End of Course Examination Program (EOCEP).	2014-2015 PASS and Algebra/Biology EOCEP as baseline
Objective Five: The average scale score for subgroups (African American, special education, LEP, and subsidized meals) will narrow by 5 points.	2014-2015 state assessment scores as baseline
Comparison Study is designed to compare the teachers in each of the three tiers of professional development, as well as their students.	Comparison on student state assessments scores and observations
1. Process Evaluation	<ol style="list-style-type: none"> <li>1. Professional development provided to all three tiers.</li> <li>2. Project Administration Professional development , Instructional Coaches and Master Teachers Professional development</li> <li>3. Activities of instructional coaches and master teachers</li> <li>4. Observation and interviews of teachers at Summer Institute</li> <li>5. Interviews of project administrators, instructional coaches and master teachers</li> </ol>

### **Impact of Project on Student Achievement**

The study of the impact of the project on student achievement uses a quasi-experimental matched-pair design. The experimental group is the Tier 3 teachers. The comparison groups are the teachers who participated only in district professional development. Entry into the experimental group was through self-selection. Therefore, the comparison group teachers could not be chosen until after the experimental group was constituted. Baseline equivalence of each group was measured to determine if significant differences in teacher credentials or demographics exist and any differences are accounted for in the analysis.

The effect of the two types of professional development activity offered (Tier One and district professional development) are examined by comparing changes in teacher content knowledge and instructional practices, and student academic achievement between both groups of teachers. Regression statistics are used to account for differences in student demographics and teacher credentials and to measure the significance of the relationship. Finally, differences between achievement rates of experimental group students and comparison group students are analyzed to determine if differences in achievement are greater than what would normally be expected. Differences in number of professional development days, number of teachers with advanced degrees, and other staff characteristics are accounted for in the analysis.

## **GPRA Measures**

The federal Government Performance and Results Act (GPRA) measures are reported on as they are stated in the Federal reporting system.

## **Information System**

The project continued to use the MSP GEMS® online data system as the central point for data gathering, storage, initial statistical manipulation and routine reporting. The MSP GEMS® was modified as needed following a meeting among SWS and the two district staffs to determine changes necessitated by the new project. The process plan, database, surveys, protocols, reports, and other necessary information as identified are available through the system. Data was entered by project staff and classroom activity observers. Student demographic and available academic achievement data was provided by the school districts and imported into the MSP GEMS® for analysis purposes. Classroom observation data were collected and entered directly into the MSP GEMS®, using an instrument developed for the project (See Appendix One for a copy of the observation instrument.)

## **Phases of the Evaluation**

### **Phase 1 – Preparation for Data Gathering**

In this phase, the grant application was reviewed, with a particular emphasis on the goals, objectives, outcomes and activities of the project. The evaluation design of the project was reviewed and questions prepared regarding availability of data, key informants and access to qualitative information.

The GEMS® online information system was modified to collect all the necessary information that could be captured in this manner. The evaluators worked with the Districts to assure appropriate pre and post test instruments, identification of the comparison group members, site visit dates and other technical details. On site interview schedules were prepared. Online forms of pre and post tests were developed. In addition, a classroom observation instrument was designed. (Copies of instruments may be found in Appendix One)

Individuals who enter data into the GEMS® were provided with user id's, passwords and professional development on using the system. Users only have access to their own data, or, in the case of administrators of the project, to the project's data. Project administrators do have access to summaries and de-identified records for teacher assessments, but do not have access to view the scores of any individual teachers.

## **Phase 2 – Gathering and Reviewing Information**

Information gathering occurred in five stages. The first stage was to hold a series of meetings and conversations with the project manager and other project personnel. In these meetings, the data and other information needs of the project and of the evaluation were addressed and solutions assured.

The second stage was to test the instruments and the GEMS® system, then to train personnel who would use the GEMS®. Continuing technical assistance was also arranged.

The third stage was to monitor the data being entered into the system, make adjustments as necessary and to provide special reports or feedback to the project. Two site visits were also made to the project during each year of the grant. These were followed up with telephone interviews and email communications with members of the project management team.

The fourth stage was to access the standardized test score data for both Laurens County School Districts Standardized test score data (science PASS, state math assessment and EOCEP) for the Laurens School Districts.

The fifth stage was a series of interviews with the participants in the Summer Institute and observation of the Institute.

## **Phase 3 –Preparation of the Information and Data**

The qualitative information gathered was placed in a single qualitative database for analysis. The quantitative data was exported from GEMS® into the Statistical Packages for the Social Sciences (SPSS) for analysis. Tables and Graphs describing the outcomes were developed in Microsoft Excel and exported to Microsoft Word.

## **Phase 4 – Analysis of Information and Data and Development of the Report**

In developing the report, the following steps were conducted.

1. The evaluation team achieved consensus on:
  - a. *What Happened?* (Findings of the Study) What activities and actions took place during the grant period?
  - b. *So What?* (Conclusions of the Study) What meanings do the activities and the actions have in terms of the goal and objectives of the project and the expressed desires of the participants? To what extent have the aims of the project been achieved? Which activities were most successful? Which could be improved upon?

- c. *Now What?* (Recommendations of the Study) What changes and additions does the evaluation team believe might be useful in advancing the goals of the project?
2. The sections of the report were assigned to different team members for drafting and all team members edited the report.
3. The final report includes a description of the grant and its goals, strategies, objectives, and activities; process findings; findings of progress toward the project goals and objectives; the impact on student achievement, the GPRA findings, the conclusions; and the recommendations. This resulted in a detailed written documentation of the progress of the project.
4. In addition, SWS will complete the interim, six-month report required by the SCDE and the LEA portions of the Annual Performance Review (APR) to the US Department of Education by providing the information from its evaluation work and from the MSP GEMS®.

## **Limitations of the Evaluation**

Since the state math assessment instrument was different for the baseline year and the report year, changes in math scores for students may not be comparable.

Laurens 55 experienced a significant re-assignment of administrators and lead teachers to other schools between the 2014-2015 and 2015-2016 academic years. The administrators and lead teachers conduct the observations. In order to avoid problems with inter rater reliability, it was decided by the district and the evaluators to have observations made only on teachers by the personnel who had done so previously, thus reducing the number of potential observations.

# FINDINGS PART I: PROCESS EVALUATION

## Introduction

The process evaluation reports first on the numbers and makeup, to the extent possible, of the teachers and students served by the grant. It then reports on the progress made toward carrying out the activities included in the grant proposal.

