
Decision Information Resources, Inc.

# Final Assessment of the Applied Math Program (AMP!) 2015/16

# Part I: Analysis of program impact

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# Executive summary: What is the Applied Math Program (AMP)?

The Applied Math Program (AMP!) is an innovative year-long professional development opportunity for eighth-grade science and mathematics teachers, conducted through a partnership between ConocoPhillips and Rice University Office of STEM Engagement (R-STEM). AMP! was designed for pairs of mathematics and science teachers (each pair from the same campus) to learn and work together to improve student engagement and achievement by making connections between applied mathematics and inquiry science. The course was designed to (1) increase the content knowledge of participating educators, (2) empower them to implement rigorous, inquiry-based, student-centered, integrated science and mathematics and (3) train participants toward mastery of mathematics and science content. The course began with a summer institute to engage teachers with content experts who provided an experience that focused on the correlation between grade-level mathematics and science content along with pedagogy and leadership.

Teachers applied for and were accepted to AMP! during the 2015/16 school year. Seventy-eight teachers participated in the 2015 summer AMP! course. Ultimately, however, 75 participants completed the program because some attrition occurred. A more detailed account of reasons for the attrition and how it was addressed is in the body of the report.

AMP! 2015/16 had five goals and five objectives:

## Program goals

1. Increase mathematics and science content and pedagogical knowledge of eighth-grade middle school teachers.
2. Improve student engagement and achievement in STEM subjects.
3. Create a supportive and rewarding environment to sustain AMP! teachers in high-needs schools.
4. Create a community of teachers that can motivate students toward careers in STEM fields.
5. Inject a new culture of support in the school districts for accomplished science teachers.

## Program objectives

1. To think reflectively and critically about current teacher practice.
2. To improve middle school teachers' understanding of mathematics and science content and state standards.
3. To facilitate the transformation of teacher practice through the exploration of best practices in educational pedagogy.
4. To improve mathematics and science education on each campus through the development of teacher leaders.

5. To support AMP! participants in the application of improved mathematics and science instruction.

## Assessments

Part I of the Final Assessment of AMP! analyzes the relationship between teachers' participation in AMP! and (1) leadership abilities, (2) mathematics and science efficacy, and (3) mathematics and science content abilities. AMP! teachers also had the opportunity to answer questions about their overall AMP! experience, from the summer professional development through program implementation. Several assessments were conducted pre- and post-program to determine if changes occurred and, when possible, the level of statistical significance of those reported changes. Participants revealed their perceptions regarding efficacy in their content areas, their perceived professional leadership abilities, perceived abilities to plan and implement inquiry-based lessons, and needs with regard to teaching. The following assessments were used:

- Leadership test—pre-and post-program
- STEBI-A (Science Teaching Efficacy Belief Instrument)—pre- and post-program
- MTEBI (Mathematics Teaching Efficacy Belief Instrument )—pre-and post-program
- Needs assessments—pre-and post-program
- Diagnostic Teacher Assessments in Mathematics and Science (DTAMS)—pre-and post-program
- Teacher interviews—post-program
- Professional Development (PD) Logs[1]—maintained by AMP! participants
- Attitudes Toward Mathematics Inventory (ATMI)—pre- and post-student survey
- Attitudes Toward Science Inventory (ATSI)—pre- and post-student survey
- Observations of portfolio presentations (maintained by AMP! participants)—post-program evaluation

Some statistically significant and non-statistically significant findings for each test discussed in Part I are presented in the body of the report. Results from participant interviews, portfolio presentations, and the survey of the professional development (PD) logs maintained by participants are also summarized in the body of the report. Other findings from the evaluation are in the appendixes, including additional statistical findings, verbatim entries from select participants' PD logs, and scored portfolio presentation rubrics.

Part II of the Final Assessment of AMP! analyzes the relationship between students' test results on the State of Texas Assessments of Academic Readiness (STAAR) and their teachers'

[1] Though AMP! Participants maintained PD logs throughout the academic year, they were not collected for external assessment until the end of the 2015/16 year

participation in AMP!. Scientific methods used for data analysis in Part II are imbedded in that report.

## Methods

Initial observations of absolute changes were followed by statistical analyses to determine whether any statistically significant changes in scores from pre- to post-program or between AMP! and non-AMP! teachers or students were observed. Though some statistically significant results were revealed, it should be noted that because the teacher sample size was so small (N = 75 AMP! teachers, N <75 for non-AMP! teachers, and N<40 for math or science only AMP! teachers), a number of questions had a nominal number of observations in each category; therefore, statistical significance, though found, may not be valid, due to the extremely small number of observations.[2] Student scores on a given test, on the other hand, for STAAR analyses conducted in Part II, are much more robust, given the large numbers of students and teachers (N>200).

Where possible, analysis of changes in scores from pre-program to post-program between the treatment and comparison groups was conducted. For those teacher assessments (or parts) that had categorical questions, it may have been more prudent to observe the treatment vs comparison group at the post-test or the pre vs post within treatment group differences only, based on the statistical test and the number participants in the comparison group.

Some observations where results were not statistically significant are also presented and discussed using directional trends of absolute scores. For student data analyses, Hierarchical Linear Modeling (HLM) and linear regression were used.

## Results of analysis

Both quantitative and qualitative results indicate that the number and types of opportunities provided by AMP! were associated with achievement of some of the project's goals and objectives. More time will be needed to determine whether other goals and objectives will be achieved.

**Goal 1**—Increase mathematics and science content and pedagogical knowledge.

Evidence obtained from assessments and participant interview results, PD log entries, and portfolio presentations point toward the achievement of Goal 1. Qualitative findings show that while mathematics teachers reported a higher level of confidence regarding their content knowledge than did science teachers, science teachers generally felt more confident about developing *and* facilitating inquiry-based lessons following AMP! implementation.

[2] The number of participants will shift on assessments because of missing values for assessment responses. That is, for any question on a given assessment, if a teacher didn't answer the question when frequencies were run, the missing response was not counted.

Quantitative assessments generally support AMP! participants' stated perceptions regarding their competence, with the exception of some pre- to post-test scores on combined science (earth, physical, and life science). The 72 AMP! participants' mean Inquiry scale score was higher on the post-test than on the pre-test, while mean scores on five of the seven scales on the combined science test were statistically significantly lower on the post-test. Likewise, the 35 AMP! science teachers' observed mean scores were also statistically significantly lower on five of the seven scales of the combined science post-test. AMP! mathematics teachers' combined science post-test scores were statistically significantly lower on four of the seven scales and statistically significantly higher and only one of the seven scales—Inquiry.

On the algebra test, the average gain of the comparison group was statistically significantly lower than the average gain of the AMP! group on one subscale—Equations/Inequalities. Within the treatment group, gains in algebra were statistically significantly higher on a majority of topics for both mathematics teachers and science teachers.

**Goal 2**—Improve student engagement and achievement in STEM subjects.

The needs assessment pre-post results showed statistically significantly more AMP! mathematics teachers reported that they give tests and/or quizzes that include constructed-response/open-ended items more often, since experiencing AMP!. Additionally, there was a statistically significant increase in the number of science teachers who said they should have students more often attend presentations by guest speakers focused on science and/or engineering in the workplace. The needs assessment results also showed that statistically significantly more science teachers said that students were asking and answering their own questions. Last, on the needs assessment, statistically significantly more science teachers placed more emphasis on understanding science concepts. Relatedly, also at the level of statistical significance, by the post-assessment the majority of science teachers said that laboratory work was usually done before teaching the concept, allowing for discovery.

There is evidence that there is a significant improvement in the pass and pass advanced rates for the students of the AMP! teachers and the students of non-AMP! teachers for math in 2015/16, on the STAAR. Comparing treatment and comparison group students on the STAAR produced evidence of a significant improvement in the pass rate for the students of the AMP! teachers and the comparison group for math in 2015/16. Generally, there is also evidence of a significant improvement in students' performance on mathematics and/or science STAAR with an AMP! science or mathematics teacher than students without AMP! mathematics or science teachers even when scores of the different demographic subgroups (for example ethnicity, economic status, or receiving special education or gifted/talented services) are observed.

**Goal 3**—Create a supportive and rewarding environment to sustain AMP teachers in high-needs schools.

This goal requires extended observation and evaluation to determine whether AMP! has sustaining environmental impact. Nevertheless, evidence appears to show that AMP! intentionally addressed this goal. Participants self-reported about the program's immediate

environmental impacts. Qualitative evidence shows that inquiry-based lessons, new approaches to content vocabulary development, and the science-mathematics connection that was emphasized throughout the program assisted program participants in achieving rewarding classroom experiences that benefitted both the teachers and the students. AMP! mathematics and science teachers' efficacy—belief in their ability to be effective—improved from pre to post, though not statistically significantly. These findings present some evidence, however, that AMP! teachers' behaviors are trending in the direction that the program administrators desired.

The needs assessment from pre to post showed that statistically significantly more AMP! teachers were quite familiar with the inquiry model and had used it. In addition, needs assessment responses showed that statistically significantly fewer AMP! teachers agreed that at the beginning of instruction on a mathematics/science idea, students should be provided with definitions for new vocabulary that will be used. The science needs assessment further showed that statistically significantly more science teachers believed the appropriate approach to content vocabulary development entailed students exploring the associated phenomena in a hands-on fashion and being given the appropriate words as needed. Statistically significantly more mathematics teachers said that questioning goes on from teacher to student, student to student and student to teacher, and that many of the questions are higher-level questions.

**Goal 4**—Create a community of teachers that can motivate students toward STEM careers.

Interview responses, PD log entries, and portfolios suggest that AMP! participants have begun to motivate students toward careers in STEM, primarily through the mathematics-science connection and the real-world applications of mathematics and science.

As previously stated, there was a statistically significant increase in the number of science teachers who said they should more often have students attend presentations by guest speakers focused on science and/or engineering in the workplace. Moreover, there is generally evidence of a significant improvement in students' performance on mathematics and/or science STAAR with an AMP! science or mathematics teacher than students without AMP! mathematics or science teachers even when scores of the different demographic subgroups are observed. Nevertheless, this goal requires extended observation and evaluation to determine lasting achievement, namely through a longitudinal assessment of AMP! teachers' students' pursuits—for example, the number of STEM courses taken in high school and college, or the percentage of students of AMP! teachers who pursue STEM careers in college vs students of non-AMP! teachers.

**Goal 5**—Inject a new culture of support in the school districts for accomplished science teachers.

As with Goal 3, this goal requires extended observation and evaluation to determine whether AMP! has sustaining cultural impact. Evidence appears to show that AMP! administrators set out to intentionally address this goal by recruiting and ultimately training 75 teachers from 16 public school districts, 2 public charter systems, and 2 private school systems. Through qualitative measures, these 75 AMP! teachers said that they felt more able to connect mathematics and

science, collaborate with their assigned partners as well as with others on their campus, and generally use several strategies to teach students using inquiry methods.

Statistically significantly higher post-test scores were posted for mathematics teachers on the needs assessment in three areas: (1) instruction methods, (4) teacher-directed vs student-centered methods and activities, and (3) inquiry.

Science teachers had statistically significantly higher needs assessment scores on the post administration in four areas: (1) instruction methods, (2) understanding science concepts, (3) inquiry, and (4) STEM emphasis.

In addition, AMP! teachers' post-test scores were generally statistically significantly higher on all three parts of the leadership test, which measured the following items: (Part 1) facilitating presentations and working with others, (Part 2) campus leadership opportunities, and (Part 3) leadership readiness, roles, and perceived administrator views.

To summarize, general observations of data, statistical analyses, and qualitative results tend to support the notion that AMP! provided participants with an experience that has the potential to impact a number of aspects of their abilities as teachers; thus, the program is also potentially achieving its student-focused objectives.

# Introduction

The Applied Math Program (AMP!) is an innovative year-long professional development opportunity for 8th grade science and mathematics teachers, conducted through a partnership between ConocoPhillips and Rice University Office of STEM Engagement (R-STEM). AMP! was designed for pairs of mathematics and science teachers (each pair from the same campus) to learn and work together to improve student engagement and achievement by making connections between applied mathematics and inquiry science. The course was designed to (1) increase the content knowledge of participating educators, (2) empower them in implementing rigorous, inquiry-based, student-centered, integrated science and mathematics and (3) provide participants with training toward mastery of mathematics and science content. The year-long course began with a summer institute, designed to engage teachers with content experts who provided an experience that focused on the correlation between grade level mathematics and science content along with pedagogy and leadership.

Teachers applied for and were accepted to AMP! during the 2015/16 school year. Seventy-eight teachers were originally recruited to participate in the 2015 summer AMP! course. Ultimately, however, due to attrition, there were 75 program participants. Following the summer AMP! professional development (PD) session, some teachers returned to their campuses in late summer/early fall and learned that they were reassigned to different grade levels or positions for the 2015/16 school year. Thus, some of those teachers concluded that AMP! was no longer appropriate or applicable. As a result, the program organizers began recruitment efforts again in an attempt to fill the available slots. In the end, 13 teachers chose to leave the program—11 immediately after the summer session and 2 during the school year because of their perception that the program demands were too strenuous. Ten teachers were recruited to start the program after the summer PD session. Program administrators reported that all 10 of them officially began the program in September 2015; thus, AMP! had 75 teachers who participated in the remaining 2015/16 AMP! activities. At least one teacher did not have an assigned partner from her campus with whom to work throughout the year; a few who were reassigned to new campus duties, nevertheless, chose to remain in the program. See Table 1.

**Table 1. 2015/16 participant and comparison numbers**

| | Total Teachers | Total Students |
|---|---|---|
| **Total AMP! teachers** | **75** | **334** |
| Math | 38 | 49 |
| Science | 37 | 285 |
| **Total comparison teachers** | **15** | **628** |
| Math | 7 | 190 |
| Science | 8 | 438 |

AMP! 2015/16 had five goals and five objectives. The goals focused on how students would benefit from teachers' participation in the program. The objectives highlighted how program facilitators planned to achieve the student-focused results in their classrooms, by helping teachers improve their instruction. The 2015/16 program goals and objectives were:

### Program goals

1. Increase mathematics and science content and pedagogical knowledge of 8th grade middle school teachers.
2. Improve student engagement and achievement in STEM subjects.
3. Create a supportive and rewarding environment to sustain AMP! teachers in high-needs schools.
4. Create a community of teachers that can motivate students toward careers in STEM fields.
5. Inject a new culture of support in the school districts for accomplished science teachers.

### Program objectives

1. To think reflectively and critically about current teacher practice.
2. To improve middle school teachers' understanding of mathematics and science content and state standards.
3. To facilitate the transformation of teacher practice through the exploration of best practices in educational pedagogy.
4. To improve mathematics and science education on each campus through the development of teacher leaders.
5. To support AMP! participants in the application of improved mathematics and science instruction.

The assessment plan and final evaluation findings for AMP! are presented in the next section.

## Assessment plan

Multiple assessments, consisting of quantitative and qualitative approaches, were integral components of the evaluation of AMP!. Pre-program assessments consisted of, content tests, and teacher surveys regarding pedagogy, efficacy, and leadership, and student perception surveys. The post-program assessments entailed administration of the content tests, pedagogy, efficacy and leadership surveys, teacher interviews, survey of participants' professional development (PD) logs, observation of participants' end-of year portfolio presentations, and administration of student perception surveys.

**Table 2. How program objectives relate to assessments**

| Goals/objectives | Pre-assessment (teacher surveys and teacher content tests) | Mid-program assessment (teacher and student surveys) | Late-program assessment (portfolio presentations and professional development logs) | Post-assessment (teacher and student surveys, post-teaching interviews, teacher content tests, and student scores) |
|---|---|---|---|---|
| 1. Increase teacher content knowledge | Direct/indirect | Indirect | Direct/indirect | Direct/indirect |
| 2. Improve student engagement and achievement in STEM subjects | Indirect | Indirect | Direct/indirect | Direct/indirect |
| 3. Support and sustain teacher teams | Indirect | Indirect | Indirect | Indirect |
| 4. Create teacher teams that motivate STEM careers | Indirect | Indirect | Indirect | Indirect |
| 5. Inject a new culture of teacher support in school districts | Indirect | Indirect | Indirect | Indirect |

This report focuses on programmatic impact from the inception of treatment (that is, initial professional development provided during the summer), during treatment (that is, program support throughout the academic year), and to the end of implementation.

Assessments throughout the year were both direct (for example, content tests) and indirect, in which participants self-assessed and self-reported the program impact. In Table 2, the program objectives are linked to the assessments used.

Several assessments were conducted pre- and post-program to determine whether changes occurred and, when possible, the level of statistical significance of those reported changes. Participants were asked about their perceptions regarding efficacy in their content areas, their perceived professional leadership abilities, perceived abilities to plan and implement inquiry-based lessons, and needs with regard to teaching. The following assessments and surveys were used:

- Leadership test—pre-and post-program (paired t-test, ANOVA, Chi-square)
- STEBI-A (Science Teaching Efficacy Belief Instrument)—pre- and post-program (paired t-test, ANOVA)
- MTEBI (Mathematics Teaching Efficacy Belief Instrument )—pre-and post-program (paired t-test, ANOVA)

- Needs assessments—pre-and post-program (paired t-test, Chi-square)
- Diagnostic Teacher Assessments in Mathematics and Science (DTAMS)—pre-and post-program (paired t-test, ANOVA, Chi-square)
- Teacher interviews—post-program (by telephone)
- Professional Development (PD) Logs[3]—maintained by AMP! participants (from summer PD through implementation)
- Attitudes Toward Mathematics Inventory (ATMI)—pre- and post-student survey (linear regression)
- Attitudes Toward Science Inventory (ATSI)—Pre- and post-student survey (paired t-test, ANOVA, HLM)
- Observations of portfolio presentations (maintained by AMP! participants)—post-program evaluation

Some statistically significant findings for each test discussed in Part I are presented in the body of the report. Results from participant interviews, portfolio presentations, and the survey of the professional development (PD) logs maintained by participants are summarized at the end of the body of the report. Other findings (both statistically significant and not) that support the evaluation are in the appendixes. Verbatim entries from select participants' PD logs and scored portfolio presentation rubrics for all participants are presented in the appendixes.

A comparison group was not recruited for the 2015/16 program year. Instead, the performance of those selected for the comparison group in 2014/15, was used for comparison, when possible. To obtain the comparison group in 2014/15, teachers who applied for participation in AMP! but did not have the requisite pairing (that is, science-mathematics) on their campuses served as the basis for comparison group selection. From those teachers, program administrators recruited participants for the comparison group, and that recruitment yielded 25 teachers. Due to attrition, 15 teachers remained in the comparison group.

Parts 1 and 3 of the leadership test and all parts of the needs assessment for mathematics and science contain questions that are categorical and, therefore, difficult to summarize in a way that is meaningful or useful.[4] The nature of categorical questions on some assessments administered is further compounded by different numbers of teachers in the treatment and comparison groups. So, it was either more prudent to observe the treatments vs comparisons on the post-test or present pre-test vs post-test differences for the treatment group only. Change score analyses for those categorical question types were not conducted. Instead, t-tests were used on the post-survey to test for differences between pre vs post within treatment changes or between the

[3] Though AMP! Participants maintained PD logs throughout the academic year, they were not collected for external assessment until the end of the 2015/16 year.

[4] An example of how a categorical question would not yield useful information can be illustrated by a question on the leadership assessment, which asks about the number of presentations. An observation of a response with the number "2" could mean that two teachers on a campus stated that they have presented nationally and could also mean that one teacher presented twice.

treatment and comparison groups when possible. To test for statistical significance for all assessments, the alpha was set at 0.05, the acceptable significance level for social sciences.

Initial observations of absolute changes were followed by statistical analyses[5] to determine if there were any observed statistically significant changes in scores from pre to post for program teachers, between AMP! (treatment) and non-AMP! (comparison) teachers, or students on pre- and post-tests. The analysis of change score differences provides the most rigorous comparative assessment between treatment and comparison groups, and allows us to make claims that suggest the impact of treatment.

Though some statistically significant results were revealed, it should be noted that because the teacher sample size was so small (N = 75 for AMP! teachers, N <75 for non-AMP! teachers, and N<40 for math or science only AMP! teachers) a number of questions had nominal observations in each category; therefore, statistical significance, though found, may not be valid due to the extremely small number of observations.[6] Student scores regarding their attitudes toward science and mathematics, as well as STAAR test results, on the other hand, are deemed valid, with student counts exceeding 200 for any given assessment. For student data analyses, Hierarchical Linear Modeling (HLM) and linear regression were used.

Findings regarding each assessment presented will include those that are statistically significant. Some observations where results were not statistically significant are also presented and discussed using directional trends of absolute scores. Themes and summary statements of PD logs, culminating presentations, and interview findings are presented last.

Part II of the Final Assessment of AMP! (which follows Part I) offers an analysis of student state assessment results. Part II presents an examination of the relationship between student test results on the State of Texas Assessments of Academic Readiness (STAAR) and their teacher's participation in AMP!.

## Leadership test

The leadership test is divided into three parts, which focus on different aspects of leadership—facilitating presentations and working with others, campus leadership opportunities, and leadership readiness/roles/perceived administrator views.

General findings from the three parts of the test are presented first. Next, statistical test results for Parts 1–3 are presented. More detailed presentations of absolute scores and effect size scores can be viewed in tables in Appendixes A1–A6.

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[5] Statistical test(s) used for each assessment: (1) DTMAS: paired t-test, ANOVA, Chi-square; (2) ATSI: paired t-test, ANOVA, HLM; (3) ATMI: Linear regression; (4) STEBI/MTEBI: paired t-test, ANOVA; (5) Leadership: paired t-test, ANOVA, Chi-square; (6) Needs Assessments: paired t-test, Chi-square.

[6] The number of participants will shift on assessments because of missing values for assessment responses. That is, for any question on a given assessment, if a teacher didn't answer the question when frequencies were run, the missing response was not counted.

## Leadership test part 1

Given the small number of comparison group teachers (n≤15), pre- to post-test comparisons were made only for those receiving treatment. The first five questions of Part 1 of the Leadership Test ask about formal presentations made over the past year. Initial observations reveal that the number of teachers who presented at the campus, district, local, state, or national/international level, generally increased from pre- to post-test.

All mathematics and science teacher total scores on each "presentation" question in Part 1 for AMP! participants are displayed in Appendix A1.

The final section of Part 1 consisted of two questions that asked about the number of hours that respondents had worked closely with one teacher or a group of teachers. On the post-test the majority of treatment teachers from both mathematics and science reportedly worked closely with another teacher or group of teachers for more than 20 hours over the past year. All absolute pre-post scores are shown in Appendix A2.