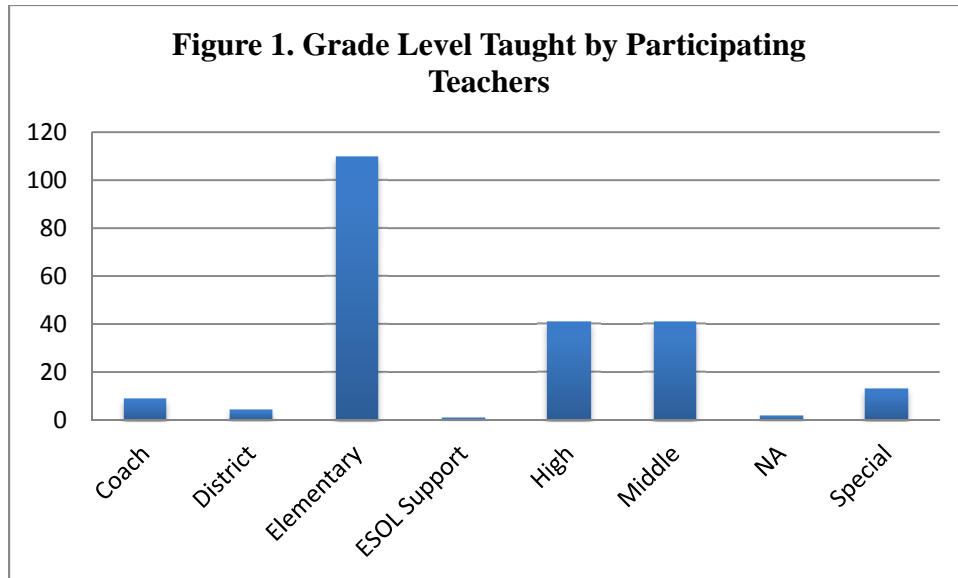
## Teachers Served

During the 2015-2016 grant year, which includes the 2015-2016 school year, the summer of 2016, and the first three months of the 2016-2017 school year, 221 teachers and staff participated in professional development offered by the project. Of the 221 teachers and staff, 110 (49.8%) teach students in grades kindergarten through fifth (elementary), 41 (18.5%) teach students in grades six through eight (middle), and 41 (18.5%) teach students in grades nine through twelve (high). Fourteen (6.3%) taught ESOL or Special Education, nine (4.3%) served as instructional coaches, four (1.8%) are school administrators or district staff, and two did not identify the grade level taught (See Table 1).

*Table 1: Grade Level Taught by Participating Teachers*

	#	%
Early Childhood	0	0%
Elementary Grades	110	49.8%
Middle School Grades	41	18.5%
High School Grades	41	18.5%
Special Ed/ESOL	14	6.3%
Instructional Coach	9	4.1%
Administrative	4	1.8%
Not identified	2	1.0%
<b>Total</b>	<b>221</b>	<b>100%</b>





Of the 217 teachers and staff who participated during the 2015-2016 grant year (after excluding district personnel), 149 were identified as teaching mathematics, science, or both. Seventeen (7.8%) teach only math, 23 (10.6%) teach only science, and 109 (50.3%) teach both math and science. Sixty-eight teachers (31.3%) did not identify a content area taught.

**Table 2: Subjects Taught By Participating Teachers**

	#	%
Mathematics Only	17	7.8%
Science Only	23	10.6%
Math and Science	109	50.3%
Not disclosed	68	31.3%
<b>Total</b>	<b>217</b>	<b>100%</b>

## Characteristics of Students in the District

In 2015-2016, there were approximately 6018 students enrolled in nine schools in Laurens 55 School District. More than half of the students in the district (55.7%) are White, 32.8% are African American, 10.9% are Hispanic, and 0.6% are of another race. Seventy percent of the students receive free or reduced price meals.

## Description of Implementation of Professional Development

As stated in the Introduction, the project is designed to increase teacher content knowledge and create a cohort of teachers with advanced skills in project based instruction. In this section of the evaluation, each of the types of professional development is described. Additional information

regarding the implementation of the professional development is also provided. A complete listing of professional development activities with descriptions may be found in Appendix Two.

The project provided all professional development called for in the plan. A total of 53 professional development events were provided to 221 teachers and staff. The 221 teachers and staff received 10,052 hours of professional development, for an average of 45.48 hours of professional development per participant

**Table 3a: Professional Development by Type School Year 2015-2016**

Professional development Type	Professional Developments Completed			Professional Developments in Progress			Total for All Professional Developments		
	# Professional developments	# Staff	# Hours	# Professional developments	# Staff	# Hours	# Professional developments	# Staff	# Hours
Summer Institute	1	47	1410	0	0		1	47	1410
District Professional Development	9	109	2023	0	0		9	109	2023
Saturday Cohort	2	39	1950	0	0		2	39	1950
Conference	12	67	1394	0	0		12	67	1394
<b>Total</b>	<b>22</b>	<b>160</b>	<b>6777</b>	<b>0</b>	<b>0</b>		<b>22</b>	<b>160</b>	<b>6777</b>

**Table 3b: Professional Development by Type September 1, 2016—December 31, 2016**

Professional development Type	Professional Developments Completed			Professional Developments in Progress			Total for All Professional Developments		
	# Professional Developments	# Staff	# Hours	# Professional Developments	# Staff	# Hours	# Professional developments	# Staff	# Hours
District Professional Development	24	261	2841	0	0		24	261	2841
Conference	6	13	84	0	0		6	13	84
Instructional Coaching	1	14	350	0	0		1	14	350
<b>Total</b>	<b>31</b>	<b>266</b>	<b>3275</b>	<b>0</b>	<b>0</b>		<b>31</b>	<b>266</b>	<b>3275</b>

## **The Summer Institute**

The most intensive professional development is provided in the Annual Summer Institute. The Institute is designed to provide STEM teachers with a rigorous summer experience that will motivate innovation. The 41 teachers who participated in the Summer Institute received a total of 1,410 hours of experience over a four day period, (an average of 35 hours per person). The Summer Institute schedule may be found in Appendix Three.

An evaluator attended one day of the institute. Both the project manager and teachers were interviewed.

### **Project Manager Interview**

1. How do you think things are going with the new grant?

The grant is going well, they have good participation. The partnership with Clemson is working very well. Professors are very skilled and connect with the teachers.

2. What activities have you done during this summer PD?

They have made site visits and spent time with Clemson professors in several hands-on research labs on campus. Teachers got the chance to see research that leads to spin-off high tech business and jobs. (Example: making fiber optic cable)

3. How is this summer institute different or the same as previous ones?

This institute is more focused on content and deepening teacher's content knowledge, not so much on pedagogy.

4. What aspects of the project are going as planned? Where have you made adjustments and why?

All has gone well. The professors have planned most of the activities.

5. What are the most successful aspects so far? The least successful?

They had more demand for the Saturday classes second semester from teachers than they had spaces. Many teachers have been part of the previous grant and have recruited their peers.

### **Teacher Interviews**

Teachers were interviewed individually, in pairs and in small groups while they were doing a hands-on activity, building a wind powered generator, in preparation for a competition. About 50 teachers were at the Institute. All were white females except for 1 white male and 1 black male. The

evaluator spoke directly with about 25 teachers. Many of the participants said they had attended PD for the current grant and also the prior grant.

#### Group #1

1. What parts of the PD being offered by the new grant have you they have taken part in?
  - a. 10 Buck Institute Project Based Learning Professional development (30 teachers)
  - b. 15 Saturday Cohorts (20 math, 20 science, 20 engineering) - 4 Saturdays each semester
  - c. 25 Summer STEM Extended Learning Experience - 60 teachers, 1 week in the summer.

They all liked the field visits to Clemson and several mentioned the planetarium. They seemed excited about seeing the different research labs using nanotechnology and making fiber optical cable.

2. What did you learn from each of these PD options?
  - a. Buck Institute Project Based Learning Professional development (30 teachers)

All indicated that they learned new ways to use projects to teach science subjects.

- b. Saturday Cohorts (20 math, 20 science, 20 engineering) - 4 Saturdays

About 15 had attended the Saturday sessions and seemed to like that format. Content focused on Astronomy and Physics. (The Math Saturday sessions will be held next year). They all appreciated the competence and attitude of the Clemson professors. They were reported to be respectful to the teachers as professionals and made the content accessible. The teachers liked the exchange of visiting the Clemson campus and the professors visiting Laurens SD.

#### Activity Observation

The day began with all participants in the auditorium. About 50 teachers were present. Brenda Schranz made a short announcement of the schedule. Then the teachers broke into three groups, each with a Clemson professor supervising. Teachers worked in pairs for two hours to develop their entry for the Wind Turbine Challenge. Each pair had a kit, a volt meter, pieces of cardboard, scissors and an electric fan. They had to experiment with different fan blade shapes and angles to maximize the power output. All teams were very engrossed in the activity.

The Clemson professors checked the data to select the top three designs from each classroom. Then the final competition was held in the auditorium.

The Summer Institute concluded with a video collage of all the activities in which they had participated.

### District Based Professional Development

District based professional development was accomplished during regular staff development times. All math and science teachers participated in these sessions during release time and other identified

times. Teachers received recertification points for these professional developments. Details of the professional developments may be found in Appendix Two.

### **Administrators, Lead Teacher and Instructional Coaches Conferences and Professional Development**

In addition to the tiers, professional development was provided to administrators, Instructional Coaches and Master Teachers.

The final level of professional development was for lead teachers, instructional coaches and program leaders. This level of professional development is designed to increase the capacity of the districts to continue project activities after the grant period. The professional development activities included at this level are conferences and specialized sessions designed to train trainers. Details of the conferences and professional developments may be found in Appendix Two.

## FINDINGS PART II: OUTCOME EVALUATION

### Objective 1

During each year of the grant, teachers in Tier 3 will increase their STEM content knowledge, particularly their specialized content knowledge, related to the SC College and Career Readiness Standards.

Teacher content knowledge in math and science was measured using pre- and post- assessments developed by the College of Charleston MSP project. The electronic spreadsheet supplied by the MSP federal program office was used to determine the number of teachers who showed significant gains in math and science content knowledge. This spreadsheet uses a “dependent t-test (for 30 or more respondents) or the Wilcoxon signed ranks test (for less than 30 respondents) to calculate, with 85 percent certainty, the number of teachers who showed significant gains”.

Overall, teachers completing the pre- and post-assessments in Astronomy demonstrated a significant increase in content knowledge, with a pre-mean score of 33.8 and a post-mean score of 44.9 ( $z = -4.228, p < 0.001$ ). Similarly, teachers completing the Energy pre- and post-assessments also demonstrated a significant increase in content knowledge ( $z = -4.330, p < 0.001$ ), as did teachers completing the pre- and post-assessments in Physics ( $z = -3.823, p < 0.001$ ).

Thirty of these teachers completed both the pre-test and the post-test on Astronomy content knowledge, 26 completed the pre-test and post-test on Energy content knowledge, and 22 completed the pre-test and post-test on Physics Content Knowledge. Teachers with an improvement of six points or more from the Astronomy pre-test to the post-test were considered to have made a significant improvement ( $T = 4.79, p < 0.0001$ ). Teachers with an improvement of four points or more from the Energy pre-test to the post-test were considered to have made a significant improvement ( $W = 4.33, p < 0.0001$ ). Teachers with an improvement of six points or more from the Physics pre-test to the post-test were considered to have made a significant improvement ( $W = 3.83, p < 0.0001$ ). Of the 78 completed teacher assessments, 57 (73.1%) achieved significant gains in scientific content knowledge from the pre-test to the post-test. Twenty-two of the 30 teachers showed significant gains on the Astronomy test, 24 of the 26 teachers showed significant gains on the Energy test, and 11 of the 22 teachers showed significant gains on the Physics test.

**Table 4: Pre- and Post-Assessment Scores for Astronomy, Energy, and Physics Content**

Content Area Test	N	Pre-test Mean	Post-test Mean	Z value	P value
Astronomy	30	33.8	44.9	-4.228	p<0.001
Energy	26	44.7	63.0	-4.330	p<0.001
Physics	22	47.5	56.1	-3.823	p<0.001

**Based on the data available, this objective was met.**

## Objective 2

During each year of the grant, teachers will implement at least one project based learning activity within each unit of study to provoke student's application of new knowledge in a problem-solving context.