## Leadership test part 2

Leadership Part 2 has 30 questions regarding mathematics/science leadership activities, for which observations of change scores were made. Change was observed by item from pre to post, for AMP! participants in mathematics and science. Appendix A3 displays those change scores along with change in "YES" percentage for mathematics and science. Interpretations of the changes are also provided. With some exceptions, the changes observed from pre- to post-test were in the direction that reflects AMP! goals and objectives. For example, more became campus mathematics and science leads; more science and mathematics teachers became coaches on their campus; more mathematics and science teachers developed intervention plans; and more were awarded grants in mathematics and science.

## Leadership part 3

Part 3 of the Leadership test consists of three categorical questions. Treatment group pre-post sums were computed on all items and are displayed in Appendix A4. Overall, post-test scores showed more teachers indicating they had more leadership roles and skills at the post-test. They were also slightly more likely to be perceived more as leaders by their administration than at the pre-test. Specifically, scores on the items measuring the aspects of general leadership skills and readiness, leadership roles attained, and administration perceptions were higher on the post-test than on the pre-test for both mathematics and science teachers. Most AMP! mathematics and science teachers demonstrated the greatest growth from pre to post regarding (1) the belief that they feel ready for leadership and have well developed skills for being a mathematics or science leader, and (2) having an official campus leadership role (for example department chair, team leader, etc.). More mathematics and more science teachers believed that their administrators only require them to be responsible for their own mathematics/science classroom.

As previously stated, the three parts of the assessment focus on different aspects of leadership:

- Part 1—Facilitating presentations and working with others
- Part 2—Campus leadership opportunities
- Part 3—Leadership readiness, roles, and perceived administrator views

AMP! teachers' post-test scores were higher on all three parts of the Leadership Test, as shown in Figures 1–3.

**Figure 1. Parts 1–3, Differences between pre- and post-scores for all treatment teachers**

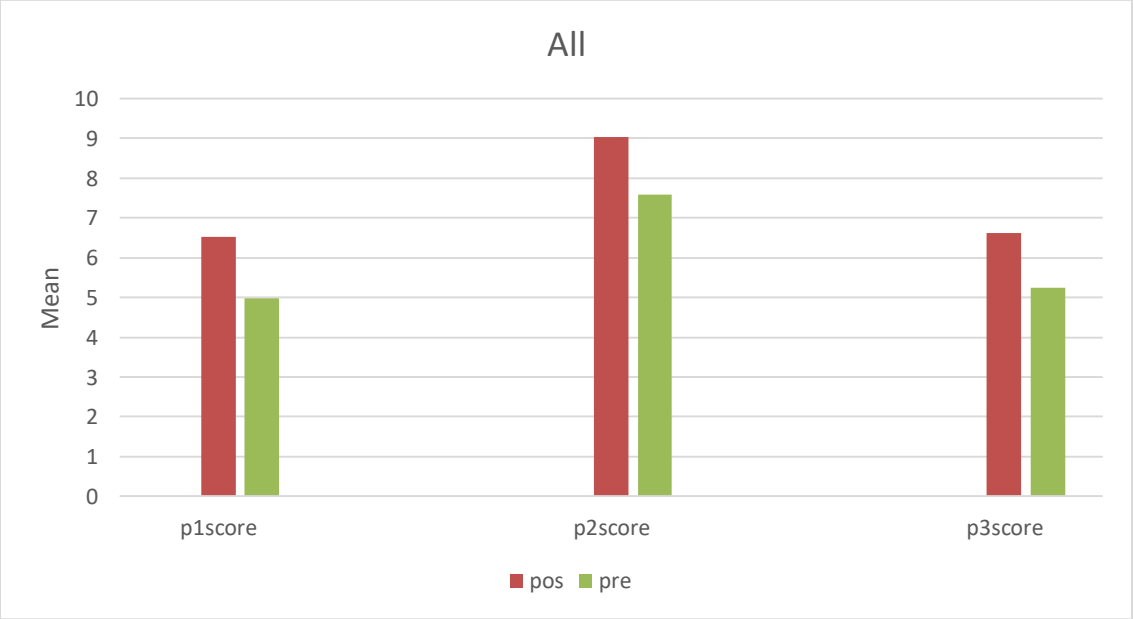



**Figure 2. Parts 1–3, Differences between pre- and post-scores for math treatment teachers**

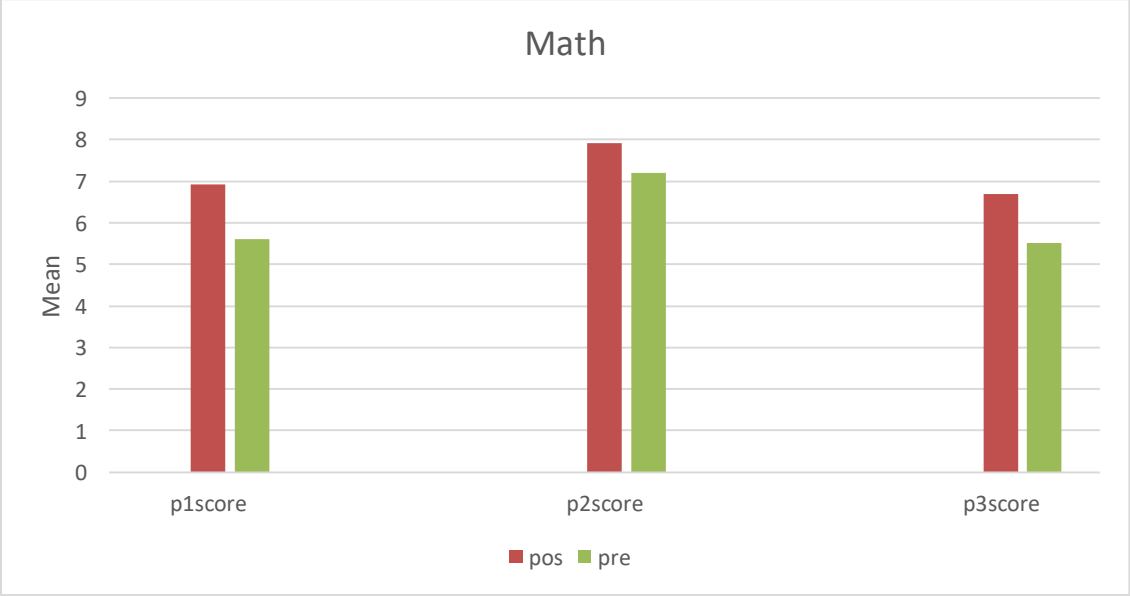
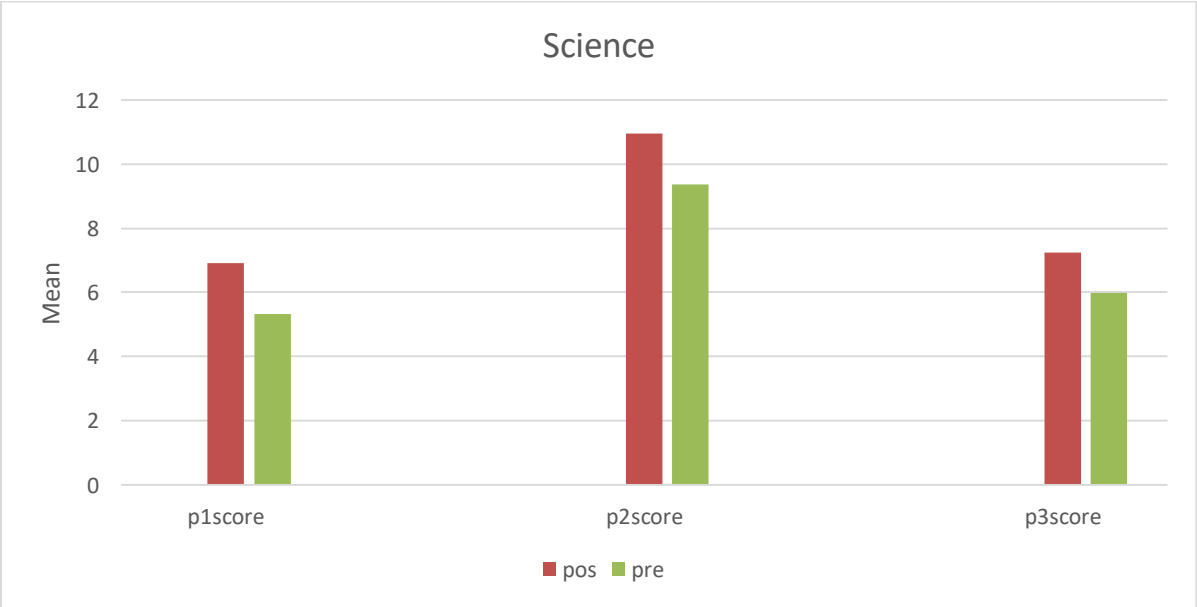


**Figure 3. Parts 1–3, Differences between pre- and post-treatment scores for science treatment teachers**




## Statistical differences

Three tests to determine statistically significant differences were conducted: (1) Test whether significant difference exists between pre and post for treatment teachers (under three conditions: using data of all AMP! teachers, using data of math teachers only, and using data of science teachers only); (2) Test whether significant difference exists in mean scores for Parts 1–3, and (3) Test whether significant difference exists in gain scores (post-pre) between comparison and treatment groups for Part 1, 2 or 3. Findings of these tests are presented next.

As shown in Table 3, six statistically significant differences were observed on questions from all three parts of the leadership test using—(1) all AMP! data, (2) math-only data, and (3) science-only data. Analyses that used all pre vs post data from AMP! teachers were statistically significantly different on all but one item (p1q3—Over the past year, I have made a formal mathematics/science presentation at the district level). Science-only data indicated that significantly more science teachers made a formal presentation at the district level.

**Table 3. Statistically significant differences between pre and post administrations of leadership test for AMP! participants**

| Questions | All data—p value | Math—p value | Science—p value |
|---|---|---|---|
| **p1q2** | 0.02376 | 0.26438 | 0.06038 |
| **p1q3** | 0.06954 | 0.88057 | 0.04665 |
| **p1q7** | 0.00895 | 0.08309 | 0.12741 |
| **p2q13** | 0.00012 | 0.01626 | 0.00283 |
| **p2q14** | 0.00122 | 0.01891 | 0.01288 |
| **p3q1** | 0.00071 | 0.01488 | 0.02860 |

Notes:

**p1q2:** Over the past year, I have made a formal mathematics/science presentation to a campus.

**p1q3:** Over the past year, I have made a formal mathematics/science presentation at the district level.

**P1q7:** Over the past year, I have worked closely with one other teacher in mathematics/science.

**p2q13:** I observed a mathematics / science lesson being taught by another teacher.

**p2q14:** I modeled a mathematics / science lesson for another teacher.

**p3q1:** I possess the skills needed to be science/mathematics leader.

*****Highlighted cells = p-values ≤ .05.

## Observed gains

Treatment vs comparison (pre-post) gain scores were also analyzed for Parts 1–3. For the most part, the treatment group had higher gains than the comparison group. In fact when using all data, the treatment group made greater gains on all three parts of the leadership test. Mathematics AMP! teachers outperformed non-AMP! mathematics teachers on Parts 2 and 3. Treatment group science teachers posted greater gains than the comparison group on all three parts of the test. However, not all total gain score differences were statistically significant. The results of tests for statistical significance are shown in Appendix A5.

Effect sizes were calculated for treatment vs comparison gain scores as well. The effect sizes ranged from small (0.2–0.4) to large (0.8–1.0). Large effects (0.9) were observed for Parts 1 and 3 treatment vs comparison science teachers' gain scores. The largest gain score effects (1.0) were observed on Part 3, between treatments and comparisons, using data for all teacher, and science data only for Part 3. Gain score effects are displayed in Appendix A7. For a visual representation of gain score differences, see figures 4–6.

**Figure 4. Parts 1–3 gain score differences between treatment and comparison groups, using all AMP! scores**

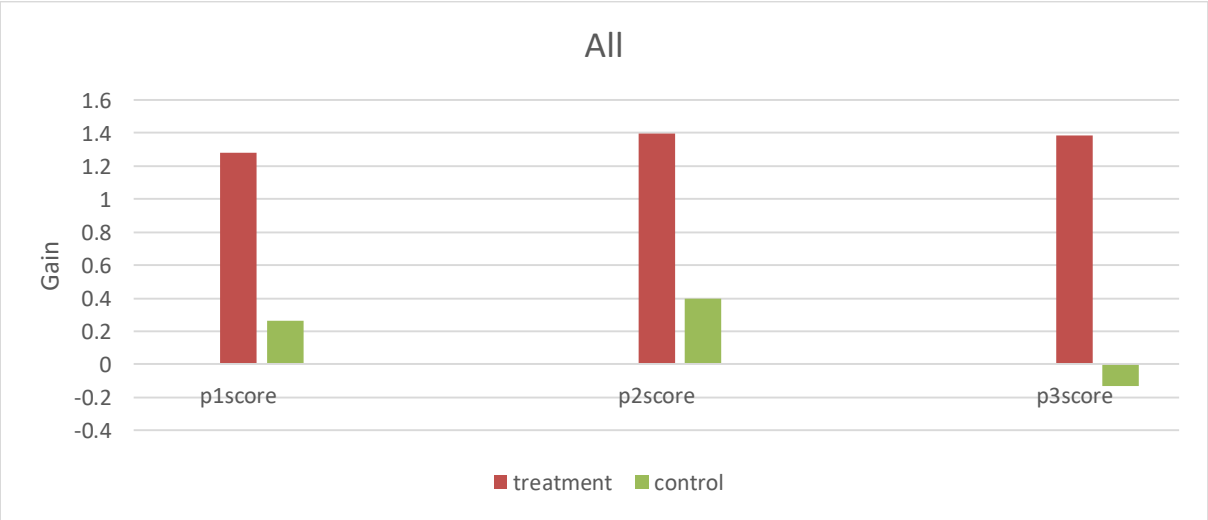



**Figure 5. Math only gain score differences between treatment and comparison groups**

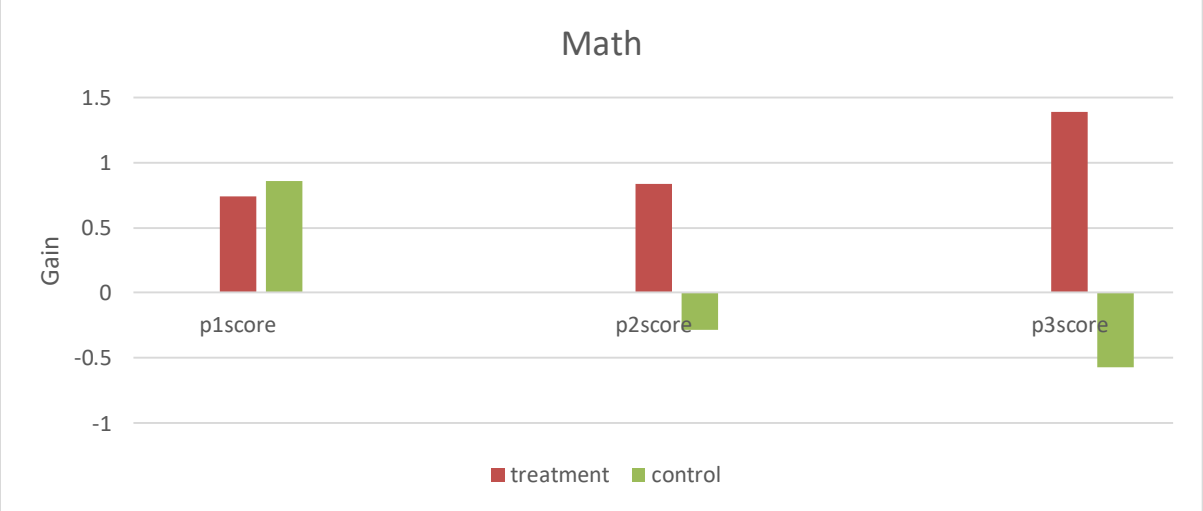
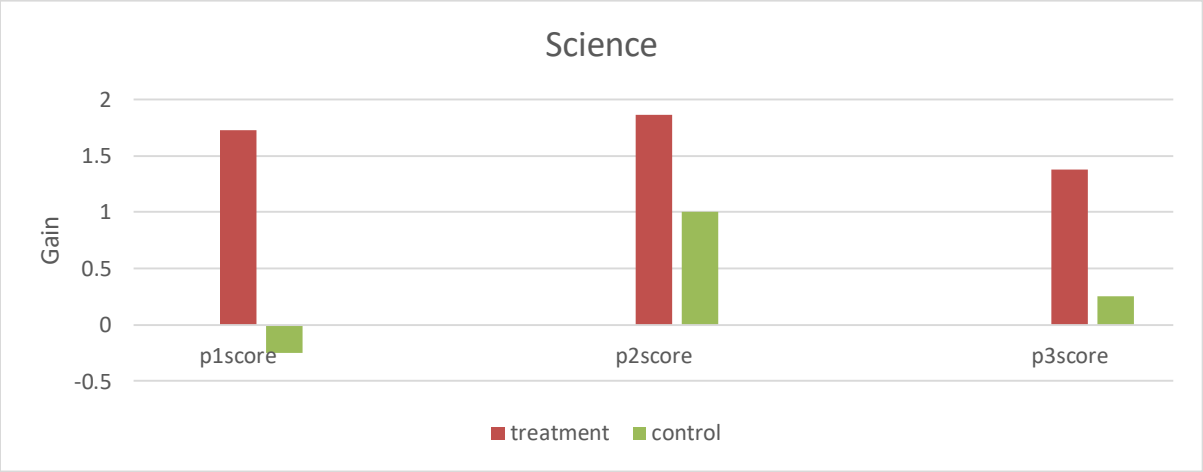


**Figure 6. Science only gain score differences between treatment and comparison groups**




# STEBI and MTEBI

The Science Teaching Efficacy Belief Instrument (STEBI) and the Mathematics Teaching Efficacy Belief Instrument (MTEBI) were administered to examine participants' science or mathematics teacher efficacy. The tests were conducted to find any differences that might exist between the treatment and comparison groups of science or mathematics teachers. Each instrument contains two subscales that are representative of the respective content area: the Personal Science/Mathematics Teaching Efficacy Belief Scale (PSTE/PMTE) and the Science/Mathematics Teaching Outcome Expectancy Scale (STOE/MTOE). For statistical analyses, the data sets included only those teachers who took both the pre- and post-test. The t-test was used to test the differences between the comparison group and treatment group post-surveys and paired t-test was used to test the statistical significance in gain scores between treatment and comparison. No statistically significant differences were found for STEBI or MTEBI scores. The STEBI and The MTEBI are discussed separately in the two subsections that follow.[7]

## STEBI

The Science Teaching Efficacy Belief Instrument (STEBI) contains 25 questions with the options strongly agree, agree, uncertain, disagree, and strongly agree to examine science teachers' self-efficacy. The questions include 12 negatively-written questions. Five points were assigned to positively worded items with the response of Strongly Agree and the other items were reversed. The assessment contains two subscales: the Personal Science Teaching Efficacy

[7] For the STEBI and MTEBI treatment and comparison groups' mean score comparisons there are no *p* values for the comparison group because a statistical pre vs post analysis was conducted for the AMP! (treatment) teachers only, but not for the comparison teachers.

Belief Scale (PSTE) and the Science Teaching Outcome Expectancy Scale (STOE). The STOE subscale has a possible range between 10 and 50 points. The PSTE subscale has a possible range from 13 to 65 points.[8]

Thirty-six AMP! participants completed both the pre- and post-survey. Ten comparison group participants completed the pre-survey and eight completed the post survey.

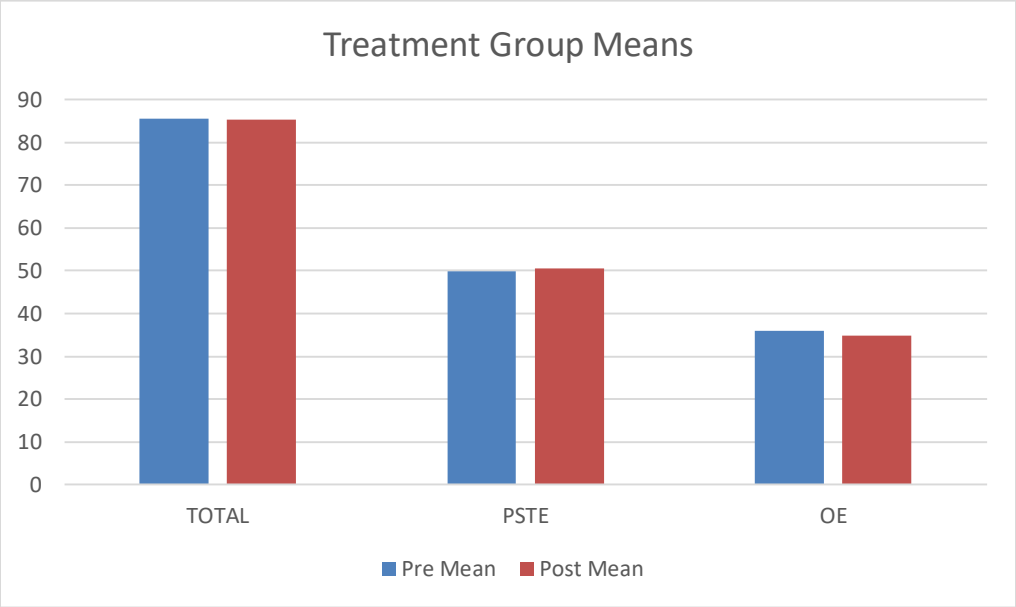
In the pre to post results, shown in Table 4, participants' overall scores decreased on two scales (Total and STOE). The average total pre-test score was 85.58 and the average post-test score was 84.72, for a difference of –0.79. The average STOE pre-test score was 35.80 and the average post-test score was 34.83 representing a difference of –0.97. On the PSTE subscale (belief in one's ability to be an effective science teacher), program participants demonstrated a slight gain (0.67) from pre to post administrations. There were no statistically significant differences found within treatment group scores from pre to post-test. Figure 7 displays a graphic representation of AMP! participants' pre to post performance.

**Table 4. STEBI mean score comparisons between treatment and comparison**

| STEBI mean scores treatment and control | | | | | | |
|---|---|---|---|---|---|---|
| **Treatment** | | | | | | |
| | **Pre (N = 36)** | | | **Post (N = 36)** | | |
| | **Mean** | **Std dev** | | **Mean** | **Std dev** | **P value** |
| **Total** | 85.58 | 6.72 | **Total** | 85.25 | 7.28 | 0.7657 |
| **PSTE** | 49.75 | 3.60 | **PSTE** | 50.42 | 4.51 | 0.3461 |
| **STOE** | 35.80 | 4.65 | **STOE** | 34.83 | 4.17 | 0.2016 |
| **Comparison** | | | | | | |
| | **Pre (N = 10)** | | | **Post (N = 8)** | | |
| | **Mean** | **Std dev** | | **Mean** | **Std dev** | |
| **Total** | 80.80 | 11.00 | **Total** | 88.13 | 7.66 | |
| **PSTE** | 46.00 | 8.46 | **PSTE** | 52.00 | 5.07 | |
| **STOE** | 34.80 | 3.36 | **STOE** | 36.13 | 3.22 | |

[8] Enochs, L.G. and Riggs, I.M. (1990). Further development of an elementary science inquiry teaching efficacy belief instrument: A preservice elementary scale, School Science and Mathematics, 90, 695–706.