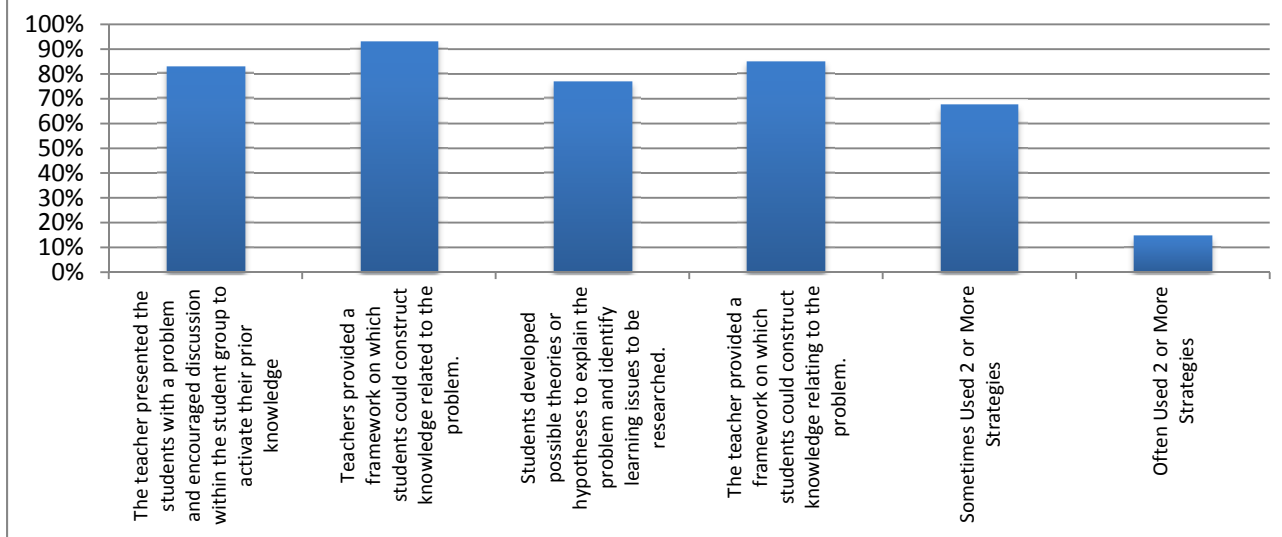
In 2015-2016, observation data shows that the teacher presented the students with a problem and encouraged discussion within the student group to activate their prior knowledge “sometimes” ( $mean=3.00, sd=0.56$ ). Of the 87 teachers observed, 72 (82.8%) exhibited use of this strategy “sometimes” or more. Teachers provided a framework on which students could construct knowledge related to the problem “sometimes” ( $mean=3.00, sd=0.59$ ), and 81 (93.1%) exhibited use of this strategy “sometimes” or more. Students developed possible theories or hypotheses to explain the problem and identify learning issues to be researched somewhat less than “sometimes” ( $mean=2.93, sd=0.61$ ), and 67 (77.0%) exhibited use of this strategy “sometimes” or more. The teacher provided a framework on which students could construct knowledge relating to the problem “sometimes” ( $mean=3.00, sd=0.57$ ), and 74 (85.1%) exhibited use of this strategy “sometimes” or more. Overall, 72 (82.8%) of the Laurens 55 teachers exhibited the use of two or more STEM instructional strategies sometimes or more in the second year of the grant. It should be noted that Laurens 55 experienced a significant re-assignment of administrators and lead teachers to other schools between the 2014-2015 and 2015-2016 academic years. The administrators and lead teachers conduct the observations. In order to avoid problems with inter rater reliability, it was decided by the district and the evaluators to have observations made only on teachers by the personnel who had done so previously, thus reducing the number of possible observations.

Laurens 56 did not provide observation data for the 2015-2016 grant year.

***Table 5: Use of STEM Instructional Strategies by Laurens 55 Teachers***

	2015-2016		
	Mean	# Use	% Use
The teacher presented the students with a problem and encouraged discussion within the student group to activate their prior knowledge.	3.00	72	82.8%
Teachers provided a framework on which students could construct knowledge related to the problem.	3.00	81	93.1%
Students developed possible theories or hypotheses to explain the problem and identify learning issues to be researched.	2.93	67	77.0%
The teacher provided a framework on which students could construct knowledge relating to the problem.	3.00	74	85.1%
<i>Sometimes Used 2 or More Strategies</i>	-	59	67.8%
<i>Often Used 2 or More Strategies</i>	-	13	14.9%

**Table 5: Use of STEM Instructional Strategies by Laurens 55 Teachers**



Of the 87 teachers who were observed in Laurens 55 during the 2015-2016 grant year, 72 (82.8%) exhibited the use of one or more STEM instructional strategies at least sometimes. Laurens 56 did not provide observation data for the 2015-2016 grant year.

**This objective was met.**

### Objective 3

During each year of the grant, the percentage of students of teachers who score met or above on the math state assessment will improve by an average of 2% as measured by the state assessment.

This objective achievement is measured by comparing scores on state assessments in each year of the grant compared using 2014-2015 scores as a baseline. Comparisons are presented in Table 6.

In 2014-2015, the state changed the math assessment to the ACT Aspire. Of the 2,580 Laurens 55 students in grades 3 through 8 that were tested, 41.3% met the readiness benchmark. Of the 1,334 Laurens 56 students in grades 3 through 8 that were tested, 42.4% met the readiness benchmark.

In 2015-2016, the state changed the math assessment to the SC READY. Of the 2,599 Laurens 55 students in grades 3 through 8 that were tested, 34.13% met or exceeded the readiness benchmark. Of the 1,336 Laurens 56 students in grades 3 through 8 that were tested, 33.68% met or exceeded the readiness benchmark. Due to the difference in tests administered between 2015 and 2016, a comparison could not be made between student test scores.



In 2015-2016, 500 students in Laurens 55 completed the Algebra End of Course (EOC) test, and 81% earned a 70 or higher. From 2014-2015 to 2015-2016, the proportion of students in Laurens 55 who passed the Algebra EOC test increased by 5.4 percent. The difference between the percentage of students passing the Algebra EOC in 2015 (75.6%) and in 2016 (81%) is not statistically significant ( $z=-2.04$ ,  $p=0.0414$ ).

In 2015-2016, 227 students Laurens 56 completed the Algebra EOC test and 68.3% earned a 70 or higher. From 2014-2015 to 2015-2016, the proportion of students in Laurens 56 who passed the Algebra EOC test decreased by 18.9% percent, and this difference is statistically significant ( $z=4.6001$ ,  $p<0.001$ ).

**This objective was met for Laurens 55 high school students and not met for Laurens 56 high school students. Due to changes in the assessment instrument, it was not possible to make judgements about the meeting of this objective for other student grade levels.**

### Objective 4

During each year of the grant, the percentage of students who score met or above on the science state assessment will improve by an average of 2% as measured by the state assessment

This objective achievement is measured by comparing scores on state assessments in each year of the grant compared using 2014-2015 scores as a baseline. Comparisons are presented in Table 8

Of the 2,134 Laurens 55 students in grades 4 through 8 who completed the science PASS in 2015-2016, 1,289 (60.40%) score met or exemplary, a reduction of 4.4%. Of the 1,105 Laurens 56 students in grades 4 through 8 who completed the science PASS, 658 (59.55%) score met or exemplary, a reduction of 3.3%. The difference between the percentage in 2014-2015 (62.9%) and 2015-2016 (62.25%) is not statistically significant.

In 2015-2016, the percentage of students in Laurens 55 who passed the Biology EOC (65.7%) decreased by 6.1% when compared to scores in 2014-2015. This difference is not statistically significant ( $z=1.855$ ,  $p=0.063$ ).

In 2015-2016, the percentage of students in Laurens 56 who passed the Biology EOC (81.8%) decreased by 5.5% when compared to 2014-2015. The difference is not statistically significant ( $z=1.5496$ ,  $p=0.1211$ ).

**Table 6: Comparison of Achievement on State Tests from 2013 to 2016**

	Laurens 55					Laurens 56				
	2013	2014	2015	2016	Change	2013	2014	2015	2016	Change
Math PASS	69.6%	68.2%	-	-	-	73.9%	71.2%	-	-	-
Math ACT	-	-	41.3%	-	-	-	-	42.4%	-	-
SC READY	-	-	-	34.1%	-	-	-	-	33.7%	-
Science PASS	70.6%	67.1%	64.8%	60.4%	(4.4)	70.9%	66.9%	62.9%	59.6%	(3.3)
Algebra EOC	87.2%	86.1%	75.6%	81%	5.4	71.6%	77.4%	87.2%	68.3%	(18.9)
Biology EOC	79.1%	73.1%	71.8%	65.7%	(6.1)	74.9%	71.8%	87.3%	81.8%	(5.5)

\* Test of significance is based on the Normal approximation to the binomial distribution and is calculated using the z value.

**This objective was not met.**

### Objective 5

During each year of the grant, the average scale score for subgroups (African American, special education, LEP, and SIP) of teachers will narrow by 5 points.

In 2015, the mean score for all elementary students in Laurens 55 was a 415.1 on the ACT Aspire for Mathematics, and a 415.0 for all elementary students in Laurens 56. In both districts, the achievement gap was below five points for all subgroups in elementary mathematics (See Table 9). This includes the subgroups for African American students, Limited English Proficiency Students, Special Education students, and Students in Poverty (SIP). This trend continued in both districts for middle school mathematics scores, with each subgroup scoring within five points of the student population as a whole.

In high school, however, significant gaps remained in Laurens 55 when comparing the mean mathematics score for all students (78.0) to students in special education (70.7). Likewise, the mean score for special education students in Laurens 56 had a gap greater than five points when compared to the mean score for all Laurens 56 students (70.7 and 80.7, respectively). In all other subgroups, the mean scores for both Laurens 55 and Laurens 56 mathematics scores were less than five points.

In 2015, gaps existed in science scores for elementary aged students. The mean science score in Laurens 55 was 617.1; the mean score for the African American students (602.3), students with Limited English Proficiency (594.1), and Special Education subgroups (590.5) had a gap greater than five points. Students identified in the SIP subgroup performed within five points of the district

mean (414.4 and 415.0, respectively). Mean scores across subgroups for Laurens 56 were similar at the elementary level; the mean score for all students was 614.5, while students in the African American and Special Education subgroups earned a mean score with a difference of more than five points; in addition, students in the SIP subgroup earned a mean score of 605.4. There were not enough students in the LEP subgroup to analyze scores for this subgroup in all categories for Laurens 56.

At the middle school levels, the achievement gap existed for all subgroups for both Laurens 55 and Laurens 56 science scores (see Table 7). At the high school level, however, the achievement gap was narrowed for students in the African American, and SIP subgroups, with students in both districts earning a mean score that was within five points of the overall district average. In Laurens 55, students in the LEP subgroup, and Special Education subgroup had a mean score that was more than five points lower than the district average. In Laurens 56, students in the Special Education subgroup scored more than five points lower than the district average. There were not enough LEP students in Laurens 56 to compare this subgroup to the district mean.

**Table 7: Achievement Gap on State Tests for Identified Subgroups for 2015**

	Laurens 55					Laurens 56				
	All	A.A.	LEP	SPED	SIP	All	A.A.	LEP	SPED	SIP
<b>Mathematics</b>										
Elementary	415.1	414.0	414.4	413.1	414.7	415	413.9	--	413	414.4
Middle	420.0	417.9	419.4	416.3	419.3	420.3	417.5	--	416.1	419.1
High	78	77.2	74.9	70.7	77.4	80.7	77.5	--	70.7	78.9
<b>Science</b>										
Elementary	617.1	602.3	594.1	590.5	613.2	614.5	593.7	--	580.6	414.4
Middle	619.0	599.5	608.4	586.6	613.1	623.9	602.9	--	578.0	419.1
High	78.8	73.6	71.0	66.0	76.8	86.0	81.2	--	72.6	78.9

In 2016, the state changed the mathematics assessments for elementary and middle schools from the ACT Aspire to the SC Ready test. The mean score for all elementary students in Laurens 55 was a 1441.5 on the SC Ready for Mathematics, and a 1468.6 for all elementary students in Laurens 56. In both districts, the achievement gap was above five points for all subgroups in elementary mathematics (See Table 8). This trend continued in both districts for middle school mathematics scores, with each subgroup scoring within five points of the student population as a whole. The one exception was the middle school LEP subgroup in Laurens 55, who outperformed the mean student average by 0.3 pts. At the time of reporting, the state had not released data for the SIP subgroup; therefore, no comparisons are made between this subgroup and the mean student average in mathematics for science for 2016.

In high school, however, there were no gaps greater than five points in Laurens 55 when comparing the mean mathematics score for all students (78.5) to all student subgroups. In Laurens 56, the only subgroup with a mean difference of five or greater from the mean student score was the Special

Education subgroup (76.0 and 66.7, respectively). In all other subgroups, the mean scores for both Laurens 55 and Laurens 56 mathematics scores were less than five points.

In 2016, gaps existed in science scores at the elementary level. The mean science score in Laurens 55 was 616.2; the mean score for the African American students (597.3), students with Limited English Proficiency (590.5), and Special Education subgroups (585.3) had a gap greater than five points. Mean scores across subgroups for Laurens 56 were similar at the elementary level; the mean score for all students was 618.7, while students in the African American and Special Education subgroups earned a mean score with a difference of more than five points; in addition, students in the SIP subgroup earned a mean score of 605.4. There were not enough students in the LEP subgroup to analyze scores for this subgroup in all categories for Laurens 56.

At the middle school levels, the achievement gap existed for all subgroups for both Laurens 55 and Laurens 56 science scores (see Table 8). At the high school level, however, the achievement gap was narrowed for students in the African American subgroup, with the subgroup earning a mean score within five points of the overall district average (71.3 and 76.5, respectively). In Laurens 55, students in the LEP subgroup and Special Education subgroup had a mean score that was more than five points lower than the district average. In Laurens 56, students in the African American and Special Education subgroups scored more than five points lower than the district average. There were not enough LEP students in Laurens 56 to compare this subgroup to the district mean.