**Figure 7. Treatment STEBI mean score changes from pre-test to post-test**

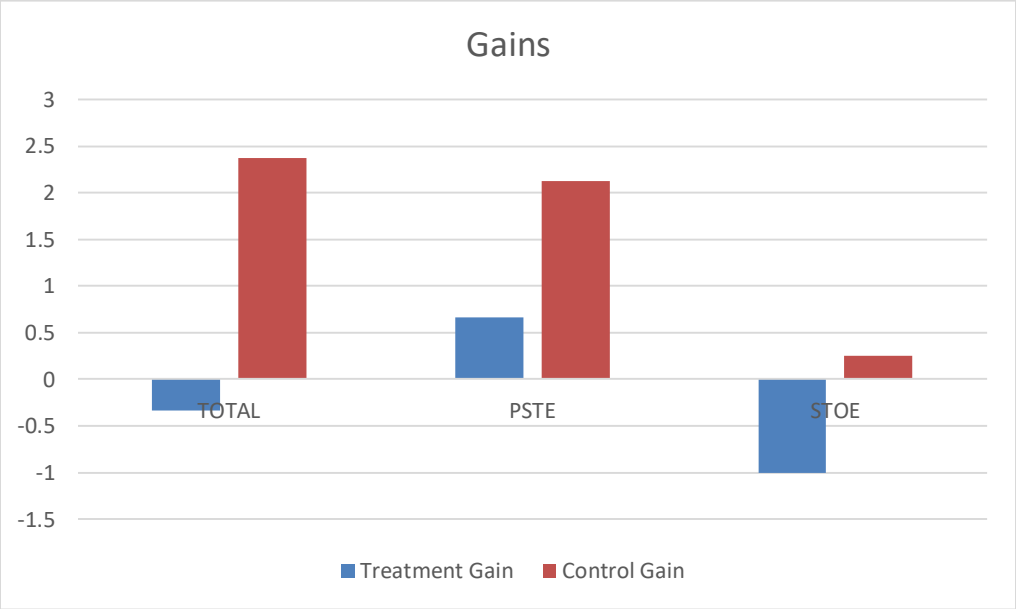



Differences between the treatment and comparison groups were nominal. A paired t-test of significance of average gain scores, shown in Table 5, revealed that the comparison group had greater gains than the treatment group on all three subscales (that is, Total, PSTE and STOE scores), though not statistically significant. The treatment group made negative gains in two areas—total and STOE, while all comparison group gains were positive. Specifically, the average gain for the treatment group is negative (–0.33, *sd* = 6.66), and the average gain for comparison group is 2.38 (*sd* = 6.97). The average PSTE gain for treatment group is 0.67 (*sd* = 6.66), and the contol group's average gain is 2.13 (*sd* = 4.73). The average STOE post-survey gain score for treatment group is negative –1.00 (*sd* = 4.61), and the average gain for comparison group is 0.25 (*sd* = 3.53). There is no significant difference between gain scores for the two groups on any scale of the STEBI. Because the differences in gains between the treatment and comparison groups are not statistically significant no claim regarding impact of program strategies on science teachers' efficacy can be made with confidence. Figure 8 is a graphical representation of the gains made by the treatment and comparison groups on the STEBI.

**Table 5. STEBI mean gains between treatment and comparison**

| STEBI mean value of gains | | | |
|---|---|---|---|
| **Category** | **Treatment (N = 36)** | **Comparison (N = 8)** | **P value** |
| **Total** | –0.33 | 2.38 | 0.3078 |
| **PSTE** | 0.67 | 2.13 | 0.3900 |
| **STOE** | –1.00 | 0.25 | 0.4800 |

**Figure 8. STEBI treatment vs comparison gains**




## MTEBI

The Mathematics Teaching Efficacy Belief Instrument (MTEBI) contains 25 questions with options Strongly Agree, Agree, Uncertain, Disagree, and Strongly Agree to examine mathematics teacher's self-efficacy. The questions include 12 negatively-written questions. Five points were assigned to positively worded items with the response of Strongly Agree and the other items were reversed. The assessment contains two subscales: the Personal Mathematics Teaching Efficacy Belief Scale (PMTE—measuring the belief in one's ability to be an effective mathematics teacher) and the Mathematics Teaching Outcome Expectancy (MTOE—measuring the belief that effective teaching of mathematics can bring about student learning) Scale. The MTOE scale has a possible range from 8 to 40 points. The PMTE subscale has a possible range from 13 to 65 points.[9]

Thirty-three AMP! participants completed the pre-and post-surveys. Seven comparison group participants completed both administrations.

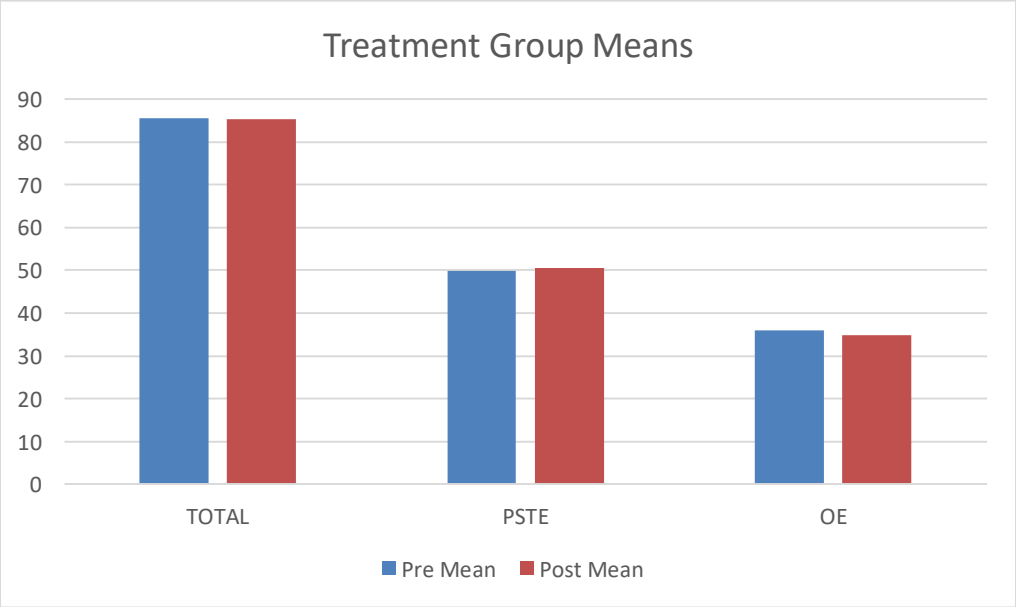
As shown in Table 6, no statistically significant findings from the MTEBI results were observed. Though not significant, nominal within-group participant gains were made from pre to post on all three scales. Nearing the level of statistical significance the total pretest scores from pre to post ($p$=0.0515) were 74.79 ($sd$ = 6.43) and 76.79 ($sd$ = 6.17). The average PTME participant pretest score was 47.30 ($sd$ = 4.40), and the post-test scores on average were slightly higher (M = 48.79 and $sd$ = 4.14). The average MTOE pretest score was 27.42 ($sd$ = 3.01), and the post-test score was 27.89 ($sd$ = 2.89). Figure 9 displays the treatment pre and post means in a bar graph.

[9] Enochs, L. G., Smith. P. L., & Huinker. D. (2000). Establishing factorial validity of the mathematics teaching efficacy beliefs instrument. School Science and Mathematics, 100, 194–203.

**Table 6. Pre- and post-test MTEBI scores**

| MTEBI mean scores treatment and control | | | | | | |
|---|---|---|---|---|---|---|
| **Treatment** | | | | | | |
| | **Pre (N = 33)** | | | **Post (N = 33)** | | **P value** |
| | **Mean** | **Std dev** | | **Mean** | **Std dev** | |
| **Total** | 74.58 | 6.06 | **Total** | 76.78 | 6.30 | 0.0515 |
| **PMTE** | 47.16 | 4.18 | **PMTE** | 48.89 | 4.11 | 0.0560 |
| **MTOE** | 27.42 | 3.01 | **MTOE** | 27.89 | 2.89 | 0.2455 |
| **Comparison** | | | | | | |
| | **Pre (N = 7)** | | | **Post (N = 7)** | | |
| | **Mean** | **Std dev** | | **Mean** | **Std dev** | |
| **Total** | 76.71 | 2.56 | **Total** | 77.43 | 2.37 | |
| **PMTE** | 49.43 | 2.37 | **PMTE** | 49.43 | 3.64 | |
| **MTOE** | 27.29 | 1.60 | **MTOE** | 28.00 | 3.11 | |

**Figure 9. Treatment mean MTEBI score changes from pre-test to post-test**



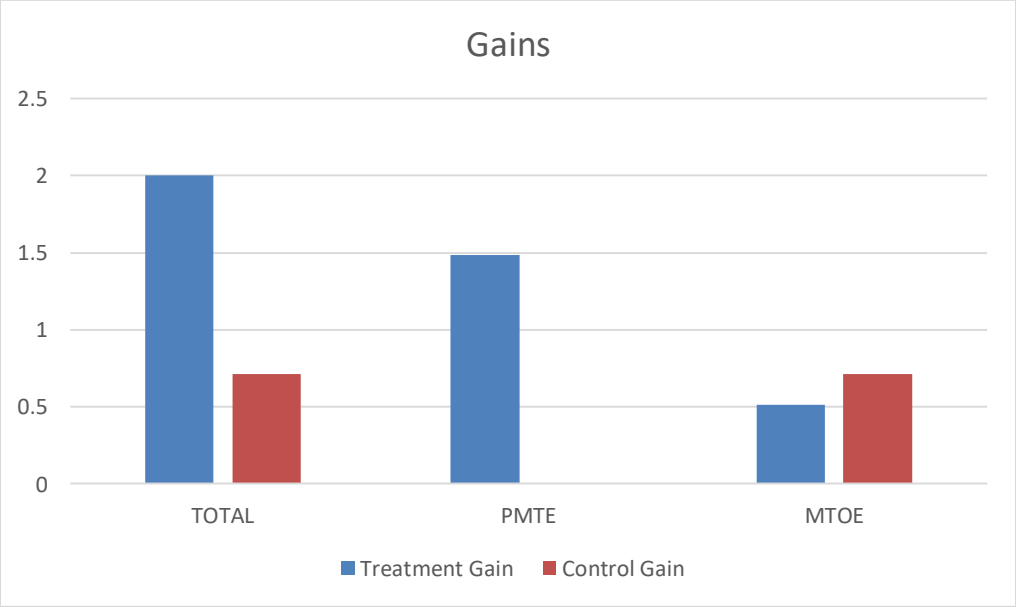

Gain score analysis revealed no statistically significant findings. The average treatment gain score was lower than that of the comparisons on only the MTOE subscale (math teaching outcome expectancy). Gains greater than one point were posted by the treatment group on the Total and PMTE scales. However, because the differences in gains between the treatment and comparison groups are not statistically significant no claim regarding impact of program strategies on mathematics teachers' efficacy can be made with confidence (See Table 7). Figure

10 presents a visual representation of the differences in gain scores between the treatment and comparison groups.

**Table 7. MTEBI mean gains between treatment and comparison**

| MTEBI mean value of gains | | | |
|---|---|---|---|
| **Category** | **Treatment (N = 33)** | **Comparison (N = 7)** | **P value** |
| **Total** | 2.00 | 0.71 | 0.5608 |
| **PMTE** | 1.48 | 0.00 | 0.3857 |
| **MTOE** | 0.52 | 0.71 | 0.8599 |

**Figure 10. MTEBI treatment vs comparison gains**




## Content tests: algebra and combined science

Using the Science and Math DTAMS (Diagnostic Teacher Assessments in Mathematics and Science), AMP! and comparison group teachers were asked to demonstrate scientific and mathematical knowledge. Specifically, both groups were asked to demonstrate four primary types of knowledge and content knowledge divided into subcategories.[10, 11]

[10] These are the kinds of knowledge that the teachers were asked to demonstrate: Declarative_Knowledge (DEC): This is knowledge of definitions and facts. It includes memorized statements of concepts, rules, and laws. 2. Scientific Inquiry and Procedures (INQ): This is knowledge of scientific procedures and approaches. 3. Schematic Knowledge (SCH): Schematic knowledge represents a deep understanding of science concepts, laws, theories, principles, and rules. 4. Pedagogical Content Knowledge (PED): This knowledge represents strategic knowledge for science teaching—the when, where, and how of it. 5. Science, Technology, and Society Knowledge (STS): STS

Program administrators selected questions from three content area tests—earth science, physical science, and life science to create one science test. Analyses were conducted on each of the sciences, and the "combined" area test. Because the comparison group did not complete the 2015/16 "combined" science exam, analyses of change from pre to post performance in science were conducted for AMP! participants only. Since the algebra test did not change from 2014/15 to 2015/16, it was possible to look at treatment and comparison group performance (pre to post) on the algebra exam. For each assessment from pre to post, a different version was administered.[12]

Statistical analyses of change scores between the treatment and comparison group yielded some statistically significant results, as did analyses of the treatment group's change score from pre to post. Analyses for algebra are presented first, and combined science change scores are presented last.

Results from analyses of individual earth, physical, and life science performance are presented in the appendixes, along with tables that display effect scores for each of the content exams. These findings can be viewed in Appendixes B1–B4.

## Algebra

Table 8 shows that the average gain of the comparison group was statistically significantly lower than the average gain of the treatment group on one subscale—equations/inequalities. On all other scales, the comparison group's average gain was slightly lower than the average gain of the treatment group, though not statistically significantly lower.

addresses the interactions of science with technology and human society. STS knowledge is represented in situations where human needs are a primary purpose for the application of science.

[11] Content subcategories are (1) atmo/hydrosphere, (2) lithosphere, and (3) solar system. Two total scores are reported: Total1 for knowledge type scores and Total2 for content subcategory scores.

[12] Algebra pre-test: version 3.3; algebra post-test: version 5.3; earth science pre-test: version 3.2; earth science post-test: version 5.2; physical science pre-test: version 3.2; physical science post-test: version 5.2; life science pre-test: version 3.2; life science post-test: version 5.2.

**Table 8. Algebra mean pre- to post-test gains between treatment and comparison teachers**

| Algebra mean value of gains | | | | |
|---|---|---|---|---|
| | **Category** | **Treatment (N = 74)** | **Comparison (N = 15)** | **P value** |
| Knowledge type | **DEC** | 0.95 | 0.80 | 0.7637 |
| | **INQ** | 0.66 | –0.60 | 0.0680 |
| | **SCH** | 0.76 | 0.40 | 0.5711 |
| | **PED** | 0.16 | –0.47 | 0.1523 |
| | **TOTAL1** | 2.53 | 0.13 | 0.1290 |
| Subcategory | **Patt./Func. Rel./Form.** | 1.46 | –0.13 | 0.1338 |
| | **Express./ Polynom.** | –0.07 | 0.53 | 0.2371 |
| | **Eqns/ Inequal.** | 1.14 | –0.27 | **0.0296** |
| | **TOTAL2** | 2.53 | 0.13 | 0.1290 |

***Bold** highlight = p-value < .05.

Table 9 shows that AMP! mathematics teachers performed better on the algebra post-test than they did on the pre-test. In fact, their average post-test score was statistically significantly higher in six of nine areas. AMP! science teachers also performed statistically significantly higher on the algebra post-test on six scales (see Table 10). A closer look at the algebra scores for AMP! mathematics and science teachers also shows that mathematics teachers had higher average pre-test and post-test scores than their science counterparts on all scales.

**Table 9. Algebra mean pre- to post-test change for math treatment teachers**

| Pre to post change on algebra AMP! math (N = 30) | | | | | | |
|---|---|---|---|---|---|---|
| | **Category** | **Pre mean** | **Std dev** | **Post mean** | **Std dev** | **P value** |
| **Knowledge type** | **DEC** | 7.51 | 2.01 | 8.00 | 1.63 | **0.0452** |
| | **INQ** | 6.62 | 2.03 | 7.24 | 1.89 | **0.0199** |
| | **SCH** | 7.11 | 2.25 | 7.59 | 2.50 | 0.2738 |
| | **PED** | 3.81 | 1.78 | 4.05 | 1.72 | 0.3680 |
| | **TOTAL1** | 25.05 | 7.20 | 26.90 | 6.13 | **0.0242** |
| **Subcategory** | **Patt./Func. Rel./Form.** | 11.73 | 3.88 | 12.97 | 3.28 | **0.0164** |
| | **Express./ Polynom.** | 5.62 | 1.82 | 5.27 | 1.41 | 0.2089 |
| | **Eqns/Inequal.** | 7.70 | 2.41 | 8.65 | 3.00 | **0.0370** |
| | **TOTAL2** | 25.05 | 7.20 | 26.89 | 6.12 | **0.0242** |

***Bold** highlight = p-values ≤ .05.

**Table 10. Algebra mean pre- to post-test change for science treatment teachers**

| Pre to post change on algebra AMP! math (N = 30) | | | | | | |
|---|---|---|---|---|---|---|
| | **Category** | **Pre mean** | **Std dev** | **Post mean** | **Std dev** | **P value** |
| **Knowledge type** | **DEC** | 3.81 | 1.71 | 5.22 | 2.19 | **<.0001** |
| | **INQ** | 4.24 | 1.91 | 4.95 | 2.87 | 0.0836 |
| | **SCH** | 3.24 | 1.67 | 4.27 | 2.12 | **0.0014** |
| | **PED** | 2.03 | 1.36 | 2.11 | 1.52 | 0.7676 |
| | **TOTAL1** | 13.32 | 5.01 | 16.54 | 7.22 | **0.0018** |
| **Subcategory** | **Patt./Func. Rel./Form.** | 6.32 | 2.88 | 8.00 | 4.05 | **0.0085** |
| | **Express./ Polynom.** | 3.35 | 1.62 | 3.57 | 1.80 | 0.4801 |
| | **Eqns/Inequal.** | 3.65 | 1.83 | 4.97 | 2.54 | **0.0004** |
| | **TOTAL2** | 13.32 | 5.01 | 16.54 | 7.22 | **0.0018** |

***Bold** highlight = p-values < .05.

## Science

As stated earlier, teachers were asked to demonstrate their science skills on one test that combined items from the areas of earth, life, and physical science. Analyses of AMP! participants' performance on the combined science test that was administered at pre and post intervals are presented in the following sections.

The average pre-test to post-test score changes for all AMP! teachers were significant on all but one science test scale—Declarative Knowledge—knowledge of definitions and facts. Of those that were statistically significant, only one was significantly higher on the post-test—Inquiry (see Table 11).

When only mathematics teachers' pre-post performance is observed on the combined science test, we see that the mathematics teachers post statistically significant changes on five of the seven scales. As with all AMP! teachers' scores, on the post-test, AMP! mathematics teachers performed statistically significantly higher on the Inquiry scale (see Table 12).

There was no change in average pre- to post-test scores for science teachers on the Inquiry scale of the science test. More striking, as shown in Table 13, is that the science teachers' average post-test scores are statistically significantly lower on the science test for five of the seven scales. This result was confirmed in the findings of the single-subject science tests as well. That is, for most of the categories on the earth, physical, and life science tests, the pre-test scores were statistically significantly greater than the post-test scores (see Appendixes B1–B3). Therefore, when these content tests are combined, it likely follows that the combined science pre-test score would be greater than the combined post-test score.

**Table 11. Combined science mean pre- to post-test change for all treatment teachers**

| Pre to post change on combined science test all AMP! (N = 72) | | | | | | |
|---|---|---|---|---|---|---|
| | Category | Pre mean | Std dev | Post mean | Std dev | P value |
| Knowledge type | DEC | 3.49 | 1.11 | 3.43 | 1.05 | 0.6921 |
| | INQ | 4.14 | 1.66 | 4.61 | 1.50 | **0.0271** |
| | SCH | 7.81 | 2.84 | 6.15 | 2.80 | **<.0001** |
| | PED | 4.10 | 3.62 | 2.65 | 3.29 | **<.0001** |
| | TOTAL1 | 19.53 | 7.51 | 16.85 | 6.97 | **<.0001** |
| | TOTAL2 | 15.43 | 4.71 | 14.19 | 4.27 | **0.0042** |
| | STS | 1.86 | 0.79 | 1.26 | 0.75 | **<.0001** |

***Bold** highlight = p-values < .05.

**Table 12. Combined science mean pre- to post-test change for math treatment teachers**

| Pre to post change on combined science math AMP! (N = 37) | | | | | | |
|---|---|---|---|---|---|---|
| | Category | Pre mean | Std dev | Post mean | Std dev | P value |
| Knowledge type | DEC | 3.11 | 1.10 | 3.05 | 1.00 | 0.7858 |
| | INQ | 3.41 | 1.54 | 4.32 | 1.49 | **0.0040** |
| | SCH | 6.30 | 2.56 | 4.78 | 2.53 | **0.0012** |
| | PED | 2.16 | 3.00 | 0.70 | 1.75 | **0.0003** |
| | TOTAL1 | 14.97 | 5.94 | 12.86 | 4.89 | **0.0064** |
| | TOTAL2 | 12.81 | 3.95 | 12.16 | 3.84 | 0.2902 |
| | STS | 1.84 | 0.73 | 1.24 | 0.68 | **0.0010** |

***Bold** highlight = p-values < .05.

**Table 13. Combined science mean pre- to post-test change for science treatment teachers**

| Pre to post change on combined science AMP! (N = 35) | | | | | | |
|---|---|---|---|---|---|---|
| | Category | Pre mean | Std dev | Post mean | Std dev | P value |
| Knowledge type | DEC | 3.89 | 0.99 | 3.83 | 0.95 | 0.7775 |
| | INQ | 4.91 | 1.44 | 4.91 | 1.46 | 1.0000 |
| | SCH | 9.40 | 2.19 | 7.60 | 2.32 | **<.0001** |
| | PED | 6.14 | 3.07 | 4.71 | 3.29 | **0.0072** |
| | TOTAL1 | 24.34 | 5.83 | 21.06 | 6.38 | **0.0006** |
| | TOTAL2 | 18.20 | 3.79 | 16.34 | 3.64 | **0.0024** |
| | STS | 1.89 | 0.87 | 1.29 | 0.83 | **0.0173** |

***Bold** highlight = p-values < .05.

# ATSI and ATMI

The ATSI and the ATMI were designed to be brief while also capturing multiple factors that contribute to one's attitude about science and math. The Attitudes Toward Science inventory (ATSI) measures six different attitudinal dimensions about how students feel about science. It consists of 48 items, divided into six scales: enjoyment of science, motivation in science, anxiety toward science, value of science in society, perception of the science teacher, and self-concept in science. The Attitude Toward Math Inventory (ATMI) is a 40-item survey with four factors designed to measure students' attitudes toward mathematics. The four factors on the ATMI include: confidence in mathematics, value of mathematics, enjoyment of mathematics, and motivation in mathematics.