**Table 8: Achievement Gap on State Tests for Identified Subgroups for 2016**

	Laurens 55					Laurens 56				
	All	A.A.	LEP	SPED	SIP	All	A.A.	LEP	SPED	SIP
<b>Mathematics</b>										
Elementary	1441.5	1433.3	1426.5	1417.4	TBD	1468.6	1436.2	--	1429.3	TBD
Middle	1742.6	1734.0	1742.9	1725.9	TBD	1737.1	1730.7	--	1717.8	TBD
High	78.5	76.0	75.2	73.7	TBD	76.0	73.2	--	66.7	TBD
<b>Science</b>										
Elementary	616.2	597.3	590.5	585.3	TBD	618.7	593.7	--	580.6	TBD
Middle	621.7	599.0	605.7	582.5	TBD	616.0	594.7	--	570.6	TBD
High	76.5	71.3	68.3	68.9	TBD	83.8	77.0	--	65.8	TBD

**Based on the data available, the project has not met this objective.**

## **FINDINGS PART III: IMPACT OF THE PROJECT ON STUDENT ACHIEVEMENT**

### **Within Group Comparisons**

To determine the impact of the project on student achievement, comparisons were made between student test scores of district teachers in each of the following groups: those that participated in the Summer Institute, Saturday courses or both (Tier 3), and those that participated only in district professional development. For the sample, teachers were identified that indicated whether they taught math, science, or both. District personnel, coaches, special education, and ESOL support teachers were not counted in the data for within group comparison. High school teachers were not counted, as the EOCEP test was graded on a letter, rather than numerical, scale.

#### **SC Ready Math Exam**

After removing the coaches, district personnel, and non-testing staff, the remaining teachers were matched with student tests data. Those without student test data were eliminated from the within group comparison. The final sample of Tier 3 teachers for the within group comparison included data from the students of 20 teachers for elementary and middle grade mathematics. There were 26 teachers with student data in the district professional development group.

There were 1335 grades 3-8 students in the group of teachers who participated in professional development only. There were 755 students in the group of teachers that qualified as Tier 3 teachers. The mean score for the students of the PD only teachers was 627.5 ( $sd=41.54$ ), and the mean score for the students of teachers in the Tier 3 group was 630.99 ( $sd=46.68$ ).

Differences in available student characteristics between the groups were also tested. Of the 2090 students for whom all data were available, students whose teacher participated in district professional development only in 2016 were more likely to be in middle school (69.8%) than those whose teachers participated in Tier 3 activities (44%). There were no significant differences between the groups in students' gender. Of the 1335 students in the professional development group, 692 (51.8%) were female, and of the 755 students in the Tier 3 group, 364 (48.2%) were female ( $z=1.59$ ,  $p=0.11$ ). Of the professional development only teachers, 9.4% of the students had an IEP, whereas 12.5% of students with Tier 3 teachers had an IEP. This difference is statistically significant ( $z=-2.21$ ,  $p=0.03$ ), as is the difference in the proportion of students on free or reduced lunch ( $z=5.12$ ,  $p<0.001$ ).

**Table 9: Demographics for Within Group Comparison, SC Ready**

	District PD Only	Tier 3
<b>N</b>	1335	755
<b>Mean Score</b>	627.5	630.99
<b>% Middle school</b>	69.8%	44.0%
<b>% Female</b>	70.6%	67.1%
<b>% with IEP</b>	9.4%	12.5%
<b>% on F/R Lunch</b>	67.6%	56.4%

To estimate the combined impact of the student variables, teacher data, and teacher participation on student achievement on the 2016 SC Ready Math test, multiple linear regression estimation was used. The final model used in the analysis is:

$$TestScore_i = \beta_0 + \beta_1 Participation_i + \beta_2 StudentDemographics_i + \beta_3 TeacherEffects_i + u_i$$

To test the effects of each portion of the model, two separate models were developed, each one adding a new set of variables and comparing the effect on the adjusted R<sup>2</sup>.

Initial analysis of the student control variables (Model 1) indicates that student effects account for approximately 12.6% of the variation in the 2016 SC Ready Math test scores for all students ( $F_{(4, 2085)}=75.2, p<0.001$ ). Female students had a score decrease of 3.2 points, which was not significant ( $t=1.91, p=0.06$ ). Having an IEP decreased the student score by 37 points ( $t=-8.00, p<0.001$ ). In addition, students on free or reduced lunch had a score decrease of 22.7 points ( $t=-12.25, p<0.001$ ). Students in middle school had a score decrease of 1.0 point, which was not significant ( $t=-1.81, p=0.07$ ).

Returning to the student control variables and adding teacher participation in project activities did not change the adjusted R<sup>2</sup> from 0.124. In Model 2, the influence of gender was still not significant, ( $t=1.89, p=0.06$ ). The influences of having an IEP remained significant ( $t=-12.66, p<0.001$ ), as did receiving free or reduced lunch ( $t=12.07, p<0.001$ ). Grade level remained insignificant ( $t=-1.62, p=0.11$ ). In this model, teacher participation in the district professional development activities versus Tier 3 participation had no influence on student scores ( $t=0.69, p=0.49$ ).

**Table 10: Impact of Participation on Student Achievement**

	Model (1)	Model (2)
<b>Adjusted R2</b>	0.124	0.124
<b>N</b>	2,089	2,089
<b>Student-Level Variables</b>		
Middle School	-1.01	-0.93
Female	-3.4	-3.4
Individualized Education Plan	-37.0*	-37.0*
Subsidized Meals	-22.7*	-22.5*
<b>Participation Variables</b>		
Tier 3 Participation		1.32

## PASS Science Exam

After removing the coaches, district personnel, and non-testing staff, the remaining teachers were matched with student tests data. Those without student test data were eliminated from the within group comparison. The final sample of Tier 3 teachers for the within group comparison for science included data from the students of 17 grades 3-8 teachers. There were 28 teachers with student data in the district professional development group.

There were 871 grades 4-8 students in the group of teachers who participated in professional development only. There were 544 students in the group of teachers that qualified as Tier 3 teachers. The mean score for the students of the PD only teachers was 631.59 ( $sd= 42.32$ ), and the mean score for the students of teachers in the Tier 3 group was 633.01 ( $sd= 43.42$ ).

Differences in available student characteristics between the groups were also tested. Of the 1415 students for whom all data were available, students whose teacher participated in district professional development only in 2016 were more likely to be in middle school (70.9%) than those whose teachers participated in Tier 3 activities (54%). There were no significant differences between the groups in students' gender or IEP status. Of the 871 students in the professional development group, 462 (53%) were female, and of the 544 students in the Tier 3 group, 259 (47.6%) were female ( $z=1.99, p=0.05$ ). Of the professional development only teachers, 8.7% of the students had an IEP, whereas 11% of students with Tier 3 teachers had an IEP ( $z=-1.43, p=0.15$ ). The proportion of students on free/reduced lunch was not statistically significant ( $z=1.72, p=0.09$ ).

**Table 11: Demographics for Within Group Comparison, SC PASS**

	District PD Only	Tier 3
<b>N</b>	871	544
<b>Mean Score</b>	631.59	633.01
<b>% Middle school</b>	70.9%	54.0%
<b>% Female</b>	53.0%	47.6%
<b>% with IEP</b>	8.7%	11.0%
<b>% on F/R Lunch</b>	65.6%	61.0%

To estimate the combined impact of the student variables, teacher data, and teacher participation on student achievement on the 2016 PASS Science test, multiple linear regression estimation was used. The final model used in the analysis is:

$$TestScore_i = \beta_0 + \beta_1 Participation_i + \beta_2 StudentDemographics_i + \beta_3 TeacherEffects_i + u_i$$

To test the effects of each portion of the model, two separate models were developed, each one adding a new set of variables and comparing the effect on the adjusted  $R^2$ .

Initial analysis of the student control variables (Model 1) indicates that student effects account for approximately 11% of the variation in the 2016 PASS test scores for all students ( $F_{(4, 1410)}=43.5$ ,  $p<0.001$ ). Female students had a score decrease of 4.2 points, which was not significant ( $t=1.93$ ,  $p=0.05$ ). Having an IEP decreased the student score by 29.4 points ( $t=-8.00$ ,  $p<0.001$ ). In addition, students on free or reduced lunch had a score decrease of 21.1 points ( $t=9.4$ ,  $p<0.001$ ). Students in middle school had a score increase of 9.7 points, which was also significant ( $t=4.12$ ,  $p<0.001$ ).

Returning to the student control variables and adding teacher participation in project activities did change the adjusted  $R^2$  from 0.107 to 0.108. In Model 2, the influence of gender was still not significant, ( $t=1.87$ ,  $p=0.062$ ). The influences of having an IEP remained significant ( $t=-8.01$ ,  $p<0.001$ ), as did receiving free or reduced lunch ( $t=9.33$ ,  $p<0.001$ ). Grade level also remained significant ( $t=4.298$ ,  $p<0.001$ ). In this model, teacher participation in the district professional development activities versus Tier 3 participation had no influence on student scores ( $t=1.233$ ,  $p=0.218$ ).

**Table 12: Impact of Participation on Student Achievement**

	Model (1)	Model (2)
<b>Adjusted R2</b>	0.107	0.108
<b>N</b>	1,414	1,414
<b>Student-Level Variables</b>		
Middle School	9.71	10.27
Female	-4.2	-4.04
Individualized Education Plan	-29.41*	-29.47*
Subsidized Meals	-21.1*	-20.9*
<b>Participation Variables</b>		
Tier 3 Participation		2.78



## **FINDINGS PART IV: GOVERNMENT PERFORMANCE AND RESULTS ACT (GPRA)**

This section reports on the federal Government Performance and Results Act (GPRA) measures established for this grant. The results of measurements are reported and variances discussed.

### **GPRA Measure 1: Teacher Content Knowledge**

The specific GPRA measure is “the percentage of teachers who significantly increase their content knowledge in mathematics and science, as reflected in project-level pre- and post-assessments.”

Teacher content knowledge in math and science was measured using pre and post assessments developed by the College of Charleston MSP project. The electronic spreadsheet supplied by the MSP federal program office was used to determine the number of teachers who showed significant gains in math and science content knowledge. This spreadsheet uses a “dependent t-test (for 30 or more respondents) or the Wilcoxon signed ranks test (for less than 30 respondents) to calculate, with 85 percent certainty, the number of teachers who showed significant gains”.

Of the 221 teachers and staff who participated in professional development opportunities, 78 participated in at least one of the courses that provided science content (a total of 98 participations). Thirty of these teachers completed both the pre-test and the post-test on Astronomy content knowledge, 26 completed the pre-test and post-test on Energy content knowledge, and 22 completed the pre-test and post-test on Physics Content Knowledge. Teachers with an improvement of six points or more from the Astronomy pre-test to the post-test were considered to have made a significant improvement ( $T=4.79, p<0.0001$ ). Teachers with an improvement of four points or more from the Energy pre-test to the post-test were considered to have made a significant improvement ( $W=4.33, p<0.0001$ ). Teachers with an improvement of six points or more from the Physics pre-test to the post-test were considered to have made a significant improvement ( $W=3.83, p<0.0001$ ). Of the 78 completed teacher assessments, 57 (73.1%) achieved significant gains in scientific content knowledge from the pre-test to the post-test. Twenty-two of the 30 teachers showed significant gains on the Astronomy test, 24 of the 26 teachers showed significant gains on the Energy test, and 11 of the 22 teachers showed significant gains on the Physics test.

### **GPRA Measure 2: Students at the Basic Level or Below in State Assessments of Mathematics or Science**

The specific GPRA measure is “The percentage of students in classrooms of MSP teachers who score at the basic level or below in State assessments of mathematics or science.”

Algebra End of Course tests are not administered to every high school student and are taken by some middle school students. Therefore, it is unknown at this time how many students were taught by the teachers served; however, efforts are being made to obtain this information from the districts. For the purposes of this report, the total number of students in the two districts (9,122) is used as the total number of students served. In Laurens 55, 1,712 (65.9%) of the 2,599 students who

completed the math SC READY in 2016 did not meet the readiness benchmark and 95 (19%) of the 500 students who completed the Algebra End of Course (EOC) test and were served by participating teachers did not pass the test (scored less than 70 points). In Laurens 56, 886 (66.32%) of the 1,336 students who completed the math SC READY in 2015 did not meet the readiness benchmark and 70 (31.7%) of the 227 students who completed the Algebra EOC test did not pass the test. Altogether, 2,763 students (59.3%) did not meet the state standard.

The science PASS and Biology End of Course tests are not administered to every student. Therefore, it is unknown at this time how many students were taught by the teachers served. For the purposes of this report, the total number of students in the two districts (9,122) is used as the total number of students served. In Laurens 55, 845 (39.6%) of the 2,134 students who completed the science PASS in 2016 and were served by participating teachers scored not met and 137 (34.3%) of the 399 students who completed the Biology End of Course (EOC) test and were served by participating teachers did not pass the test (scored less than 70 points). In Laurens 56, 447 (40.5%) of the 1,105 students who completed the science PASS in 2016 scored not met and 34 (18.3%) of the 186 students who completed the Biology EOC test did not pass the test. Altogether, 1463 students (38.3%) did not meet the state standard.

### **GPRA Measure 3: Students at the Proficient Level or Above in State Assessments of Mathematics or Science**

The specific GPRA measure is “The percentage of students in classrooms of MSP teachers who score at the proficient level or above in State assessments of mathematics or science.”

Algebra End of Course tests are not administered to every high school student and are taken by some middle school students. Therefore, it is unknown at this time how many students were taught by the teachers served. however, efforts are being made to obtain this information from the districts. For the purposes of this report, the total number of students in the two districts (9,122) is used as the total number of students served. In Laurens 55, 887 (34.13%) of the 2,599 students who completed the math SC READY in 2016 meet or exceeded the readiness benchmark and 405 (81.0%) of the 500 students who completed the Algebra End of Course (EOC) test and were served by participating teachers passed the test (scored 70 or higher points). In Laurens 56, 450 (33.68%) of the 1,336 students who completed the math SC READY in 2016 met the readiness benchmark and 157 (68.3%) of the 227 students who completed the Algebra EOC test passed the test. All together, 1899 students (40.7%) met or exceeded the state standard.