The ATSI and the ATMI were administered to the AMP! and comparison teachers' students. A large number of students did not take the pre- and post-surveys. Of the 1,174 observed in the science treatment group, only 283 students took both pre- and post-surveys. Of the science comparison group of 1,324 students, only 438 students took both pre- and post-surveys. Of the 409 observed in the math treatment group, only 49 students took both pre- and post-surveys. In the math comparison group of 907 students, only 190 students took both pre- and post-surveys. For the ATSI and ATMI Hierarchical Linear Modeling (HLM) was used to analyze (1) differences between comparison and treatment groups or pre- and post-tests, and (2) percent of variability in the score for teachers or students.

Every classroom has an effect. Unlike t-tests, HLM analysis takes this into account. Therefore, the use of HLM analyses provided the ability to quantify the extent of the teacher/classroom contribution to student scores. Due to the small sample size of the treatment group (N=49), the HLM analysis of ATMI was not used. Instead a linear regression was used to determine if gain scores between AMP! participants and those of the comparison group were statistically significantly different.

HLM results for ATSI and linear regression results for ATMI are presented in the following sections.

## ATSI

Initial observations revealed that the students of AMP! participants scores in all areas rose from the pre-test to the post-test; and the average of all scale scores for the comparison group on the pre-test was higher than that of the students whose teachers participated in AMP!, except for enjoyment and motivation. Moreover, on the post-test, the average scores for the comparison group were higher than average scores of those receiving treatment in every area except motivation. Tables 14a and 14b show the average ATSI scores on the pre- and post-tests for AMP! participants' students (treatment) and non-AMP! participants' students (comparisons) for all students that took a pre- and a post-test.

**Tables 14a. and 14b. Paired ATSI pre-test and post-test scores for treatment and comparison groups**

| ATSI treatment | | |
|---|---|---|
| **Variable** | **Mean** | **Std dev** |
| **Pre-test (N = 285)** | | |
| Total | 118.04 | 39.61 |
| Perception | 17.04 | 3.32 |
| Anxiety | 17.00 | 8.45 |
| Value | 20.12 | 7.41 |
| Self-concept | 18.20 | 8.06 |
| Enjoyment | 20.56 | 8.22 |
| Motivation | 25.12 | 6.53 |
| **Post-test (N = 285)** | | |
| Total | 118.21 | 38.93 |
| Perception | 17.15 | 8.14 |
| Anxiety | 17.06 | 8.69 |
| Value | 19.52 | 7.40 |
| Self-concept | 18.28 | 8.12 |
| Enjoyment | 20.41 | 8.01 |
| Motivation | 25.79 | 6.65 |

| ATSI comparison | | |
|---|---|---|
| **Variable** | **Mean** | **Std dev** |
| **Pre-test (N = 438)** | | |
| Total | 125.15 | 10.89 |
| Perception | 20.43 | 2.87 |
| Anxiety | 21.89 | 3.01 |
| Value | 21.62 | 2.56 |
| Self-concept | 20.12 | 2.51 |
| Enjoyment | 20.54 | 2.62 |
| Motivation | 20.55 | 3.18 |
| **Post-test (N = 438)** | | |
| Total | 125.50 | 9.55 |
| Perception | 20.34 | 2.61 |
| Anxiety | 21.79 | 2.71 |
| Value | 21.77 | 2.44 |
| Self-concept | 20.14 | 2.04 |
| Enjoyment | 20.79 | 2.59 |
| Motivation | 20.67 | 3.03 |

Overall, the students' average gain in the ATSI for the comparison group was .18 points (N = 285) and for the treatment group was .35 points (N = 438). HLM analysis of ATSI was used to account for the dependence of student results due to being in the same classroom. For science, 0 percent to 19.93 percent of differences between pre and post surveys are attributed to the teachers. The HLM analysis revealed no statistically significant differences between pre- and post-tests for students' overall (Total) scores and in the subcategories (See Table 15). This suggests that neither the treatment nor comparison groups resulted in significant increases in any of the measures. However, the HLM did show a statistically significant difference for treatment and comparison, meaning that these groups were statistically different.

**Table 15. HLM analysis of ATSI scores**

| HLM analysis of ATSI | | | | |
|---|---|---|---|---|
| | P-value | | | |
| Variable | Comparison/treatment | Pre/post | Variability in teacher science scores | Variability in student science scores |
| **Total** | **0.0492** | 0.7686 | 4.09% | 50.84% |
| **Perception** | **<.0001** | 0.9451 | 14.85% | 36.05% |
| **Anxiety** | **<.0001** | 0.8900 | 18.75% | 37.14% |
| **Value** | **0.0074** | 0.4726 | 7.10% | 44.42% |
| **Self-concept** | **0.0424** | 0.8316 | 10.01% | 45.73% |
| **Enjoyment** | 0.5760 | 0.6372 | 0.00% | 54.44% |
| **Motivation** | **<.0001** | 0.0648 | 19.93% | 40.29% |

***Bold** highlight = p values ≤ .05.

## ATMI

Initial observations revealed that the students of AMP! participants scores in all areas rose from the pre-test to the post-test; and the average of all scale scores for the comparison group on the pre-test was higher than that of the students whose teachers participated in AMP!. Moreover, on the post-test, the average scores for the comparison group students were higher than average scores of those students of teachers receiving treatment in every area. Tables 16 a and b show the average ATMI scores on the pre- and post-tests for AMP! participants' students (treatment) and non-AMP! participants' students (comparisons).

**Tables 16a and 16b. Paired ATMI pre-test and post-test scores for treatment and comparison groups**

| ATMI treatment | | |
|---|---|---|
| Variable | Mean | Std dev |
| **Pre-test (N = 49)** | | |
| **Total** | 82.10 | 32.18 |
| **Confidence** | 26.82 | 11.70 |
| **Value** | 6.73 | 2.82 |
| **Enjoyment** | 19.53 | 7.92 |
| **Motivation** | 10.57 | 4.81 |
| **Post-test (N = 49)** | | |
| **Total** | 89.92 | 41.83 |
| **Confidence** | 29.29 | 15.49 |
| **Value** | 7.37 | 3.23 |
| **Enjoyment** | 20.88 | 10.10 |
| **Motivation** | 11.80 | 5.60 |

| ATMI comparison | | |
|---|---|---|
| Variable | Mean | Std dev |
| **Pre-test (N = 190)** | | |
| **Total** | 139.25 | 14.93 |
| **Confidence** | 46.16 | 6.70 |
| **Value** | 10.81 | 2.82 |
| **Enjoyment** | 32.21 | 5.60 |
| **Motivation** | 16.19 | 2.46 |
| **Post-test (N = 190)** | | |
| **Total** | 132.08 | 13.58 |
| **Confidence** | 43.99 | 6.16 |
| **Value** | 10.38 | 2.53 |
| **Enjoyment** | 31.02 | 5.36 |
| **Motivation** | 14.33 | 3.31 |

Overall, the students' average gain on the ATMI for the treatment group was 7.82 points (N = 49) and the comparison group declined 7.17 points (N = 190). Due to the small sample size

of the treatment group (N = 49), the HLM analysis of ATMI was not used. Instead a linear regression was used to determine if the treatments fared better than the comparisons. The regression did show a statistically significant difference for treatment and comparison. Additionally, the analysis revealed statistically significant differences between pre- and post-tests for students overall (Total) scores and in the motivation subcategory (see Table 17). The results show that the subcategories improved over time and the comparison group declined. This suggests that the treatment resulted in significant increases in student motivation as well as their overall attitude towards mathematics. Due to the large drop in the sample, these results should be viewed cautiously.

**Table 17. Linear Regression Analysis of ATMI Scores**

| Linear Regression Analysis of ATSI | | |
|---|---|---|
| | P-value | |
| Variable | Comparison/treatment | Pre/post |
| **Total** | **<.0001** | 0.0353 |
| **Confidence** | **<.0001** | 0.1160 |
| **Value** | **<.0001** | 0.4158 |
| **Enjoyment** | **<.0001** | 0.2513 |
| **Motivation** | **<.0001** | 0.0002 |

***Bold** highlight = p values < .05.

## Needs assessment

Needs assessments were administered as pre- and post-tests to program participants. The math needs assessment has a total of 36 question stems/questions and the Science Needs Assessment has 39 questions stems/questions. Both have Likert-type items and items for which more than one response may apply. Each needs assessment asks teachers about their philosophy of teaching and learning through a series of questions regarding

- Their level of preparedness to teach their content, various types of learners, and concepts;
- Their perceptions of instructional strategies and students;
- Their perceived locus of control over teaching resources, techniques, and strategies;
- Where they place the most to least emphasis concerning learning;
- Where they use most/least time;
- Their access to equipment/resources; and
- Their perceptions about district and community support

Participants completed pre- and post-tests for the content area that they are assigned to teach.

Because the Needs Assessment questions are categorical, they do not lend themselves to gain score analysis. Statistical tests were conducted for pre- to post-performance of the treatment group. Results are discussed in the following sections. Only small to medium effects were observed in both the math and science assessments. On the math assessment there were only two

items for which there was a medium effect between pre and post administrations. The same is true for science. There were no large effects on either the math or the science assessment. Appendixes C1–C2 display the items for which at least medium effects were observed for mathematics and science.

## Mathematics

Statistically significant differences were found between pre and post Math Needs Assessment scores in three areas: (1) instruction methods, (2) teacher-directed vs student-centered methods and activities, and (3) inquiry. Specifically, at levels of statistical significance, by the post administration of the Needs Assessment, fewer mathematics AMP! teachers agreed that at the beginning of instruction on a mathematical idea that students should be provided with definitions for new vocabulary that will be used ($p$ = 0.0289) or that students should be provided with the purpose for a lesson as it begins ($p$= 0.0351). The majority said that they are quite familiar with the inquiry model and have used it ($p$ <.0001). The majority also said that questioning occurs from teacher to student, student to student and student to teacher, and many of those questions are higher-level questions ($p$= 0.0096). Finally, AMP! mathematics teachers reported that they give tests and/or quizzes that include constructed-response/open-ended items more often ($p$ = 0.05).

Observation of absolute changes from pre to post, generally suggests that mathematics AMP! teachers were positively influenced by what was taught in the program. For example, by the post-test *fewer* teachers were engaging in the following behaviors:

- Explaining a science idea to the whole class
- Having students complete textbook/worksheet problems
- Conducting a demonstration while students watched
- Practicing for standardized tests
- Giving a test or quiz

Conversely, by the post-test more teachers reported that they typically engaged the whole class in discussion, as well as allowed students to do hands-on/laboratory activities and use instructional technology.

Though the Math Needs Assessment yielded only a few statistically significant results, the areas in which those results were significant can be linked to AMP! goals and objectives. Further, many results that were not found to be statistically significant were nonetheless going in the direction of behaviors that were emphasized during AMP! instruction.

## Science

On the Science Needs Assessment, statistically significant differences were found between pre and post administration in four areas: (1) instruction methods, (2) understanding science concepts, (3) inquiry and (4) STEM emphasis.

Statistically significant differences were observed from pre to post administrations of the Science Needs Assessment, for AMP! science teachers on ,some of the same items as the mathematics AMP! teachers. Statistically significant observations were made with regard to the following: Fewer agreed that at the beginning of instruction on a science idea, students should be provided with definitions for new vocabulary that will be used ($p$ =0.003). Instead, the majority believed that students should explore the associated phenomena in a hands-on fashion and be given the appropriate words as needed ($p$= 0.0287).There was more emphasis placed on understanding science concepts ($p$=0.046). Moreover, by the post-test, the majority said that students were asking and answering their own questions ($p$=0.005). At the pre-test, the majority said that laboratory work usually comes *after* teaching the concept; however, at the post-test the majority said that laboratory work usually comes *before* teaching the concept ($p$= 0.0439). The majority also said they were quite familiar with the inquiry model and had used it ($p$=0.0002). Finally, science teachers felt that they should have students attend presentations by guest speakers focused on science and/or engineering in the workplace more often ($p$=0.0395).

As with the AMP! mathematics teachers, observation of absolute changes from pre to post mostly suggests that science AMP! teachers' pedagogy and practice were also influenced by what was taught in the program. For example, by the post-test *fewer* science teachers were engaging in the following behaviors:

- Explaining a science idea to the whole class
- Having students complete textbook/worksheet problems
- Conducting a demonstration while students watched
- Giving a test or quiz
- Students doing hands-on activities

By the post-test more teachers reported that they typically had students use instructional technology and read about science.

Given the overall number and number of subset items on the Science Needs Assessment, the number of statistically significant differences that were found were, as with math assessment, nominal. However, also like math, results that were not found to be statistically significant were heading in the direction of teaching behaviors that were emphasized during AMP! instruction. Moreover, the statistically significant findings are aligned with the overall goals and objectives of AMP!.

## Professional development (PD) logs

Professional development logs were maintained by participants and entries were made at the end of each of 15 sessions attended over the course of the year. For the purposes of this evaluation, a total of 30 participants (5 mathematics and 5 science teachers from each of three cohorts) were randomly selected to have their logs reviewed. A participant was not replaced if they did not provide reflections for all activities. Therefore, the total number of entries surveyed for each session varied based on the presence/absence of responses provided by each of the selected

participants. Verbatim responses from the first through the last session, of the 30 selected respondents, are presented by subject in Appendix D.

Participant responses indicate that, generally, participants formulated implementation goals that were aligned with AMP! objectives. For example, participants set goals to regularly implement inquiry in their planning and teaching; deliberately engage students; use higher order thinking questions more often to challenge students to think differently and deepen their understanding of mathematics and science concepts; collaborate with AMP! partner; and become a facilitator of learning. They further demonstrated an understanding of the process of making science and mathematics connections—seeking to align math and science terms, discuss vocabulary terms with partner, have word walls in both classrooms to expose students more than once per day, use visual aids and hands-on objects to improve students' understanding of terms, and/or align the TEKS from each subject.

Moreover, following each session, participants were able to identify: parts of the activities that they would use and how they might use them; how they might adapt activities, as needed. They also used "AMP! language" to identify how they would apply what was learned, not only with their students but with their colleagues as well. For example, entries reflected use of such terms as "collaboration," "critiquing the reasoning of others," "problem solving," "correlate math and science TEKS," and "real-world application."

In sum, the participant logs selected for program evaluation revealed that participants, largely, were indeed able to articulate implementation goals for the school year following their summer PD experience; state specifically how they would use elements of the activities and lessons presented during the summer and throughout the year; articulate plans to use what was learned over the course of the year with their students and colleagues—one participant reported that she would facilitate the "Woodles" activity during the October 2016 professional development on her campus. The logs further showed participants' ability to reflect and demonstrate thoughtfulness about their approach to teaching and implementing what was taught in AMP! Finally, the logs, on the whole, revealed that participants' classrooms gradually shifted from teacher-directed to student-centered, or from mathematics or science only to mathematics-science connected, as they became more facilitators of their students' learning.

## AMP! portfolio presentations

AMP! 2015/16 culminated with participants from each of the three cohorts giving presentations in their mathematics/science teams, over three evenings. Cohort I had 10 pairs and one individual to give presentations to their peers, for Cohort II there were 12 pairs, and 13 pairs and two individuals from Cohort III for a total of thirty-five pairs and three individuals across the three evenings. Two individual presentations had partners who were absent and one individual went through the program without an assigned partner from her campus. Some presenters used videos or collections of photographs to demonstrate student engagement in the inquiry-based lesson

process. They shared content on connection goals, lesson shifting ideas, shifts in personal beliefs and practices, questioning and vocabulary ideas, and future steps or goals.

A presentation rubric was developed and used to rate the degree to which artifacts demonstrating growth were present (i.e., sufficiently, minimally, or not present). The rubric shows the total number of teams demonstrating the presence of each artifact. Scored presentation rubrics along with summary text are displayed in Appendix E.

The rubrics reveal that (1) the majority of teams demonstrated growth, at least minimally, in all areas (2) artifacts demonstrating growth were sufficiently present in all areas for the majority of teams, and (3) all presenters sufficiently demonstrated inquiry-based lesson shifting (towards the mathematics/science connection).

Across all three cohorts, presentation scores were impacted when an expected behavior was not explicit or only minimally present. Other reasons scores were impacted varied among the three cohorts. For example, (1) No explicit implementation goals were presented, (2) Changes in questioning, shifts in beliefs, practices, and perceptions were not explicit or only minimally provided, and/or (3) Changes in questioning and vocabulary development, and shifts in beliefs, practices and perceptions were not explicit or only minimally provided. While all of the presentations across cohorts had a lot of overlap regarding teacher behaviors, there were some themes that emerged more frequently from each of the three cohorts:

Cohort I participants provided demonstrations of inquiry, reportedly increased their wait-time, and to a greater degree used higher order questioning. They also used more self- and peer evaluations with their students, helped their students to discover "everyday" mathematics/science connections, and engaged students in lessons that allowed for more discovery and reflection.

Cohort II participants shared evidence that that they used inquiry-based lessons with their students, shifted lessons toward the mathematics/science connection, and used vocabulary development techniques learned through AMP!. They also reported that they were able to allow students to "struggle" while improving student engagement.

Cohort III participants expressed how they became more facilitators of learning by "guiding" instruction instead of "directing" instruction. They used more of their partners' content vocabulary when teaching concepts, used pre-assessments to identify misconceptions, used more student-centered learning and experienced more student engagement.

Overall, the presentations showed that AMP! participants experienced growth over time. They worked effectively with their partners, made mathematics/science connections more frequently, more effectively engaged their students in lessons, and ultimately became increasingly comfortable with inquiry-based planning and teaching.

## Interviews: post summer PD through implementation

Thirty of the 75 AMP! participants were interviewed about perceived changes to their pedagogy from prior to their exposure to AMP! teachings that they received during the summer PD through

implementation of AMP! teachings received throughout the year. Summaries of mathematics and science teachers' responses are presented in the following sections. A copy of the interview protocol is presented in Appendix F.

Tables 18 and 19 show how participants felt about their pedagogical skills prior to the one-week summer training, as well as their confidence level regarding their pedagogical skills and content knowledge, at various points in time after the summer training. All science teachers and the majority of mathematics teachers felt the participation in the summer AMP! session resulted in the improvement of their pedagogy.

Five mathematics teachers who were interviewed said that they did not feel more confident—primarily because they felt a passion for and confidence in knowing and being able to teach their content before participating in AMP!. They delineated between confidence in knowing the content and confidence in using new ways to deliver the content.

While mathematics teachers reported a higher level of confidence regarding their content knowledge than did science teachers, science teachers felt more confident about developing *and* facilitating inquiry-based lessons following AMP! implementation. In fact, only one mathematics participant rated her own confidence in ability to develop *and* facilitate inquiry-based lessons post-AMP! at a "10."

Aspects of AMP! that contributed to building mathematics teachers' level of confidence were attributed to the modeling the facilitators provided, experiencing the lessons as a student, having the "real life" examples provided, improved questioning skills, teaming with a partner, cooperating with colleagues in the program and on campus, doing more hands-on activities with students, seeing the connection between mathematics and science, participating in the Saturday sessions, and seeing other participants struggle also with the newness of inquiry-based learning.

Science teachers who felt they were not less confident and competent to teach their content prior to their AMP! experience, said that was primarily because, like the mathematics teachers, they largely felt very confident and competent to teach their content prior to participating in the summer PD experience. One respondent entered the program after the summer session had ended), so she did not feel confident about using AMP! activities at the beginning of the school year. A few other science teachers felt their number of years of experience contributed to their confidence level more than their participation in AMP!. Moreover, one teacher had previous exposure to inquiry-based learning and was using it prior to participation in AMP!.

Those science teachers who felt more confident to teach their content after exposure to AMP! said as they tried using the inquiry method their competence grew, and so did their confidence in content delivery. Another qualifier offered as a reason for increased confidence was the distinction science participants, who were interviewed, drew between knowledge of the content itself and the new strategies learned to deliver the content. That is, they didn't feel more confident to teach their content, because the confidence was already there. However, they did feel more confident in using inquiry and the various strategies associated with it, such as allowing students the freedom to explore, lead their own learning, or develop their own

questions. Moreover, their own ability to use effective questioning, shift to student-centered learning from direct instruction, and understand how students learn, helped to (1)increase the amount of control given to students to maximize their success, (2) effectively connect science concepts to mathematics concepts, (3) set achievable goals for their students, and (3) make learning enjoyable and fun.

**Table 18. Confidence in pedagogy and content delivery**

| | Yes | No | Other |
|---|---|---|---|
| **Math (N = 14)** | | | |
| Q3. Did you develop stronger pedagogical skills (i.e., more effective teaching tools) as a result of your participation in the summer PD? | 12 | 2 | NA |
| Q4. At the start of the school year, did you feel more confident in your ability to teach your assigned content as a result of your PD experience? | 9 | 5 | NA |
| **Science (N = 16)** | | | |
| Q3. Did you develop stronger pedagogical skills (i.e., more effective teaching tools) as a result of your participation in the summer PD? | 15 | 0 | NA |
| Q4. At the start of the school year, did you feel more confident in your ability to teach your assigned content as a result of your PD experience? | 9 | 5 | 2* |

*One participant responded, "I don't know" and would not elaborate. Another responded, "Not at the beginning of the year, but by the second semester."

**Table 19. Average confidence scores in content knowledge and inquiry**

| On a scale of 1–10, with 1 being not at all confident and 10 being extremely confident . . . | |
|---|---|
| **Math (N = 14)** | |
| Q5. How confident did you feel about your content knowledge prior to participating in the AMP! course? | 9.14 |
| Q6. Please rate your content knowledge confidence level after completion of AMP! | 9.32 |
| Q10. How confident do you feel about developing and facilitating inquiry-based lessons now that you have implemented AMP! Teachings? | 6.96 |
| **Science (N = 16)** | |
| Q5. How confident did you feel about your content knowledge prior to participating in the AMP! course? | 7.88 |
| Q6. Please rate your content knowledge confidence level after completion of AMP!. | 8.88 |
| Q10. How confident do you feel about developing *and* facilitating inquiry-based lessons now that you have implemented AMP! teachings? | 7.91 |

## Math participants

Though some mathematics teachers said they didn't encounter difficulties when teaching, prior to the summer PD, most reportedly had. Difficulties that reflected student behaviors included a lack of student engagement and students' preconceived (that is, negative) notions regarding mathematics. Difficulties that dealt with teacher behaviors included being unwilling to give up

control to students, being relatively new to the profession, and ineffectively or not at all using the 5-Es (Engage, Explore Explain, Elaborate, and Evaluate).