The science PASS and Biology End of Course tests are not administered to every student. Therefore, it is unknown at this time how many students were taught by the teachers served. For the purposes of this report, the total number of students in the two districts (9,122) is used as the total number of students served. In Laurens 55, 1289 (60.4%) of the 2,134 students who completed the science PASS in 2016 and were served by participating teachers scored met or higher and 262 (65.7%) of the 399 students who completed the Biology End of Course (EOC) test and were served by participating teachers passed the test (scored 70 points or higher). In Laurens 56, 658 (59.5%) of the 1,105 students who completed the science PASS in 2015 scored met or higher and 152 (81.7%)

of the 186 students who completed the Biology EOC test passed the test. All together, 2361 students (61.7%) met or exceeded the state standard.

## **GPR Measure 4: Experimental or Quasi-Experimental Evaluation Design**

The specific GPR measure is “The percentage of MSP projects that report using experimental or quasi-experimental design for their evaluations.”

The study of the impact of the project on student achievement uses a quasi-experimental matched-pair design. The experimental group is the Tier 3 teachers. The comparison groups are the teachers who participated only in district professional development. Entry into the experimental group was through self-selection. Therefore, the comparison group teachers could not be chosen until after the experimental group was constituted. Baseline equivalence of each group was measured to determine if significant differences in teacher credentials or demographics exist and any differences are accounted for in the analysis.

The effect of the two types of professional development activity offered (Tier One and district professional development) are examined by comparing changes in teacher content knowledge and instructional practices, and student academic achievement between both groups of teachers. Regression statistics are used to account for differences in student demographics and teacher credentials and to measure the significance of the relationship. Finally, differences between achievement rates of experimental group students and comparison group students are analyzed to determine if differences in achievement are greater than what would normally be expected. Differences in number of professional development days, number of teachers with advanced degrees, and other staff characteristics are accounted for in the analysis.

## **GPR Measure 5: Scientifically Valid Evaluation Results**

The specific GPR measure is “The percentage of MSP projects that use experimental or quasi experimental design for their evaluations that are conducted successfully and that yield scientifically valid results.”

To determine the impact of the project on student achievement, comparisons were made between student test scores of district teachers in each of the following groups: those that participated in the in the Summer Institute, Saturday courses or both (Tier 3), and those that participated only in district professional development. For the sample, teachers were identified that indicated whether they taught math, science, or both. District personnel, coaches, special education, and ESOL support teachers were not counted in the data for within group comparison. High school teachers were not counted, as the EOCEP test was graded on a letter, rather than numerical, scale.

Differences in available student characteristics between the groups were also tested. Of the 2,090 students for whom all data were available, students whose teacher participated in district professional development only in 2016 were more likely to be in middle school (69.8%) than those

whose teachers participated in Tier 3 activities (44%). There were no significant differences between the groups in students' gender. Of the 1335 students in the professional development group, 692 (51.8%) were female, and of the 755 students in the Tier 3 group, 364 (48.2%) were female ( $z=1.59$ ,  $p=0.11$ ). Of the professional development only teachers, 9.4% of the students had an IEP, whereas 12.5% of students with Tier 3 teachers had an IEP. This difference is statistically significant ( $z=-2.21$ ,  $p=0.03$ ), as is the difference in the proportion of students on free or reduced lunch ( $z=5.12$ ,  $p<0.001$ ).

To estimate the combined impact of the student variables, teacher data, and teacher participation on student achievement on the 2016 SC Ready Math test, multiple linear regression estimation was used. To test the effects of each portion of the model, two separate models were developed, each one adding a new set of variables and comparing the effect on the adjusted  $R^2$ .

Initial analysis of the student control variables (Model 1) indicates that student effects account for approximately 11% of the variation in the 2016 PASS test scores for all students ( $F_{(4, 1410)}=43.5$ ,  $p<0.001$ ). Female students had a score decrease of 4.2 points, which was not significant ( $t=1.93$ ,  $p=0.05$ ). Having an IEP decreased the student score by 29.4 points ( $t=-8.00$ ,  $p<0.001$ ). In addition, students on free or reduced lunch had a score decrease of 21.1 points ( $t=9.4$ ,  $p<0.001$ ). Students in middle school had a score increase of 9.7 points, which was also significant ( $t=4.12$ ,  $p<0.001$ ).

Returning to the student control variables and adding teacher participation in project activities did change the adjusted  $R^2$  from 0.107 to 0.108. In Model 2, the influence of gender was still not significant, ( $t=1.87$ ,  $p=0.062$ ). The influences of having an IEP remained significant ( $t=-8.01$ ,  $p<0.001$ ), as did receiving free or reduced lunch ( $t=9.33$ ,  $p<0.001$ ). Grade level also remained significant ( $t=4.298$ ,  $p<0.001$ ). In this model, teacher participation in the district professional development activities versus Tier 3 participation had no influence on student scores ( $t=1.233$ ,  $p=0.218$ ).

## CONCLUSIONS

1. The project was implemented quite effectively. The project management team was flexible in adjusting specifics to achieve the planned activities of the project. All of the activities were achieved at or above the degree planned.
2. There has been a decline in the standardized test scores of students in both District 55 and 56 on standardized tests comparing the baseline year of 2014-2015 to the first year of the project of 2015-2016. In the case of Algebra End of Course tests, the decline is statistically significant. The program is, therefore, not meeting the objective of improving standardized test scores at this time.
3. It was not possible to report on the districts objective of narrowing the achievement gap between the state Annual Measurement Objective (AMO) and the average scale score for special needs students due to this data not being available from the state at the time of the writing of this report
4. Three of the five outcome objectives were met.
5. Initial analysis of the student control variables indicates that student effects account for approximately 11% of the variation in the 2016 PASS test scores for all students. Female students had a score decrease of 4.2 points, which was not significant. Having an IEP or receiving free or reduced lunch significantly decreased scores. Students in middle school had a significant increase in scores.
6. Teacher participation in the district professional development activities versus Tier 3 participation had no influence on student scores. However, it is early in the project and change may occur as more opportunity for implementing knowledge gain and pedagogical change occurs.

## **RECOMMENDATIONS**

It is recommended that:

1. The project staff continue the flexibility exhibited in the implementation of the project.
2. There be a review of the decline in student test scores.
3. The districts continue to support the project as planned.

**APPENDIX ONE:  
INSTRUMENTS**

**APPENDIX TWO:  
PROFESSIONAL DEVELOPMENT ACTIVITIES**



**APPENDIX THREE:  
SUMMER INSTITUTE SCHEDULE**