Mathematics participants were able to assuage previous difficulties using what they learned throughout their AMP! experience. For example, they reportedly were able to more effectively use the 5-Es, engage students in the teaching objective, question students (using more and better higher order thinking questions), use good vocabulary activities, and facilitate the overall lesson. They were also able to use AMP! "artfully" by, as one respondent said, "sneaking math in on students" using activities emphasizing inquiry and better questioning. Several participants also appreciated (some for the first time) the connections AMP! revealed between mathematics and science.

Some mathematics participants indicated that the inquiry process and the level of the lessons would be too difficult to use with their students, without some modifications, or too difficult to use at all. To illustrate, one participant indicated that she could not use all that she learned with her lower level students stating this was "due mostly to time constraints and having large SPED (special education) and ESL (English as a second language) populations in a 45-minute class period."

For those mathematics teachers who said inquiry-based learning was new to them and, therefore, negatively impacted their confidence, they felt that was to be expected. As one veteran teacher noted, "When learning a new strategy, confidence wanes; but, the expectation is that it will go up" with regular use. Overall, mathematics participants felt the summer PD experience helped them be better prepared to deliver the lessons at the beginning of the year. One mathematics teacher interviewed did not have the summer PD experience because she was recruited after the summer session.

The mathematics teachers interviewed generally acknowledged that some AMP! activities helped to attain a broader picture of the content and made to think more deeply about it (for example, how to make content and process more understandable or equations and algebraic reasoning more applicable to students. In addition, their confidence in TEKS and questioning techniques were strengthened, They also learned how to use new tools such as the pantograph. They learned about methods such as scale factoring, and dilation, and how to more effectively deliver content (for example, how to measure surface area and volume using activities presented). They also expressed pleasure in being able to learn how to make the math/science connection.

Some AMP! activities were said to be very relevant and some not at all relevant. Some were very pleased with the mathematics information presented which was seen as relevant, but science was not, Many critiqued the length of some lessons (for example, 2–3 hours) and the reportedly "high level" of some lessons.

On the other hand, some mathematics teachers initially thought that lessons were not relevant because activities seemed to be geared "clearly more for advanced…gifted and talented students, and would never have worked" for average or disadvantaged students. Participants are said to have shared this perception with the instructors, and they "seemed to have modified the lessons"

for the average or disadvantaged students. Two mathematics teachers interviewed, however, felt they remained irrelevant regarding content or for the "demographic" taught. One of these two teachers went on to say that though the content was irrelevant throughout the training, the new methods and strategies she learned were "extremely relevant." By far, the lesson with the pennies was the one that was seen as least useful. It was critiqued as being too long and one that would be too hard to keep students engaged. There were other lessons that were thought to be too advanced for their students, or that "the math was either way over or under the development level of [her] students." However, she went on to say that she had to and did adjust the lessons to work for her and her students.

Some mathematics participants felt there was too much emphasis on science. The stated amount of emphasis placed on science ranged from 75–90 percent.

After the summer AMP! session and the school year sessions had begun, mathematics teachers regularly sought ways to connect mathematics and science. All mathematics participants said they felt more confident in their ability to shift inquiry-based lessons towards a mathematics/science connection. "Being able to show the math behind the science makes math more fun." Teaching is more student-centered and students are more willing to ask questions. Students became more engaged because the activities deliberately get the students involved. Students are more aware of the connections and will sometimes share how the concept being covered was learned in their science class. Mathematics is given applicability through the connection with science. Through the connection, students were shown that it is not necessary to be an engineer to use mathematics in real life. The two subjects are no longer seen as separate—there is a realization that one doesn't exist without the other. It is the AMP! partner relationship that ties the objectives of both courses together.

## How AMP! was shared

Some shared what they learned with mathematics and science colleagues across the grade level, while others shared with the entire mathematics and/or science department. One interviewee said she and her partner facilitated a PD experience with teachers in both departments.

Two mathematics teachers did not share their experience with colleagues this year—one stated she has not shared what she learned because "emphasis on Common Core put a bad taste in [her] mouth"; the other said filling in the gap left by a chronically absent teacher on her team, made it impossible to share anything this year. She does, however, plan to share next year, as do most other mathematics teachers interviewed.

## Most valuable experiences

The experiences that were restated most often as the most valuable were the lessons—actually experiencing the lessons as their students the full-day experience which allowed participants to take one or two lessons and "break them down, and do the lessons, talk about how to teach them, discuss with other colleagues how to implement them, try to foresee where students might get

hung up and discuss ways to avoid that. This collaboration with partner, other participants, and the facilitators showed how lessons initially thought would not be done with students, could actually be done well. The TEKS alignment was also seen as most valuable. The book used during AMP!, the different speakers brought in, the Conoco-Phillips field trip, and actually trying the lessons with their students were also seen as valuable.

## Recommendations

One recommendation was to break lessons into smaller pieces, giving time to do both the mathematics and the science that goes with it. "Some participants had a hard time seeing the big picture and making the connections." Another was that the order of the lessons presented was difficult to match with science partners because concepts are not presented at the same time—there is no flexibility in changing the scope and sequence provided by the district. "Besides, they were working with teams of people on their campus" so the scope and sequence could not be changed.

Additionally, mathematics teachers interviewed expressed a desire to have:

- More on-level and TEKS-relevant lessons.
- More emphasis on teaching mathematics using inquiry and using inquiry on more difficult concepts.
- More peer observations.
- More focus on algebra.
- More time at the end of each day to modify the lessons to see how they could be used in partnership with their science counterparts or with their students.
- Less emphasis on science—provide more mathematics activities rather than more emphasis on mathematics in the science activities.
- Better integration of mathematics and science

## Science participants

Prior to AMP!, the difficulty for some science teachers interviewed was not so much with the science content, as it was with the now obvious connections among collaborative PD, science content, and the mathematics/science connection. Prior to learning about these notions, science interviewees stated those challenges that are typically known to exist in classrooms—keeping all students engaged throughout a lesson, classroom management, meeting the needs of all students, time, insufficient amount of resources, stress regarding state accountability testing (the STAAR), and pressure to cover everything (that is, giving students too much all at once and "hoping they pick up all the pieces," as one teacher said.

Science teachers interviewed indicated that following the summer AMP! session, they were more open-minded regarding inquiry in that they consistently used inquiry, "hands-on" activities, and student-centered lessons. In addition, they experienced the value of collaboration and felt that the modeling provided by AMP! helped them make better connections with students and mathematics. Their questioning skills also reportedly improved.

In general, science teachers interviewed said they were strengthened in several areas — they had a deeper understanding of mathematics; a deeper understanding of students and determining where they are and where their misconceptions are; and a deeper understanding of the content. This was especially true regarding earth science and physics for two teachers, who believed they had a very good grasp on science concepts in other areas. The science teachers also felt strengthened in their ability to plan and deliver inquiry-based lessons. One science teacher was reportedly reassigned to a different grade level, and, therefore, felt she did not "get much useful content out of the program."

The summer PD was seen as mostly relevant by all but three of the mathematics teachers interviewed. Reasons noted for relevance were regarding working with others from different districts, lesson alignment with TEKS (allowing participants to discuss not only what was being covered, but how to cover it), and addressing concepts with which students struggle.

Of the three who found the experience irrelevant or not applicable, did so for reasons which were outside the purview of AMP!'s goals and objectives or what the program had to offer. One teacher, for example, found the summer PD irrelevant because her school reportedly has no technology, and there's no school- or district-level support for implementing AMP! She said, "AMP! is not the problem." Another started the program in the fall, which was after the summer session ended. The third one claimed that her reassignment of grade-level made only one lesson that was disseminated to participants completely useful.

A number of teachers said some, if not all, lessons had to be adapted because the level was too high for use with their students. Like the mathematics teachers, several science teachers said the length of the lessons is too long, regarding time it takes to implement or because they "contain too much 'fluff.'" Also like a number of mathematics teachers, a number of science teachers criticized the "Pennies" lesson. Science teachers did so primarily for its inappropriate level (that is, not appropriate for grade 8; but, more useful for grade 6. The faster pace of the day-long summer sessions was also seen as problematic. The activity with NASA was not unanimously viewed as relevant to eighth-grade TEKS. Finally, there was a request for more information about portfolio development.

With the exception of the participant who reportedly started in November, participants indicated that they feel more confident in their ability to shift inquiry-based lessons towards a mathematics/science connection. The aspects that supported their level of confidence was the alignment of the TEKS with science and mathematics; instructor modeling, which allowed them to see and experience (as a student) how the lessons should be taught; working in small groups

and collaborating with other participants and partner, developing good questions and having students arrive at their own questions to pursue during a lesson; and planning with a partner.

Simply by virtue of being a program participant, facilitation of mathematics/science connected lessons evolved during the summer PD through implementation, with those teachers who practiced inquiry-based strategies regularly. Connecting mathematics and science was viewed as valuable because the acknowledgement and deliberate promotion of the practice to make the connection during planning and during the lesson helps to promote student success, by helping them to engage in a lesson, better understand a concept, use math skills to find or evaluate science lessons, problem solve, relate science to real life, and have career path options.

## How AMP! was shared

Most science teachers shared their AMP! experience informally through department and/or faculty meetings, meetings with the principal, other administrators on campus or in the district, or teachers outside their department or team (for example, on other campuses in the district), and by sharing some handouts with other teachers on campus. One explicitly stated that she met with a district program director, shared her experience, and encouraged her to allow others to participate in AMP! 2016/17.

Some shared their AMP! experience formally through demonstrations of AMP! activities, facilitation of AMP!-focused campus staff development, or through district-level presentations, with campus partner or independently.

One science teacher interviewed said she couldn't share her AMP! lessons because GT lessons can't be the same as lessons provided to other students; however, she did share her experience with campus colleagues and encouraged them to get back to the 5-Es planning. Additionally, one teacher recommended that her campus administrator buy the book used in AMP! and conduct a book study with faculty during the 2016/17 school year.

All science teachers interviewed indicated that they plan to continue sharing their AMP! experience, at least informally.

## Most valuable experiences

Generally, science participants felt all aspects of AMP! were valuable — from summer PD to implementation. Specifically, those interviewed offered as examples, the summer and Saturday sessions, the lessons and meetings, facilitator modeling, participating in the lessons as the student, networking and collaborating with others from other campuses/districts, shifting lessons, the peer observations, the small group meetings, the practice with their own students — implementation.

## Recommendations

To improve the participant experience, the science teachers interviewed shared needs they had, with regard to the program, activities and lessons. Specifically, they expressed the need for

- Knowledge about how to build requisite knowledge for students who are lacking it
- A more effective AMP! Peer observation system
- More emphasis on helping science teachers understand how mathematics works
- More eco-systems materials
- Less time between the end of the summer session and the initial meeting in the fall.
- The length of some lessons to be shortened, as "they are too long to be practical"
- Lessons in weather and geology
- More branching out (for example, researching digitally more often)
- Emphasis on the development of the portfolios
- More consistency among the cohorts. One participant said learned through talking with others that two cohorts got to re-design lessons and labs toward inquiry-based plans, while her cohort did not get that opportunity

## Additional interview feedback from mathematics and science participants

For every person that offered additional feedback when asked if they wanted to share anything else, whether they offered praise, a critique, or both, to a person they all considered AMP! to be very beneficial, and gave high praises to the facilitators. They said the instructors were very knowledgeable, always prepared, and had a very high level of professionalism. Yet, they were very approachable and made the experience fun. They told how the hands-on approach to professional development made a welcomed difference in experience. They also deemed collaboration with a partner, the facilitators, and other participants as quite helpful.

Participants further thought the days during the summer were long, with a lot to absorb, but in the end they understood the need for the long days, the amount of work and materials given to digest. Finally, they said the year-long aspect of the program really helped lead them to any successes they experienced.

Some interviewed also offered several critiques which are highlighted here:

- The level of the activities was too high and need to be lowered to be able to use with the average student.
- There was too much "down-time" during the all-day summer session.
- Some activities could be done on-line.
- "Mentoring should be mandatory." Don't have participants simply "request" an observation.

- Have a shorter presentation night, or start earlier. The evenings ended too late, especially given that STAAR math was administered around the time of the presentations. One recommended doing presentations in early February or April (after the STAAR). She went on to say, "Many participants were grouchy and worried about STAAR."

- While the content of the presentation was great, "the NASA presenter was awful — she was condescending…and unprofessional." This particular critique of the NASA presenter came from several participants.

- Saturday sessions are not always convenient for those with children/families.

- Did not get access to some on-line materials that were promised.

Last, some offered testimonials:

- As a result of AMP! participation, the approach to teaching has effectively changed to inquiry-based

- Those with whom the lessons/activities/strategies were shared also experienced success.

- A less experienced teacher noted that the inquiry-based learning approach emphasized in AMP! was especially great for her more experienced peers who were in the program, as well as "newer ones [like her] who didn't know how to make math/science connections."

## Participants' perceived evidence of growth

Those who perceived that they became stronger pedagogically provided the following as evidence of their growth:

- Became more of a facilitator of learning than a director of learning

- Learned how to use the inquiry method

- Learned to utilize the connection between mathematics and science

- Discovered new ways to reach all learners through differentiation —new ways to tap into the developmental skills of all learners

- Learned from new skill-sets from other teachers in AMP! and from the facilitators

- Learned to use hands-on activities and manipulatives where the respondents would not have thought to use them previously

- Stepped out of her comfort zone by allowing students to "figure things out on their own"

- Saw that AMP! opened the eyes of more seasoned teachers who participated in AMP!. She believed that being relatively new to the profession allowed her to be "more able to relate to the AMP! lessons and approach" than her more experienced peers. She believed this was because teacher preparation programs focus more on inquiry-based planning and teaching.

# Conclusion

Results indicate that the number and kinds of opportunities provided through AMP! were associated with achievement of some of the project's goals and objectives. More time will be needed to determine whether some goals will be achieved.

**Goal 1**—Increase mathematics and science content and pedagogical knowledge.

Evidence obtained from assessments and participant interview results, PD log entries, and portfolio presentations point toward the achievement of Goal 1. Qualitative measures show that while mathematics teachers reported a higher level of confidence regarding their content knowledge than did science teachers, science teachers generally felt more confident about developing *and* facilitating inquiry-based lessons following AMP! implementation.

Aspects of AMP! that contributed to building mathematics teachers' level of confidence were attributed to the modeling that the facilitators provided, experiencing the lessons as a student, having "real life" examples provided, improving questioning skills, teaming with a partner, cooperating with colleagues in the program and on campus, doing more hands-on activities with students, seeing the connection between mathematics and science, participating in the Saturday sessions, and seeing other participants also struggle with the newness of inquiry-based learning.

Science teachers who felt that they were not less confident and competent to teach their content before their AMP! experience said that was primarily because, like the mathematics teachers, they largely felt very confident and competent to teach their content before participating in the summer PD experience. For example, a few science teachers, felt that their number of years of experience contributed to their confidence level more than their participation in AMP!.

Those science teachers who felt more confident to teach their content after exposure to AMP! said that as they tried using the inquiry method, their competence improved, and so did their confidence in content delivery—for example, their use of the various strategies associated with inquiry, such as allowing students the freedom to explore, lead their own learning, or develop their own questions. AMP! participants attributed much of their growth in understanding and delivering content to their AMP! experience, as confirmed by PD logs, portfolio presentations, and interview responses.

Quantitative assessments generally support AMP! participants' stated perceptions regarding their competence, with the exception of some combined science (earth, physical, and life science) pre to post scores. Seventy-two AMP! participants' mean scores on five of the seven scales on the combined science test were statistically significantly lower on the post-test. Likewise, the 35 AMP! science teachers' observed scores were also statistically significantly lower on five of the seven scales of the combined science post-test. AMP! mathematics teachers' combined science post-test scores were statistically significantly lower on four of the seven scales and statistically significantly higher and only one of the seven scales—Inquiry.

Both quantitative and qualitative analyses revealed that AMP! mathematics and science teachers demonstrated significant growth in algebra, demonstrating statistically significantly greater

within treatment group (mathematics or science teachers only) pre to post gains on the majority of the scales of the algebra post-test that included both factual and content knowledge.

**Goal 2**—Improve student engagement and achievement in STEM subjects.

The needs assessment showed some statistically significant pre- to post-test findings that begin to speak to whether this goal was achieved. For example, statistically significantly more AMP! mathematics teachers reported that they give tests and/or quizzes that include constructed-response/open-ended items more often, since participating in AMP!. Furthermore, there was a statistically significant increase in the number of science teachers who said they should have students more often attend presentations by guest speakers focused on science and/or engineering in the workplace. The needs assessment results showed that statistically significantly more science teachers said that students were asking and answering their own questions. Moreover, on the needs assessment, statistically significantly more science teachers placed more emphasis on understanding science concepts. With regard to teaching a concept, by the post-assessment, the majority of science teachers said that the laboratory work was usually done *before* teaching the concept, as opposed to afterwards, which is how the majority had responded on the pre-test.

There is evidence that there is a significant improvement in the pass and pass advanced rates on the STAAR for the students of the AMP! teachers and the students of non-AMP! teachers for math in 2015/16.When comparing comparison group students and treatment students on the STAAR, there is evidence that the treatment group (students of teachers in AMP!) in 2015/16 is statistically significantly better than students of the same teacher in 2014/15 on pass rates. Generally, students with an AMP! science teacher or an AMP! mathematics teacher differ significantly (that is, performed better on STAAR) from students without AMP! mathematics and AMP! science teachers even when the different demographics (for example, ethnicity, economic status, receiving special education or gifted/talented services) are included.

**Goal 3**—Create a supportive and rewarding environment to sustain AMP teachers in high-needs schools.

This goal requires extended observation and evaluation to determine whether AMP! has sustaining environmental impact. Nevertheless, evidence appears to show that AMP! activities intentionally addressed it. Participants self-reported about the program's immediate environmental impacts. There is qualitative evidence that inquiry-based lessons, new approaches to content vocabulary development, and the science-mathematics connection emphasized throughout the program assisted program participants in achieving rewarding classroom experiences that benefitted both the teachers and the students.

AMP teachers' beliefs regarding efficacy were measured from pre to post. Although not statistically significant, MTEBI assessment pre to post scores show that the following items increased from pre- to post-test: (1) AMP! mathematics teachers' total score, (2) their belief in one's ability to be an effective mathematics teacher, and (3) the belief that effective teaching of mathematics can bring about student learning. Science teachers' belief in one's ability to be an effective science teacher, as measured by the STEBI, also increased from pre to post

administration, though not statistically significantly. However, these scores along with the qualitative findings are trending in the direction that program administrators desired.

Statistically significant findings on the needs assessment from pre to post showed that AMP! teachers were quite familiar with the inquiry model and had used it. In addition, needs assessment responses showed that statistically significantly fewer AMP! teachers agreed that at the beginning of instruction on a mathematics/science idea, students should be provided with definitions for new vocabulary that would be used. The assessment further showed that statistically significantly more AMP! science teachers believed the appropriate approach to content vocabulary development entailed students exploring the associated phenomena in a hands-on fashion and being given the appropriate words as needed. Statistically significantly more mathematics teachers said that questioning goes on among everyone in the class—from teacher to student, student to student and student to teacher, and that many of the questions are higher-level questions.

**Goal 4**—Create a community of teachers that can motivate students toward STEM careers.

Interview responses, PD log entries, and portfolios suggest that AMP! participants have begun to motivate students towards careers in STEM, primarily through the success that the teachers reported regarding the mathematics-science connection and the real-world applications of mathematics and science.

Again, there was a statistically significant increase in the number of science teachers who said they should more often have students attend presentations by guest speakers focused on science and/or engineering in the workplace. In addition, students with an AMP! science teacher or mathematics teacher generally performed better on the STAAR mathematics and science tests than students without AMP! mathematics or science teachers even when scores of the different demographics are observed. Nonetheless, this goal requires extended observation and evaluation to determine achievement, namely through longitudinal assessments of students' career pursuits—for example, the number of STEM courses taken in high school and college or the percentage of students of AMP! teachers who pursue STEM careers in college vs the percentage of students of non-AMP! teachers.

**Goal 5**—Inject a new culture of support in the school districts for accomplished science teachers.

As with Goals 3 and 4, this goal requires extended observation and evaluation to determine whether AMP! has sustaining cultural impact. Evidence appears to show that AMP! administrators set out to intentionally address this goal by recruiting and ultimately training 75 teachers from 16 public school districts, two public charter systems, and two private school systems. These 75 AMP! teachers stated that they felt more able to connect mathematics and science, collaborate with their assigned partners as well as with others on their campus, and generally teach students by using inquiry methods.

Statistically significantly higher post-test scores were posted for mathematics teachers on the needs assessment in three areas: (1) instruction methods, (4) teacher-directed vs student-centered methods and activities, and (3) inquiry.

Science teachers had statistically significantly higher scores on the post administration in four areas: (1) instruction methods, (2) understanding science concepts, (3) inquiry, and (4) STEM emphasis.

Moreover, AMP! teachers' post-test scores were generally statistically significantly higher on all three parts of the leadership test—(Part 1) Facilitating presentations and working with others, (Part 2) Campus leadership opportunities, and (Part 3) Leadership readiness, roles, and perceived administrator views.

Mathematics and science teachers' perceptions that they can more adequately connect mathematics and science, collaborate, and teach by using inquiry methods, along with score increases in needs assessment and leadership post-tests in the aforementioned areas, present some evidence that AMP! has had some immediate impact regarding Goal 5.

In summary, interviews indicated that participants believed that their content knowledge and pedagogical skills grew in various ways by the end of the program. Portfolio entries and interviews showed that AMP! participants felt that AMP! was time-consuming, demanding and challenging, yet rewarding and fulfilling. They consistently reported on the benefits of the program's offerings—collaboration, teaming, and quality training on inquiry-based methods and mathematics-science content and connections. They all reported that they will continue the collaborative and teaming efforts on their campuses; some stated that they would seek collaboration across departments or grade levels or both.

Observed trends and statistically significant results on multiple assessments and results of comparisons made with non-AMP! teachers and their students indicate that, more often than not, AMP! mathematics and science teacher behaviors and beliefs trended upward over the course of the year. All movement, whether upward or downward, was not statistically significant on a number of assessments; however, positive effects, though generally small, indicated that AMP! teachers are mostly heading in the desired direction—that is, toward achieving all AMP! goals and objectives.

General observations of data as well as statistical analyses support the notion that AMP! provided participants with an experience that has the potential to impact a number of aspects of their abilities as teachers, as demonstrated by their pre to post performance on the various measures. There is also qualitative evidence that inquiry-based lessons, new approaches to content vocabulary development, and the science-mathematics connection emphasized throughout the program, assisted program participants in achieving the gains described throughout this report. They all reported that they will continue the collaborative and teaming efforts on their campuses, if only through informal means. The majority of them said that they would continue using the skills learned through AMP! and continue to share what they have learned with colleagues.

# Appendixes A1–A7. Leadership test

# Appendix A1. Leadership test part 1—pre and post comparisons for part 1 of the leadership test treatment

**p1q2** Over the past year, I have made a formal mathematics/science presentation to a campus–

**p1q3** Over the past year, I have made a formal mathematics/science presentation at the district level–

**p1q4** Over the past year, I have made a formal mathematics/science presentation at the local level (Region 4, etc.)–

**p1q5** Over the past year, I have made a formal mathematics/science presentation at the state level(CAST, CAMT, etc.)

**p1q6** Over the past year, I have made a formal mathematics/science presentation at the national or international level (NSTA, NCTM, etc.)

| Score | | Leadership part 1: pre treatment | | | | | Leadership part 1: post treatment | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | | 0 | 1 | 2 | 3 | |
| | | Never | Once | Twice | Three or more times | Total | Never | Once | Twice | Three or more times | Total |
| p1q2 | Math | 27 | 4 | 1 | 3 | **35** | 22 | 3 | 2 | 9 | **36** |
| | Science | 25 | 8 | 3 | 1 | **37** | 15 | 13 | 4 | 6 | **38** |
| | **Total** | **52** | **12** | **4** | **4** | **72** | **37** | **16** | **6** | **15** | **74** |
| p1q3 | Math | 32 | 1 | 1 | 1 | **35** | 31 | 2 | 1 | 2 | **36** |
| | Science | 33 | 1 | 3 | 0 | **37** | 28 | 6 | 1 | 3 | **38** |
| | **Total** | 65 | 2 | 4 | 1 | **72** | 59 | 8 | 2 | 5 | **74** |
| p1q4 | Math | 34 | 0 | 0 | 1 | **35** | 32 | 1 | 1 | 2 | **36** |
| | Science | 37 | 0 | 0 | 0 | **37** | 37 | 1 | | | **38** |
| | **Total** | **71** | **0** | **0** | **1** | **72** | **69** | **2** | **1** | **2** | **74** |
| p1q5 | Math | 34 | 0 | 0 | 1 | **35** | 33 | 0 | 1 | 2 | **36** |
| | Science | 36 | 1 | 0 | 0 | **37** | 36 | 2 | 0 | 0 | **38** |
| | **Total** | **70** | **1** | **0** | **1** | **72** | **69** | **2** | **1** | **2** | **74** |
| p1q6 | Math | 34 | 0 | 0 | 0 | **34** | 34 | 0 | 0 | 2 | **36** |
| | Science | 37 | | | | **37** | 37 | 1 | | | **38** |
| | **Total** | **71** | **0** | **0** | **0** | **71** | **71** | **1** | **0** | **2** | **74** |

# Appendix A2. Leadership test part 1—total hours worked with another teacher or group of teachers

| Leadership part I: pre treatment | | | | | | | Leadership part I: post treatment | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **P1q7** Over the past year, I have worked closely with one other teacher in mathematics/science–<br>**P1q8** Over the past year, I have worked closely with a group of teachers (PLC, grade level, department) in mathematics/science– | | | | | | | | | | | |
| | | **0 hours** | **1–10 hours** | **11–20 hours** | **more than 20 hours** | **Total** | **0 hours** | **1–10 hours** | **11–20 hours** | **more than 20 hours** | **Total** |
| **p1q7** | **Math** | 4 | 2 | 2 | 27 | **35** | 0 | 4 | 6 | 26 | **36** |
| | **Science** | 4 | 6 | 3 | 24 | **37** | 0 | 4 | 6 | 28 | **38** |
| | **Total** | **8** | **8** | **5** | **51** | **72** | **0** | **8** | **12** | **54** | **74** |
| **p1q8** | **Math** | 4 | 3 | 5 | 23 | **35** | 0 | 8 | 3 | 25 | **36** |
| | **Science** | 2 | 6 | 5 | 24 | **37** | 1 | 2 | 4 | 31 | **38** |
| | **Total** | **6** | **9** | **10** | **47** | **72** | **1** | **10** | **7** | **56** | **74** |

## Appendix A3. Leadership test part 2—interpretation of changes in math and science scores for AMP! participants, pre-test to post-test

| Leadership part 2 questions | | | | | | Interpretation of treatment group change |
|---|---|---|---|---|---|---|
| | | Change in yes for math | Percentage change in yes for math | Change in yes for science | Percentage change in yes for science | |
| p2q9 | I am designated as the campus lead mathematics / science teacher. | 3 | 10% | 2 | 5% | Increase in campus lead for math and science |
| p2q10 | I am a grade level chair or team leader. | 0 | 0% | –3 | -9% | Decrease in grade level chair or team leader for science |
| p2q11 | I am a campus liaison/coach. I have a class but I also assist others with mathematics /science. | 3 | 8% | 4 | 10% | Increase in campus liaison/coach with a class |
| p2q12 | I am a mathematics / science coach/instructional coordinator on my campus and do not have a class. | 2 | 6% | 0 | 0% | Increase in campus liaison/coach without a class |
| p2q13 | I observed a mathematics / science lesson being taught by another teacher. | 9 | 21% | 10 | 24% | Increase in class observations for math and science teachers |
| p2q14 | I modeled a mathematics / science lesson for another teacher. | 9 | 26% | 9 | 24% | Increase in class modeling for math and science teachers |
| p2q15 | I co-taught a mathematics / science lesson with another teacher. | –2 | -9% | 9 | 21% | Increase in co-teaching lessons for science, decrease for math |
| p2q16 | I designed/equipped a new science lab during the past school year. | –1 | -3% | 2 | 4% | Decrease in designing / equipping science labs for math, increase for science |

| | | | | | | |
|---|---|---|---|---|---|---|
| **p2q17** | **I maintained/reorganized a science lab and/or science materials during the past school year.** | 3 | 8% | 5 | 9% | Increase in maintaining science labs/materials |
| **p2q18** | **I helped develop an outdoor habitat or learning area on my campus.** | 2 | 6% | 0 | 0% | More math teachers helped develop an outdoor habitat or learning area |
| **p2q19** | **I ran a mathematics / science club on my campus (Garden Club, Robotics, MATHCOUNTS, etc.).** | 1 | 3% | –3 | -10% | Increase in math, decrease in science |
| **p2q20** | **I ran a Family Math / Science Night, including coordinating activities with other teachers.** | 1 | 2% | 6 | 15% | Increase in math and science |
| **p2q21** | **I ran a School Science Fair or similar event (Science Olympiad, Invention Convention, etc.).** | –4 | -11% | 2 | 4% | More science (fewer math) teachers ran the school science fair or similar events |
| **p2q22** | **I coordinated a math / science -based field trip.** | –2 | -6% | 4 | 9% | More science (fewer math) teachers coordinated a math/science based field trip |
| **p2q23** | **I analyzed or processed data from mathematics / science assessments other than my own.** | 0 | -2% | 7 | 16% | More science teachers analyzed or processed data from assessments other than their own |
| **p2q24** | **I developed a mathematics / science intervention plan for students other than my own.** | 1 | 2% | 2 | 1% | More teachers developed a mathematics / science intervention plan for students other than their own |
| **p2q25** | **I wrote a mathematics / science -related grant.** | 2 | 5% | 1 | 3% | Little change |
| **p2q26** | **I was awarded a mathematics / science -related grant.** | 1 | 3% | 3 | 7% | Increase in math and science |
| **p2q27** | **I was selected for outside professional development (Sally Ride, G-Camp, Mickelson Exxon-Mobil, etc.** | –1 | -4% | 8 | 21% | Decrease in math, increase in science |
| **p2q28** | **I mentored another mathematics / science teacher on my campus.** | 6 | 15% | 6 | 15% | More math and science teachers mentored another teacher on their campus |

| | | | | | | |
|---|---|---|---|---|---|---|
| **p2q29** | **I provided mathematics / science training or assistance to parents.** | 3 | 8% | 0 | 0% | More math teachers provided training or assistance to parents |
| **p2q30** | **I provided mathematics / science training or assistance to other members of the community.** | –1 | -3% | –1 | -3% | Decrease in math and science |
| **p2q31** | **I was a member of my school's decision-making team, which made recommendations about mathematics / science instruction and materials on my campus.** | –1 | -4% | 0 | -2% | Decrease in math teachers being part of the school's decision-making team |
| **p2q32** | **I wrote or revised district mathematics / science curriculum.** | –2 | -7% | –1 | -5% | Small change in the number of teachers involved in revising the district curriculum |
| **p2q33** | **I was featured/acknowledged by my campus.** | 1 | 2% | 2 | 4% | Slightly more math and science teachers were featured/acknowledged by their campus |
| **p2q34** | **I was awarded Teacher of the Year for my campus.** | –3 | -9% | –4 | -11% | Decrease in the number of science teachers awarded Teacher of the Year – Campus |
| **p2q35** | **I was awarded Teacher of the Year for my district.** | 1 | 3% | 0 | 0% | Small change in the number of teachers awarded Teacher of the Year - District |
| **p2q36** | **I was awarded Teacher of the Year for the state.** | 0 | 0% | 0 | 0% | No change in the number of teachers awarded Teacher of the Year - State |
| **p2q37** | **I was awarded Teacher of the Year for the nation.** | 0 | 0% | –1 | -3% | Small decrease in the number of science teachers awarded Teacher of the Year - Nation |
| **p2q38** | **I received another mathematics /science related award.** | 2 | 6% | 0 | -1% | Small increase in math |

# Appendix A4. Leadership part 3, questions 1–3

| Leadership part 3 Q1: treatment pre-test vs post-test | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Score** | | **0** | | **1** | | **2** | | **3** | | **Sum** | |
| | | I lack the skills, abilities, resources or confidence to be a science leader and so, at this time, don't really want to be a mathematics / science leader. | | I have some of the skills (etc.) needed to be a science leader, but need to develop further before I am willing to step up and be a mathematics / science leader. | | I have the skills (etc.) necessary to be a mathematics / science leader and often employ them, but need to refine these skills to make me more effective. | | I have well developed skills (etc.) for being a mathematics / science leader and am ready, now, to assist others in developing these skills. | | | |
| | | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** |
| **p3q1** | **Math** | 2 | 0 | 7 | 2 | 20 | 16 | 6 | 17 | 35 | 35 |
| | **Science** | 0 | 0 | 8 | 4 | 22 | 16 | 7 | 18 | 37 | 38 |
| | **Total** | 2 | 0 | 15 | 6 | 42 | 32 | 13 | 35 | 72 | 73 |

| Leadership part 3 Q2: treatment pre-test vs post-test | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Score** | | **0** | | **1** | | **2** | | **3** | | **4** | | **Sum** | |
| | | I am not really a mathematics / science leader. I take care of my own classroom. | | I am somewhat of an informal mathematics / science leader. I occasionally help another teacher or two on my campus. | | I am an established informal mathematics / science leader. Without an official designation, I still consistently help a number of teachers on my campus in the area of mathematics / science. | | I am an official campus mathematics / science leader. I am designated as a grade level leader for mathematics / science, a mathematics / science department chair, campus mathematics / science specialist, etc. | | My leadership in mathematics / science extends beyond my campus. I am consistently asked to lead mathematics / science trainings or other mathematics / science activities for my school district. | | | |
| | | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** |
| **p3q2** | **Math** | 7 | 3 | 6 | 6 | 13 | 12 | 8 | 12 | 1 | 3 | 35 | 36 |
| | **Science** | 2 | 2 | 13 | 4 | 7 | 11 | 14 | 18 | 1 | 3 | 37 | 38 |
| | **Total** | 9 | 5 | 19 | 10 | 20 | 23 | 22 | 30 | 2 | 6 | 72 | 74 |

| Leadership part 3 Q3: treatment pre-test vs post-test | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Q3 Campus administration view of you as a mathematics/science leader? The administration–** | | | | | | | | | | | | | |
| **Score** | | 0 | | 1 | | 2 | | 3 | | 4 | | **Sum** | |
| | | only requires of me that I am responsible for my own mathematics / science classroom. | | allows, but does not require, that I assist other teachers in mathematics / science. | | encourages me to assist other teachers on campus in mathematics / science. | | trusts me to be a leader in mathematics / science on my campus in an official setting. | | depends on me, almost completely, to advance the mathematics / science program on campus. | | | |
| | | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** |
| **p3q3** | **Math** | 7 | 13 | 4 | 4 | 10 | 5 | 12 | 9 | 2 | 5 | 35 | 36 |
| | **Science** | 4 | 14 | 10 | 2 | 8 | 4 | 11 | 11 | 4 | 7 | 37 | 38 |
| | **Total** | 11 | 27 | 14 | 6 | 18 | 9 | 23 | 20 | 6 | 12 | 72 | 74 |

# Appendix A5. Leadership test statistical differences for parts 1–3

| | Part 1 total scores | | | | P value | Part 2 total scores | | | | P value | Part 3 total scores | | | | P value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test whether significant difference exists in part 1, 2, or 3 total scores between pre data and post data** | | | | | | | | | | | | | | | |
| **All** | | **N** | **p1score** | | **<.0001** | | **N** | **p2score** | | **0.0013** | | **N** | **p3score** | | **<.0001** |
| | | | **Mean** | **Std dev** | | | | **Mean** | **Std dev** | | | | **Mean** | **Std dev** | |
| | **post** | 79 | 6.53 | 3.50 | | **post** | 79 | 9.04 | 4.81 | | **post** | 79 | 6.63 | 2.72 | |
| | **pre** | 79 | 4.97 | 2.89 | | **pre** | 79 | 7.58 | 4.85 | | **pre** | 79 | 5.24 | 2.91 | |
| **Math** | | **N** | **p1score** | | 0.0819 | | **N** | **p2score** | | 0.2075 | | **N** | **p3score** | | **<.0001** |
| | | | **Mean** | **Std dev** | | **date** | | **Mean** | **Std dev** | | | | **Mean** | **Std dev** | |
| | **post** | 36 | 6.92 | 4.15 | | **post** | 36 | 7.92 | 3.72 | | **post** | 36 | 6.69 | 2.34 | |
| | **pre** | 35 | 5.60 | 2.78 | | **pre** | 35 | 7.20 | 4.21 | | **pre** | 35 | 5.51 | 2.62 | |
| **Science** | | **N** | **p1score** | | **<.0001** | | **N** | **p2score** | | **0.0013** | | **N** | **p3score** | | **<.0001** |
| | | | **Mean** | **Std dev** | | | | **Mean** | **Std dev** | | | | **Mean** | **Std dev** | |
| | **post** | 38 | 6.92 | 2.12 | | **post** | 38 | 10.95 | 4.63 | | **post** | 38 | 7.24 | 2.29 | |
| | **pre** | 37 | 5.32 | 2.33 | | **pre** | 37 | 9.38 | 4.42 | | **pre** | 37 | 5.97 | 2.44 | |
| **Test whether significant difference exists in part 1, 2, or 3 gain scores (post-pre) between comparison and treatment groups** | | | | | | | | | | | | | | | |
| **All** | | **N** | **p1score** | | 0.1125 | | **N** | **p2score** | | 0.3038 | | **N** | **p3score** | | **0.001** |
| | **Comparison** | | **Mean** | **Std dev** | | **Comparison** | | **Mean** | **Std dev** | | **Comparison** | | **Mean** | **Std dev** | |
| Treatment | 0 | 68 | 1.26 | 2.35 | | 0 | 68 | 1.40 | 3.43 | | 0 | 68 | 1.38 | 1.45 | |
| Comparison | 1 | 15 | 0.27 | 1.39 | | 1 | 15 | 0.40 | 3.09 | | 1 | 15 | –0.13 | 2.10 | |
| **Math** | | **N** | **p1score** | | 0.8983 | | **N** | **p2score** | | 0.4418 | | **N** | **p3score** | | **0.019** |
| | **Comparison** | | **Mean** | **Std dev** | | **Comparison** | | **Mean** | **Std dev** | | **Comparison** | | **Mean** | **Std dev** | |
| Treatment | 0 | 31 | 0.74 | 2.29 | | 0 | 31 | 0.84 | 3.62 | | 0 | 31 | 1.39 | 1.69 | |
| Comparison | 1 | 7 | 0.86 | 1.07 | | 1 | 7 | –0.29 | 2.43 | | 1 | 7 | –0.57 | 2.76 | |
| **Science** | | **N** | **p1score** | | **0.0268** | | **N** | **p2score** | | 0.506 | | **N** | **p3score** | | **0.027** |
| | **Comparison** | | **Mean** | **Std dev** | | **Comparison** | | **Mean** | **Std dev** | | **Comparison** | | **Mean** | **Std dev** | |
| Treatment | 0 | 37 | 1.73 | 2.33 | | 0 | 37 | 1.86 | 3.24 | | 0 | 37 | 1.38 | 1.23 | |
| Comparison | 1 | 8 | –0.25 | 1.49 | | 1 | 8 | 1.00 | 3.63 | | 1 | 8 | 0.25 | 1.39 | |

***Bold** highlight = p-values < .05.

# Appendix A6. Leadership test—effect sizes for treatment group performance

| Computed effect sizes using all treatment data | | | |
|---|---|---|---|
| Cohen's d effect size<br>Small 0.2; medium 0.5; large 0.8 | | | |
| **Variable** | **Mean** | **Std dev** | **Effect** |
| Part 1 score | 1.56 | 3.21 | 0.5 |
| Part 2 score | 1.46 | 4.83 | 0.3 |
| Part 3 score | 1.39 | 2.82 | 0.5 |

| Computed effect sizes using math treatment data | | | |
|---|---|---|---|
| Cohen's d effect size<br>Small 0.2; medium 0.5; large 0.8 | | | |
| **Variable** | **Mean** | **Std dev** | **Effect** |
| Part 1 score | 1.32 | 3.54 | 0.4 |
| Part 2 score | 0.72 | 3.97 | 0.2 |
| Part 3 score | 1.18 | 2.48 | 0.5 |

| Computed effect sizes using science treatment data | | | |
|---|---|---|---|
| Cohen's d effect size<br>Small 0.2; medium 0.5; large 0.8 | | | |
| **Variable** | **Mean** | **Std dev** | **Effect** |
| Part 1 score | 1.60 | 2.23 | 0.7 |
| Part 2 score | 1.57 | 4.53 | 0.3 |
| Part 3 score | 1.26 | 2.37 | 0.5 |

# Appendix A7. Leadership test—gain score effects for treatment vs comparison group pre to post performance

| Computed effect sizes using all data treatment vs comparison | | | |
|---|---|---|---|
| Cohen's d effect size small 0.2; medium 0.5; large 0.8 | | | |
| **Variable** | **Mean** | **Std Dev** | **Effect** |
| Part 1 score | 1.01 | 2.21 | 0.5 |
| Part 2 score | 1.00 | 3.38 | 0.3 |
| Part 3 score | 1.52 | 1.58 | 1.0 |

| Computed effect sizes using math data treatment vs comparison | | | |
|---|---|---|---|
| Cohen's d effect size small 0.2; medium 0.5; large 0.8 | | | |
| **Variable** | **Mean** | **Std Dev** | **Effect** |
| Part 1 score | –0.12 | 2.14 | –0.1 |
| Part 2 score | 1.12 | 3.45 | 0.3 |
| Part 3 score | 1.96 | 1.91 | 1.0 |

| Computed effect sizes using science data treatment vs comparison | | | |
|---|---|---|---|
| Cohen's d effect size small 0.2; medium 0.5; large 0.8 | | | |
| **Variable** | **Mean** | **Std dev** | **Effect** |
| Part 1 score | 1.98 | 2.21 | 0.9 |
| Part 2 score | 0.86 | 3.31 | 0.3 |
| Part 3 score | 1.13 | 1.26 | 0.9 |

# Appendixes B1–B4. Content tests

# Appendix B1. Earth science

| Earth science | | | |
|---|---|---|---|
| **Treatment: pre vs post** | | | |
| | **Category** | **Mean change** | **P value** |
| **Knowledge type** | **Dec.** | 0.04 | 0.6427 |
| | **Inq.** | –0.04 | 0.6252 |
| | **Sch.** | –0.61 | **0.0003** |
| | **Ped.** | –1.06 | **<.0001** |
| | **TOTAL1** | –1.67 | **<.0001** |
| **Content subcategory** | **Atmo/ hydrosphere** | –0.21 | **0.0032** |
| | **Lithosphere** | –0.15 | 0.2354 |
| | **Solar system** | –-0.25 | 0.115 |
| | **TOTAL2** | –0.61 | **0.0043** |
| | **STS** | –0.26 | **0.0481** |

***Bold** highlight = p value < .05

| Earth science | | | |
|---|---|---|---|
| **Effect size<br>Small 0.2; medium 0.5; large 0.8** | | | |
| **Variable** | **Mean** | **Std dev** | **Effect** |
| **Dec.** | 0.04 | 0.50 | 0.1 |
| **Inq.** | –0.04 | 0.49 | –0.1 |
| **Sch.** | –0.61 | 1.63 | –0.4 |
| **Ped.** | –1.06 | 2.29 | –0.5 |
| **TOTAL1** | –1.67 | 3.89 | –0.4 |
| **Atmo/ hydrosphere** | –0.21 | 0.44 | –0.5 |
| **Lithosphere** | –0.15 | 1.06 | –0.1 |
| **Solar system** | –0.25 | 1.01 | –0.2 |
| **TOTAL2** | –-.61 | 1.89 | –0.3 |
| **STS** | –0.26 | 0.69 | –0.4 |

# Appendix B2. Physical science

| Physical science | | | |
|---|---|---|---|
| **Treatment: pre vs post** | | | |
| | **Category** | **Mean change** | **P value** |
| **Knowledge type** | **Dec.** | –0.29 | **0.0185** |
| | **Inq.** | –0.01 | 0.9277 |
| | **Sch.** | –0.10 | 0.4619 |
| | **Ped.** | –0.39 | **0.0230** |
| | **TOTAL1** | –0.79 | **0.0192** |
| **Content subcategory** | **Matter** | –0.24 | **0.0340** |
| | **Motion & force** | –0.29 | **0.0495** |
| | **Energy** | 0.13 | 0.4051 |
| | **TOTAL2** | –0.40 | 0.1246 |
| | **STS** | –0.29 | |

***Bold** highlight = p value <.05

| Physical science | | | |
|---|---|---|---|
| **Effect size Small 0.2; medium 0.5; large 0.8** | | | |
| **Variable** | **Mean** | **Std dev** | **Effect** |
| **Dec.** | –0.29 | 0.83 | –0.4 |
| **Inq.** | –0.01 | 0.97 | 0.0 |
| **Sch.** | –0.10 | 1.05 | –0.1 |
| **Ped.** | –0.39 | 1.44 | –0.3 |
| **TOTAL1** | –0.79 | 3.11 | –0.3 |
| **Matter** | –0.24 | 0.74 | –0.3 |
| **Motion & Force** | –0.29 | 1.08 | –0.3 |
| **Energy** | 0.13 | 0.96 | 0.1 |
| **TOTAL2** | –0.40 | 2.09 | –0.2 |
| **STS** | 0 | 0 | . |

# Appendix B3. Life science

| Life science | | | |
|---|---|---|---|
| **Treatment: pre vs post** | | | |
| | **Category** | **Mean change** | **P value** |
| **Knowledge type** | **Dec.** | 0.19 | **0.0013** |
| | **Inq.** | 0.53 | **<.0001** |
| | **Sch.** | –0.94 | **<.0001** |
| | **Ped.** | | |
| | **TOTAL1** | –0.22 | 0.2946 |
| **Content subcategory** | **Structure/function** | 0.21 | **0.0046** |
| | **Internal regulation** | –0.15 | 0.0549 |
| | **Heredity, diversity** | –0.07 | 0.5621 |
| | **Interdependence** | –0.21 | 0.1000 |
| | **TOTAL2** | –0.22 | 0.2946 |
| | **STS** | –0.33 | **<.0001** |

***Bold** highlight = p value <.05

| Life science | | | |
|---|---|---|---|
| **Effect size Small 0.2; Medium 0.5; Large 0.8** | | | |
| **Variable** | **Mean** | **Std dev** | **Effect** |
| **Dec.** | 0.19 | 0.35 | 0.6 |
| **Inq.** | 0.53 | 0.92 | 0.6 |
| **Sch.** | –0.94 | 0.94 | –1 |
| **Ped.** | 0.00 | 0.00 | . |
| **TOTAL1** | –0.22 | 1.60 | –0.1 |
| **Structure/function** | 0.21 | 0.49 | 0.4 |
| **Internal regulation** | –0.15 | 0.43 | –0.4 |
| **Heredity, diversity** | –0.07 | 0.87 | –0.1 |
| **Interdependence** | –0.21 | 0.77 | –0.3 |
| **TOTAL2** | –0.22 | 1.60 | –0.1 |
| **STS** | –0.33 | 0.38 | –0.9 |

# Appendix B4. Effects for combined science

| All teachers (N = 72) | | | |
|---|---|---|---|
| I | –0.06 | 1.08 | –0.1 |
| II | 0.47 | 1.58 | 0.3 |
| III | –1.65 | 2.82 | –0.6 |
| IV | –1.44 | 3.45 | –0.4 |
| total1 | –2.68 | 7.25 | –0.4 |
| total2 | –1.24 | 4.49 | –0.3 |
| sts | –0.60 | 0.77 | –0.8 |

| Math Teachers (N = 37) | | | |
|---|---|---|---|
| **Variable** | **Mean** | **Std dev** | **Effect** |
| I | –0.05 | 1.05 | –0.1 |
| II | 0.92 | 1.51 | 0.6 |
| III | –1.51 | 2.54 | –0.6 |
| IV | –1.46 | 2.45 | –0.6 |
| total1 | –2.11 | 5.44 | –0.4 |
| total2 | –0.65 | 3.90 | –0.2 |
| sts | –0.59 | 0.71 | –0.8 |

| **Variable** | **Mean** | **Std dev** | **Effect** |
|---|---|---|---|
| I | –0.06 | 0.97 | –0.1 |
| II | 0.00 | 1.45 | 0.0 |
| III | –1.80 | 2.25 | –0.8 |
| IV | –1.43 | 3.18 | –0.4 |
| total1 | –3.29 | 6.11 | –0.5 |
| total2 | –1.86 | 3.72 | –0.5 |
| sts | –0.60 | 0.85 | –0.7 |

# Appendixes C1–C2. Mathematics and science needs assessments

# Appendix C1. Mathematics needs assessment

## Math knowledge 1

| Variable | N | Mean | Std dev | p value | Effect |
|---|---|---|---|---|---|
| **p1q2_pre** | 33 | 17.64 | 3.75 | **0.015** | 0.6 |
| **p1q2_post** | 33 | 20.21 | 4.29 | | |

***Bold** highlight = p-value < .05.

## Math knowledge 2

| Variable | N | Mean | Std dev | p value | Effect |
|---|---|---|---|---|---|
| **p1q3_pre** | 33 | 20.21 | 5.40 | **0.0002** | 0.6 |
| **p1q3_post** | 33 | 23.39 | 5.33 | | |

***Bold** highlight = p-value < .05.

# Appendix C2. Science needs assessment

## Science knowledge 1

| Variable | N | Mean | Std Dev | p value | Effect |
|---|---|---|---|---|---|
| **pre** | 34 | 41.71 | 9.78 | **<.0001** | 0.6 |
| **post** | 34 | 47.74 | 10.36 | | |

***Bold** highlight = p-value < .05.

## Science knowledge 2

| Variable | N | Mean | Std Dev | p value | Effect |
|---|---|---|---|---|---|
| **pre** | 34 | 20.18 | 4.53 | **<.0001** | 1.1 |
| **post** | 34 | 24.85 | 4.35 | | |

***Bold** highlight = p-value < .05

## Whole Class Discussion and Explanation

| Variable | N | Mean | Std Dev | p value | Effect |
|---|---|---|---|---|---|
| **pre** | 34 | 7.12 | 0.95 | **0.0167** | –0.4** |
| **post** | 34 | 6.68 | 1.07 | | |

***Bold** highlight = p-value < .05

**Slightly below the .5 (medium) threshold for inclusion, but statistically significant

# Appendixes D–E. Professional development (PD) logs for science and mathematics participants

# Appendix D. Professional development (PD) logs—selected mathematics participants

(Note: Participants completed the logs online. Their responses presented are verbatim, so any typos or grammatical errors were not corrected.)

| Day 1 | Day 2 | Day 3 |
|---|---|---|
| **What small steps might you begin to take now to shift existing lessons to become more connected in mathematics and science?** | **What immediate steps can you take to begin to align your mathematics and science terminology? After participating in Woodles, what changes might you make in your instructional delivery of new vocabulary?** | **What similarities did you see between the NGSS Scientific Practices and Common Core Standards for Mathematical Practice? After participating the Standards Circus, what changes might you make in lesson preparation in regards to focusing on sound mathematics/science practices?** |
| I think it important for us to make sure we are using the same vocabulary when applicable so students see the direction between math and science. I also think communication between my science partner and I are going to be key in order to find ways to "help" each other with our curriculum. | One way to align the mathematics and science terminology is to identify the TEKS in which we can collaborate and makes sure we are using the same vocabulary. The students will see that a correlation between the contents. After participating in Woodles activity, I see the importance in providing visual representations when possible and allowing students to make predictions. Its okay if they are not necessarily correct, but let them go through the process | The NGSS scientific practices and common core standards for mathematical practice both allow for critical thinking. With both math and science, it allows for observations, analyzing data and making predictions to name a few. For math, I would used graphs activity making sure that students can choose appropriate graph. I would probably bring in terms like functions, slope and y-intercept into the mix. The bouncy ball activity can also be used to take about functionality and does the data create a linear function. |
| One step I might take now would be to collaborate with my science teachers to see if it is possible to the "Grand Scale" activity during the first couple of days of school. Another step I will take is to have a look at the science TEKS so that I know what they are and look at ways to incorporate them into my lessons. | An immediate step that can be taken is look at the science TEKS and see what TEKS can be aligned to math. After seeing what TEKS align collaborate with the science teacher to see if we are able to combine our lessons. After participating in the Woodles activity I will have an activity where the students are engaged and activity. During the activity students will be able to come up with their own definitions and it opens up the door for more discussion. Another change I learned from the woodles is to try and have an example or a picture of the vocabulary word so the students are able to see the word and apply it to the definition. | Similarities that can be seen in the NGSS Scientific Practices and Common Core Standards for Mathematical Practices are constructing explanations (NGSS) and make sense of problems and persevere in solving them (CCSMP). During both of these practices the students are explaining the meaning of a problem or attempting to explain. Another similarity is constuct variable arguments and crrittique the reasoning of others and analyzing and interpreting data. |
| I will collaborate with the science teacher at my school. We will compare objectives to see which ones work well to teach together. I will give my students more opportunities to investigate ideas, form conclusions and test those | We will determine which science and math objectives can be intertwined together. We will then decide the essential skills that we want the students to master, before creating activities to help the students master these skills. Vocabulary will never be the same in my classroom again. | Reasoning abstractly aligns with using mathematics and computational thinking. Construct viable arguments and critique the reasoning of others aligns with constructing explanations and engaging in argument from evidence. Look for make use of |

| | | |
|---|---|---|
| conclusion. | Woodles was definitely a very eye-opening experience. I'm not exactly sure what I will do with it, but it will no longer be writing definitions from the book, and using additional unknown words to define it. | structure aligns with analyzing and interpreting data. I will make sure to use student discussions throughout my lesson so the students can learn to talk about mathematics and re respectful of others' opinions. I will continue to have students work with maniuplatives so that students can form visual models of mathematics. |
| I will reconstruct my lessons in Math and Science by collaborating with the other teachers and discussing how the teks for Math and Science work together and coming up with different strategies for the students to become more active in the lessons. | What immediate steps can you take to begin to align your mathematics ad science terminology? In order to align mathematics terminology is by first finding out what terms that are used in science, then compare them to the terminology with math. I would make sure the the different terms would have the same meaning and explain how the terms differ in math and science and how they are alike. After participating in Woodles what changes might you make in your instructional delivery of new vocabulary? The changes that I would make in he use and understanding of vocabulary words is to first make sure that the students have a through understanding of the vocabulary term and how to apply the term by explanation, visuals, and demonstrating the word in a equation or problem. I would then ask if there any questions to make sure the students understood what and how to use the word. | In the assignment for today in every situation there was a word problem that could be written in a mathematical equation. First we had to understand the language being used and then figuring a way to come up with a solution of what each element or phase. In the lesson that envolved the elements I would have liked to have started with the simplest element first then work my way up to the advanced elements, in order to have a better understanding of what the atomic mass means and how to solve for the singular elements. |
| Getting students excited about mathematics and sciences can be a challenge. By allowing students to explore their thinking in a variety of ways in both math and science classrooms will foster a community of inquiry in the classroom. The inquiry activity today was a great example of this - it challenges learners to not only ask, but also attempt to answer the questions that are generated in groups. When students are the ones asking the questions, it can lead to some real-world connections that they discover themselves. So many times we hear students ask the questions, "When will I ever use this? Why does this matter?" Taking an inquiry-based approach to teaching in math and science classrooms can allow for the real-world connections to be made. I'd like to work together with the science teacher on my campus to develop a sort of "inquiry-based learning plan" that we can both use regularly in our classrooms. I'd also like to review the 8th | TEK wording. We want to try to eliminate the wall that separates the science classroom from the math classroom, and one easy way to start to break that down is by using common language across the board. Use science vocabulary words in math class; use mathematical language and processes in science class. The Woodles activity was awesome and something I am going to share with my principal we go back to school this fall. How eye-opening it is to see how it feels to be in a classroom in which you don't understand the language. Teacher-centered vs. Student-centered classrooms are going to be a big focus on our campus this coming year, and I plan to implement this activity during one day of our back-to-school professional development sessions. Introducing vocabulary to students can be done in a variety of ways; the best way for them to truly understand the meaning of the words, though, is to allow them to explore and discover the meaning on their own. Constructivism is a theory that states that all knowledge is built on experiences - so, why not let our students experience new things in the classroom? Let them create their own definition for the | The NGSS scientific practices and common core standards for mathematical practice have a lot of overlap. I think that is what was key from today's activity. We were able to circulate around the room and pinpoint both math and science process standards that would fit each station or activity. Although most of them seemed to be geared towards science TEKS, that doesn't mean that only science process standards are applicable. There are many mathematical process standards that are naturally embedded into science experiments and exploration activities. And, in turn, there are several science process standards that are naturally embedded into math activities that utilize the common core state standards for mathematical standard practices. After participating in the standards circus, I plan to work with my science partner to look at specific lessons and to see where these natural overlaps could happen in the classroom. |

| | | |
|---|---|---|
| grade TEKs and scope and sequence and see where I can use some science TEKs to support the classroom content being presented in 8th grade math. What better way to answer the, "when will I ever use this?" question than to support it with science! | word or words and simply guide them. | |
| My brain hurts. I think we were just getting into the planning that I would really like to be able to work on. The pretest for Science was difficult but I was pretty confident about the math one.<br>I am really looking forward to working with these people.<br>Found Dr. Tapia's talk over my head, but was interesting and would like to know more about his work. I liked the idea of using the scientists with the QR codes to hang in the class for students to look up or research.<br>Note- I may want to post inquiry type questions weekly or every couple of weeks in my classroom. | To align mathematics and science terminology, my science teacher and I can discuss lessons and the way we address certain topics within our subject area. Once we begin aligning lessons, we can go over prerequisite vocabulary and align the vocabulary words.<br>The Woodles lesson was very enlightening and really made me think about different ways to introduce vocabulary. I can really see this as a way to make my word wall an integral part of our class instead of just posting things we have recently covered.<br>My partner and I would like to use this lesson with our staff when we return to campus this year. I can use it to introduce functions, linear functions and other topics particularly those involving shapes our real world concept. | The circus activity really helped me see the possible integration that can be done between the 8th grade science and Algebra I curriculum. The underlying processes share several components. We found several underlying processes addressed in each activity so that my science partner and I can integrate more lessons than originally thought possible.<br>Several of the underlying process in both were similar and I love the "cheat sheet" to help us figure out which really applies. |
| I think we have started this process by looking at the TEKS in both science and math. I have not looked at the science TEKS, so this was an opportunity for me to see the TEKS and how I could incorporate science in my classroom.<br>Now to dig into those lessons!!!!! | I would need to know all the terminology that is used by both science and math. Then i can incorporate these shared words in my lessons. I already believe that vocabulary should be learned as part of the lesson and not as a component by itself. Woodles really showed how you can effectively incorporate the vocabulary into the lesson and not waste time doing at the beginning or as homework. I will continue to introduce the vocabulary through my engage, or explore activities and clarify misconceptions during the explain and elaborate sections of my lesson. | I was surprised at how many of the process standards could be interpreted the same. Also, how depending on how you read them, you might have thought of a different standard then another person. I would love to do this activity have my students think about what is actually being asked and what they need to do. Due to time, I would probably select 3 or 4 of them so that they could actually have time to discuss the activity in detail. |
| Engage with fellow science teachers to correlate TEKS for shared lessons. | Align mathematics and science terminology<br>Expand the definition of words like 'rotation' from simply a mathematical perspective to a science one by including the meaning of rotation from a science perspective.<br>Effect of Woodles in my instructional delivery of new vocabulary<br>Avoid presenting vocabulary before the lesson, and use a series of engaging activities that allow the students to experience what the new term could mean.<br>Allow students to use their own words to define a new term. | Similarities between the NGSS Scientific Practices and Common Core Standards<br>Their process skills used to understand concepts are the same, e.g identifying patterns, representing data with models...<br>Changes to Lesson Preparation<br>Identify clearly what i want the students to learn and be very intentional in planning the process skills that will guarantee student success in understanding the content. |
| **NO LOG ENTRY** | **NO LOG ENTRY** | **NO LOG ENTRY** |
| I would study the TEKS to see how the lessons coincide together. Afterwards, I would structure | I would let the students explore hands-on for the vocabulary words. In addition to that, I would let the | I would go more in depth with the mathematical aspect with the circus activity. I would add more time |

| | | |
|---|---|---|
| the lessons based on the comparison that I studied in the TEKS. | students make some type of real-life connection to help them remember the definition. Afterwards, I would start teaching the lesson involving the vocabulary related to what they have just explored. Students should be able to connect to the lesson the vocabulary words which they have just learned. | so that students will be able to explore and attend all circus activities. |
| Now that I have seen the concepts taught in both Math and Science at the 8th grade level, I will begin to examine both sets of curriculum to see how both are related. I have already found that many of the weak areas that my partner has in her science class are similar to the weak areas found in my Algebra students. I plan to plan closely with my partner so that we can reinforce the concepts being taught in both classroom. I will be continuously finding ways of incorporating the concepts from both classes. I also think I can encourage my students to inquire more and take control of their learning process. | When introducing new vocabulary, it is important that students not only understand the vocabulary but have the maximum exposure to the new terms. Remote memorization of a word does not work; students should be able to implement the word in their daily life. Along with introducing the word through a discussion, students must be able to connect the word to real-life situation. I intend to use a variety of hands-on activities while also using the word on a regular basis so that it becomes part of their own vocabulary. | The objectives in the NGSS Scientific Practices and Core Standards have many similarities. Much of what students do in science and math classes in terms of investigations, analytical skills, and critical thinking are the same. After the circus, I think I can use these standards by incorporating them into my lesson plans. Using these words and allowing my students to use these standards will make my lessons more effective. |
| Steps to take:<br>Collaboration with Science team member<br>Lesson design with Math and Science TEKS in mind<br>Closely look at pacing guides and align possible activities that match both subjects | Constant communication with my Science partner is a non negotiable to achieve terminology alignment between Math and Science.<br>Vocabulary needs to be explore by the students not given by the teacher. When students discover for themselves new terminology learning is facilitated. | Analyzing the main goal of the activity is crucial. As a teacher I need to pay close attention to I want to accomplished with the inquiry lesson, if I do not have a a clear vision of the process and skill I want the students to be exposed to learning is not facilitated and time is not maximize. |
| Talk with science teachers and compares topic that we do the same. Then talk about we can intergrade the to topics to create a lesson that connects with both subject areas. Use real life examples from science to discuss math concepts. | After the woodles, I would say that I will let the students be active in the learning of vocabulary. That if they can make association with the vocabulary then they can internalize it. Adding visual representation that the students create to help clear up their understanding of the word. Math and science and talk about common vocabulary that is seen in both subjects. They can discuss how they presented the word to the students and the teacher can make reference and differ if needed. The student can be hands o with coming up with the vocabulary to give them a better understanding of the words. | There was some common vocabulary used. In both subjects they have process that are common and more than one process connects with each of the stations. Making the difference clear on common vocabulary to the students. You can also make connections to each subject that show how they cross over with each other. |
| nice to compare the science Teks to math. When available, compare scope and sequence. | The main thing I saw was what I do as far just giving out the vocabulary words. This opened my eyes to the way I wish to present new subject matter to the students...not bad...am going to try this... | I saw the similarities when working equations and the use of the scale. This I already use in class today. |
| Currently I'm very familiar with the science TEKS, therefore the first small step i would take is to analyze the mathematics TEKS. This will | I need to first familiarize myself with the science and math terminology that can be aligned. I have never presented vocabulary in the way that Christina did on today. I believe | While planning my lesson I will identify the science practices that will be covered. Also I will require students to identify practices at the end of the lesson. |

| | | |
|---|---|---|
| enable me to determine which science and math TEKS can be aligned in a lesson. | that visual and tangible support is necessary in teaching science vocabulary. | |
| **Day 4** | **Day 5** | **Day 6** |
| **Reflect on the misconceptions we have discussed today. How can common misconceptions in mathematics and science be used to create more engaging lessons?** | **What real-world applications did you see during your tour of ConocoPhillips that can potentially be expanded upon for a lesson? What other real-world connections to the TEKS came to mind during the week?** | **Today you have had the opportunity to work on a lesson that is a mixed between a guided and open inquiry. What are your immediate thoughts on this type of lesson, its potential, and its practical implementation?** |
| Identifying misconceptions can be brought up during the engagement portion of the lesson. Then exploration can be used to have the students test the "misconceptions." I do believe having an activity that will contradict a concept will be more meaningful to the students than being told about their misconception. | I found the "fracking" lesson interesting. I like the fact that the lesson shows the use of exponents, slope and even deviations in real world scenarios. Although it may not necessary be relevant to the kids (depending on each students exposure) they can see that these concepts are being used in the real world. I have really enjoyed the science projects that we have done in class. I think they will definitely provide a more conceptual understanding of math and how it is used outside of "math" class. | I did enjoy the lesson. It definitely has its potential. I would have to work with my science partner to see how we could make it practical within our classes. I would also have to take into consideration time and facilitating them into the direction of the objective. |
| I believe misconceptions open the discussion more. For example today when we were talking about the satellites at the beginning of the science lesson. I was the only one at my table that chose the A, everyone else chose all the above. When we were able to discuss we all explained why we chose the answer we did and they were a me to explain to me why each one is a satellite. When addressing a students misconception in a math or science class you have the opportunity to open a discussion about it as well as demonstrate why the misconception is wrong. | Mrs. Jen Gabler's presentation on "Listening to cracks in the Earth: using Math at Conoco Phillips" talked about how math is used when they are figuring out where to dig for oil. This was on real-world application that I saw where math was used because we talked about probability. A TEK that 8.5(D) use a trend line that approximates the linear relationship between bivariate sets of data to make predictions. Trend lines are used in Jen's job. | I don't think I would use open inquiry with my students for this lesson. My group had trouble during the experiment that I believe my students would also face if they had to complete this experiment. I think over time I would be able to have guided inquiry with my students, but the idea of using open inquiry would definitely take time. |
| Students come into math class with many conceptional misconceptions based on incomplete ideas taught or assumed in their previous math classes. These misconceptions can be challenged during small group and class discussions. It is important to know what puzzle pieces have been misplaced, and get them correctly relocated so that the correct information can replace the misinformation and be reinforced as often as possible. | I have realized how important analyzing data, and communicating and representing trends within the data is for the real world. I am concerned as to why the TEKS have eliminated all but 1 Readiness Standards from Data Analysis from the 8th grade. I do still have a question as to how the summative assessments for these activities look. Are the Essential Questions the summative portion and the Engage, Explore, and Explain the formative assessments? | My immediate thoughts are that this took too much time to investigate with all of the objectives we have to cover and all the questions that could possibly been asked in this investigation. I feel it may be better to guide the explorations a little more in order to horn in onto specific objectives. This was just too open for my current comfort level. |
| The misconceptions we discussed today will allow the students to have a better understand of the mistakes taught in their early years of | Real-world applications that I can apply to my classroom during my visit at ConocoPhillips is: Finding the locations of cracks in the earth's surface for exploration of oil. For each | My thought on this lesson of guided and open inquire allow the student to ask those criticall questions futhering their thought and learning process. I will try |

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| their education can have wrong solutions when answering questions. We can use the misconceptions by engaging the students prior knowledge and new knowledge on elaborting on the subject. Allowing the student to have an higher order of thinking. | crack that is located, Pythagoras Theorem is used. Also using exponents in the power of 10 to give the magnitude for the cracks. Simple math such as addition, subtraction, multiplying, dividing, and statistics are also used in a numerous jobs at ConocoPhillips. My tour at ConocoPhillips was very well rounded. I am very pleased to have been a part of this program and to have experience meeting and listening to the speeches of the people that work at ConocoPhillips. PS. I love my job. I am truly blessed to be apart of this program and to be making a difference in the lives of others. | to implement more of my lessons toward this assignment. |
| Misconceptions are a great probe to use to start class. It's something that can get students talking about the content matter, and listening to them can really show you the evidence (or lack there of) they have in constructing that false knowledge. It could also be used to start a debate in class, which could in turn lead to students talking to learn and using vocabulary. | The real-world application that I experienced and believe the be the most apparent during the tour of ConocoPhillips is problem solving. The entirety of the morning was spent in small groups, with each group tasked with the same challenge. We had to work together to communicate effectively, investigate problems, and generate ideas and solutions. There were multiple math and science TEKs involved in each challenge, but the TEKs that I believe shone through the most were the process standards. When we got the opportunity to sit down with the panel of ConocoPhillips employees, I asked them what they believed to be the most important math and/or science skills that we can teach to our students. Seeing that we are essentially preparing them for future jobs that don't yet exist, I was curious to get a perspective from those who work with math and science daily. The overwhelming response from the staff members was problem solving skills. It's interesting that although the TEKs may change, the process of problem solving will never go away. The mathematics process standards are exactly the same from K-12. This just goes to show how important it is for teachers to instruct students in a way that forces them to think analytically and to problem solve. | I think the lesson has potential. I liked starting with questions and inquiry. I also liked that we were given the choice as to what we wanted to test - and many of us didn't choose our own question. I thought that was pretty interesting. However, as the day progressed, it seemed like many of us were struggling to design an apparatus to work out our investigation. Our group particularly struggled with this for quite some time. Amber mentioned that it may have seemed like more of an engineering lesson at that point in time and I can agree. The problem I have with it though would be in a classroom setting with students who shut down or give up quickly. I think it would've been beneficial to our group today, and if you plan to do this in the future with students, to have step-by-step instructions, or even little reminders and tips as to how to set up the device. Even just a few reminders like, "keep as much tension in the strings as possible" or "make sure to limit the distance between the pulley and the string for your "track" would have been helpful today. I can see the practical implementations, but not for an 8th grade math class. I think the practicality of this lesson is a much higher level - vectors and such. I don't see myself using it in the future. It was too difficult to really measure and test what we were going for, and I don't think my students would get what I'd want them to get out of this lesson. The inquiry part could be useful to generate questions and "what if" scenarios, but the testing itself was just too difficult. |
| Misconceptions are sometimes difficult to get past in the classroom, but often important enough to address because prior knowledge is | We discussed the team building activities before we left and how each could be used in the classroom. Everything we did today can be expanded upon to be used | After today's lesson, the process really came together for me. The most important realization for me was that after the inquiry process, though it may take a lot |

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| involved in the learning of new material. It's important to provide a safe forum for students to explore misconceptions.<br>Sometimes simply asking "why?" Or "show me" will get them to question on their own.<br>Sometimes this will spark a debate among students and other students can explain and explore or present counter examples.<br>Unfortunately some misconceptions are deeply founded and have created the foundation for other misconceptions. As teachers, it's important that we continue to make the student uncomfortable enough with the belief to question the foundation. | in the classroom.<br>The mathematics lesson presented by Jen Gabler will be implementable almost as is in my PAP Algebra1 classes. Not entirely at once, but in pieces. Mr.Barclay's presentation on Analytic Innovation applies to data and analysis TEKS. I found the video particularly interesting as well as the MOOCs which I intend not only to start looking into for myself, but will find ones that my students can use as enrichment.<br>I enjoyed hearing from the professionals on the panel and will also use this information with my students and fellow teachers. | of class time up front, the actual time spent on the individual concepts or content should take be less instruction based on prior knowledge. Each inquiry lesson should deepen the student's understanding of the scientific process thus improving the quality of learning and depth of understanding.<br>As teachers improve in guided inquiry, student's ability to break barriers that have previously encumbered progress, created misconceptions and generally slowed the learning process can be overcome. |
| I loved how we had the intro with different pictures and how we went outside and actually modeled the rotation and revolutions. I really understand this now and I'm a math teacher. By engaging students, you can determine the direction your lesson needs to go. I believe grabbing the students attention and asking questions are very important at the start of a lesson. | The most obvious one was the use of Pythagorean theorem when we were completing the activity with the drilling and during the discussion later in the afternoon. I love that you can use real world connections that make more since then the shadow of a tree and your height! All week, now your making me think!!! There were a lot. We used the pennies, even Instagram and how we can connect math to simple everyday activities. It is like the panel said, you are using math, problem solving, groups and communication everyday. | I loved the lesson. We were able to think about the video and then design our own investigation, and then carry it out. I also enjoyed the discussion and presentations from the groups. I am actually trying to do some type of inquiry where students will have some materials, and then will design a plan to test their theory using these materials. I believe that any type of activity that has students thinking about the why and how is important and I can't wait to change the way I have been teaching. Now don't look for miracles over night! |
| Misconceptions in math are an opportunity to have students rebuild new knowledge by challenging their misconceptions through several and repeated exploration activities. | The fairly recent technique of drilling oil wells where one sinks a vertical pipe sub surface, and takes a 90 degree turn to the left to search for possible pockets of oil along a diagonal line can clearly be extended to a Pythagorean concept lesson.<br>The tremendous value of data, and the ability to make sense of that data by drawing graphs so that analysts can make predictions for cost effectiveness in the company illuminated the importance of teaching algebra with a more clear application to the way the world works, and needs math skills ( algebra, proportionality, probability...) This was most exciting to me, and motivated me to ensure that all my kids "get" algebra. It's a basic skill that will run our world. | Our lesson today leaned heavily on open inquiry, where the student was given too wide a space in which to operate in. For example when we were asked to come up with questions we had after watching the video on parachutes, we ended up with too many QWWNDWATT questions. A better guiding question which would make students investigation more meaningful would be to come up with questions which we can investigate right now and come up with a general conclusion. I strongly believe that open inquiry should be tethered by constant guidance, (not direction). Students should be encouraged to ask questions at various stages of their exploration and/explaining and the teacher can guide them in the general direction of her purpose of the lesson. Additionally, teachers could ask students questions with the intention to allow them to defend/explain their process before their final presentation.This is because throughout the process of exploration, many |

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| | | questions arise, and the students cannot be left on their own to continue exploration, or begin to communicate their findings with misconceptions. A teacher wants the final concept to be the correct one, and to be understood. I believe this can only happen with constant guidance.I like the idea of open inquiry, with a healthy dose of guidance. |
| **NO LOG ENTRY** | **NO LOG ENTRY** | **NO LOG ENTRY** |
| Common misconceptions can be used to create more engaging lesson by having the students investigate why these are misconceptions. Students should investigate each conception through research, analyzing, and graphing. After research, the students should present there information to class and proof. | The real-world applications that I saw during my tour at Conoco Phillips that could potentially be expanded upon for a lesson in class were the straw wires. I could use the straw wires in a surface area and volume activity lesson. Students would build their own figure. After building their own figure, they would find the surface area and volume of the figures. In doing so, they would have to measure to find the lengths of the straw wires. Another real-world connection that came to mind during the week was the Pythagorean Theorem TEKS. The straw wires could also be used in finding missing sides of the triangle by incorporating measurement. | My thoughts on the guided and open inquiry lesson is that it is very versatile for student learning. Guiding the learning of students leads them on the correct path before introducing open inquiry. The potential for student learning in this implementation is very useful for the student's overall learning ability. |
| Misconceptions can be used to provide more engaging more engaging activities through student investigations and observations. The article we read stated that we should not try to fix misconceptions but allow the students to acknowledge them and see how they notice the misconceptions and replace it with the correct observation. Based on what the students observe, they will be engaged in the lesson because now they have developed a new statement that overrides their old misconception. When creating a lesson, I would get into the mind of an 8th grader and list some common misconceptions so that I can plan activities in which they investigate certain situations. | The information presented provided real-world connections in the realm of math. Often times, students will ask the teacher "when will I ever use this in real life?" Today was definitely a day in which students see the application of math. For example, we learned about whether we can feel or see a charge in the seismic wave. I think that my lessons should have more real-world application so that they can connect ideas. | I actually enjoyed the lesson that we did today. I liked how we started with a high degree of inquiry after our initial experiment. After being guided to make the initial parachute (engage), we were then asked to come up with questions (inquiry) based on a variety of materials available. I think that mixing in guided lecture and inquiry changes the pace of the lesson and keeps the students engaged while also taking control of their learning. |
| Since misconceptions are best corrected by exploring and discovering why they are not accurate, they become the best platform to start inquiry in your classroom. Engaging students with a discovery activity not only corrects the misconception but also sets the tone for the lesson. | Calculating volume and surface area with the towers is an activity that I most definitely would like to explore. | My biggest concern is how do I move from guided to open inquiry without losing the essence of the skill taught. I feel more comfortable with the guided inquiry because I feel like I can guide them into what I want them to discover. Open inquiry seems more chaotic and nor structure. How do I master this skill as a teacher? |
| A misconception that was discuss today was | The process of listening for wells. You had to use | This lesson can be implemented into my classroom. |

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| the difference between rotation and revolve. You can let the students explore their misconception and see if they can prove that their idea was true or not. If you let the students explore and create their ideas and prove their own and change it if need be. | equations and thy touch on scientific notation. A lot of the presenters touch of many of the things that students want to know how it is used in the real world. | Since we will have 90 minute class. The students are able to actively learn the material and test out what they think may happen. I would do more guided inquiry than open inquiry. |
| Thought was extremely interesting in that many I related to how I have been teaching. In particular I found the examples given regarding math, were some I am going try and utilize in my classroom this year. I have found this book in general to be outstanding. The author gets right down to the real world...no foo foo..again real world info that can be utilized today by both the new and experienced teacher...again...good info. | ConocoPhillips was good because I can use the experience to relate to my class the different opportunities and oil and gas firm can offer. I can use my experience dealing with the combined company vs. when I in the pass dealt with both firms individually. The ability to show how math and science can relate both opportunities also are available. | Like most all of the assignment, these with modifications to the 5E which our district has used. It also ties with another style or another similar approach called Project Based Learning (PBL). What I have gained from this lesson as I have many of the lessons is that they are really not new...but re-focusing us to what ...for me...I have put on the back burner. I come away with trying to put these new projects all together in how I can take parts of one and work it into my scope and sequence that I am required to follow. Again, now back at this lesson and the others...it has opened my eyes to try and be a little more updated...more adventurous and hopefully continuing to get the positive results I have had in the past. I am anxious to see how my team and my administrators take to this approach...I think it will be positive! |
| Students come to class with a lot of preconcieved misconceptions. It is important to identify these misconceptions during the engaging piece, so that they may be addressed during the explore section. Allowing students to explore these misconceptions will spark their interest and help with resolving the misconception. | **NO LOG ENTRY** | I like this lesson because as we found out it could be really manipulated according to your class. For example if my class consisted of a large number of LEP student I would use guided instruction. If the I knew the class could handle open inquiry, I would use it and move into an Extened lesson as pointed out by Christina. |

| Day 7 | Day 8—9/26/2015 | Day 9—9/30/2015--Evaluation |
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| **How would you like to see the mentoring component of AMP! structured? (Monthly visits from AMP! teachers, as-needed visits, in-class visits, planning visits, phone conferences, etc.) Think about all you have done in AMP!. What are the AMP! Goals you would like to set for yourself to achieve in the upcoming year?** | **1. Which aspects of today's session were most beneficial to you?**<br>**2. Which aspects would you like changed? Please explain.**<br>**3. Share your plans for implementing today's lesson, "The Fast and the Curious".**<br>**4. What is one thing you would do to make the Fast and the Curious Activity work better in your classroom?**<br>**5. Please share any challenges you experienced in implementing AMP! lessons to date.**<br>**6. Please share your AMP! success stories. We want to share your successes with CoP.**<br>**7. Anything else you would like to share? (optional)** | **What was most useful about tonight's presentation?**<br>**What part of tonight's presentation could be improved in future sessions?**<br>**Share you thoughts on implementing any portions of tonight's Mathematics or Science sessions.**<br>**Are the TEKS that were covered this evening currently be covered on your campus, soon to be covered, or already finished?**<br>**Please provide any other feedback you would like to share. (optional)** |
| As far as the mentoring component, I think that an as needed visit/communication would probably be sufficient. My goal for this year is really to try to push out of my comfort zone and not be so afraid of the explore before explain concept. I definitely feel like I'm getting resistance from the students. The book did recommend to find ways to scaffold especially for the struggling students. This is still very new to me. I'm alway looking for ways to improve my teaching so I want to be able to say I genuinely tried this. | 1. I enjoyed going through the activities in which we could incorporate with math and science. It gives us better a better idea of where it starts.<br>2. With the big group, side conversations are very distracting especially people who would not stop talking.<br>3. I would be curious to see if could find a way to actually graph it so they can compare their scenarios with software app. That way they could practice slope intercept form.<br>4. See above.<br>5. Getting the kids to think about scenario give and not just shut down has been a struggle.<br>6. I feel like fish out of the water trying this stuff but I will continue little by little. | I appreciate the 3 different lessons you presented. It provides ideas of how we could incorporate it in the classroom.<br>Finding ways to streamline with the time constraints that we have in the classroom.<br>I like the idea of using the tiles to differentiate between volume and surface area. I think it will provide a visual representation. I also liked starting with rectangular and triangular prism and taking it to volume of cylinders.<br>We are going to start our measurement unit in about 2 weeks. |
| I would like to have planning visits and as-needed visits. My AMP! goals I am setting for myself is that by the end of the school year I would have implemented inquiry into my classroom at least 25% of the time. I understand it will not be full inquiriy, but some sort of inquiriy. | **NO LOG ENTRY** | I really enjoyed the cross street activity. I will try to implement this into my lessons. It was also good to talk to another 6th grade math teacher and see what she is doing in her classroom, how she is implementing inquiry in the classroom. |
| Since I assessed myself at a Level 1, I would like to see as much mentoring support as possible. This type of instruction is going to be a drastic change for me. I don't want to move to quickly for myself or for my students. My goal to to change the order of my Explore and Explain portions of a lesson. This will help my students learn to communicate and represent ideas mathematically. These skills will follow them | 1. Getting to know other people and being able to bounce ideas off of each other.<br>2. All of the sessions seem to be going at a really fast pace. I don't seem to have much time to process.<br>3. As approximately 1/3 of my eighth graders have accommodations, the class is not yet quite ready for bi-variate equations. This may be an activity to cover after the first semester.<br>4. I will need to pick groups very carefully. | 1. Most Useful - Being able to talk with fellow math teachers<br>2. Parts to improve - When passing out graph paper for last activity, tell teachers that they are not make a coordinate plane out of the paper.<br>3. Thoughts on implementation - While I do not teach the TEKS, my students are not yet learning about bi-variate equations. My advanced class is working on singe variable equations, while my regular class (50% |

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| throughout their lives, giving them career advantages. | 5. Since my school will be undergoing accreditation in a week, my partner and I haven't had very much time to collaborate.<br>6. See # 5.<br>7. I need more time to process. | with accommodations) is still working with expressions. I hope to be able to get to this activity during the third grading period (out of 4).<br>4. When covered - See answer 3. |
| I would like to see the mentor program structured by my mentor visit my class once a semester. I would like to also communicate with my mentor through email. If I have any questions about my lesson and my implementing inquiry, I would like to present it to my mentor for constructive criticism. My AMP goal/goals is to implement inquiry in the classroom and construct a 4Ex2 lesson model. | The Aspects of today's lesson the most beneficial to me was finding the slope by calculating the distance and time using a stop watch and a ruler to plots points on a graph.<br>What I feel the students will benifit out of these lessons is problem solving and coming up with a solution on how to get the solution.<br>The aspect I would like to change is Putting us in quadrant insted of letting us sit where we like.<br>I plan on implementing the he video on the big race.<br>A challenge I had was using cars that are not traviling at a constant speed. | **NO LOG ENTRY** |
| I must have forgotten to submit this one at the end of our Summer Session. Thinking back on it, I wasn't sure how the mentoring was going to go. Reflecting on it now, I wish I had utilized Daniel and Allen more and sooner. The start of the year is always so hectic that it was far from my mind getting other teachers into my classroom. Now that it's February, I'm begging them to come into my classroom and team teach an inquiry lesson with me. I guess my feelings have changed because I feel so much more comfortable with teaching in this style. It was relatively new to me at the start of the year. Goals would have been to try something new. I did. I have been. And I still am. It doesn't feel new anymore, either. It feels like just another day of inquiry in math. I'm proud of what I've accomplished this year when it comes to my teaching style. I've become comfortable and confident enough to guide teachers on my campus and help design inquiry lessons in their 6th and 7th grade math classes, too. | 5. The challenges that I've had thus far is that the science/math curriculua that Jennifer and I are required to follow are not lining up just yet. We will be implementing several of these lessons during the second and third nine week grading periods. Hopefully many success stories will follow.<br>6. Stay tuned...<br>7. I am leading the Woodles activity at our staff professional development on Friday, October 9th. Hoping to show teachers the importance of "living in" academic terminology and really experiencing it, as opposed to just writing and regurgitating.<br>Since I missed this course, I am unable to reflect on the lesson. If you release the documents, I'll read through them and reflect on how I think I can use them in my classroom. | **NO LOG ENTRY** |
| I am very flexible as far as scheduling mentoring however I am certain I will need a lot of guidance. Having said that I think maybe once at 9 weeks may work better for the three of you with a little flexibility in emailing and phone calls possibly. I am certainly open for | The most beneficial piece of today's lessons for me is the "Trust your instincts" activity. This can easily be easily be implemented into the Math classroom. Students can collect data, plot it and use graphing calculators to plot data and graph a line of linear regression.<br>The aspect that has consistently difficult for me has been | Love the activities! Especially the last lesson, Cross Streets. I feel like I can really use this with Algebra one kids. I can really use the Calculus connection as well. I can totally take these and use the depth and complexity to do some Algebra Lessons.<br>For future sessions maybe clearer instructions during |

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| better suggestions.<br>For me today was bitter sweet because I have enjoyed the collaboration. I am however wishing everyone and enjoyable summer and looking forward to coming back and seeing everybody in the fall.<br>My amp! goals are twofold:<br>1) I plan to implement inquiry learning in my classroom to challenge students to think about things differently and hopefully deepen their understanding of math and science concepts.<br>2) As an educator I plan to improve in the indicator under instructional factors on order of instruction and under disclosure factors indicator classroom interaction.<br>While currently those appear to be rather lofty goals, with the help of my partner and support of the mentors,I am sure they are attainable. | the technology piece. I think we need include it more and have practical ways to implement student devices into our activities. This is what I would change.<br>Love the fast and the Curious activity! I plan to implement the rate of change and distance, but there will be some differences as I believe the videos need to be clear and maybe there needs to be a graphs.<br>As for implementing the AMP! lessons to date, being the math teacher seems to be my biggest challenge. The new Algebra curriculum, textbook and technology have been huge issues. Additionally I have a student teacher so being out of my comfort zone with a student teachers is difficult for me.<br>My science teacher is rockin' this whole inquiry lesson/learning thing. | activities. Patty Paper is great, but in the class room, kids have trouble with it, I will need to practice before I do this.<br>I plan to implement the cross streets lesson during my Linear Functions unit coming up in November. I will use graph of g'(x) and I will look for similar applications.I know that LTF (Laying the Foundation) has some similar goals.<br>I really appreciate the connection to the Calculus AP course as most of my students will take this course in the future. |
| I would love to see you once or twice a year to observe what I could change and improve on. Webinars or face time to talk every other month to check on us and then easy email to write help!!!! when we need it. I want to do it right. So I want to at least do inquiry half the time or more. Its like the evaluation. I need to select those areas and work on 4 and make them really good. I am glad I have a month to think how I would like to start the year and hopefully I can get the other math teachers on my campus on board. To start out at least 2 inquiry activities before the 3rd week of school and then evaluate how they went and move on from there. | 1) I really enjoyed working with other cohorts and getting to know them. Also hearing their experiences implementing inquiry based lessons.<br>2) I wish we all could have worked with all presenters.....rotated the rooms! Ya'll all have something great to share with us.<br>3) I would love to implement todays lesson in the next couple of weeks because we are actually on slope. But I do not have these materials. However, I can see using this lesson in a review setting before STAAR. I hate looking at questions and I can really determine what students understood from the lesson they received in the fall!<br>4) I would like to make sure all groups share their discoveries and concerns about the activity. I felt that at times we did not know what to do in the afternoon. I want all of them involved and asking questions.<br>5) I am a co teacher and my co teacher is not as open to implementing these activities. I co teach with 3 different teachers. However, I do have one class by myself and we can implement them once I get materials.<br>6) I find myself thinking outside the box and presenting my lessons in a different manner. I want the students to describe and tell me what they know and just clarify misconceptions. Yes, it takes longer to plan, but the results are worth it. I even wrote a grant asking for materials just for an activity the students will design and | I really enjoyed cross streets and can see using this within the next 2 weeks. I'm not sure what should be improved. I really enjoyed tonight. I plan on showing the activities to the math team and hopefully they will want to use cross streets. If not I will use it in my math improvement classes. I am inclusion, so they have to agree to use it in the regular class. Just finished basic slope and we are moving into these TEKS. I really enjoyed the math and felt excited about these lessons. |

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| | test!<br>7) Don't have anything at the moment! Enjoyed the day again!!!! See ya'll Wednesday. | |
| Suggested structure of AMP! Mentoring.<br>I could record a segment of my class lesson and email it to you for feedback.<br>Planning visits.<br>AMP! Goals 2015-2016<br>Explore will always come before explain. I intend to guide my students become thinkers and problem solvers through implementation of the inquiry method. I want to emphasize data collection, data presentation and precise communication of investigated ideas, all while working in teams.<br>Make memorization redundant by allowing students to use practical activities to come up with their own written definitions of vocabulary words in math. | 1. I liked the Big Race Mathematics Exploration that required deeper thought than the quick answer that the yellow car(or green car) would win. The thought process that went into the lesson needed analysis and projection, and generated two outcomes under different scenarios. I also liked the 'switch' in Real World Scenario Math Elaboration. Writing out a math word problem and then trying to prove the solution as true through an experiment is a process i will be using in my classroom.<br>2. The lessons were pretty much rushed. i believe we would have had a better take away experience if we focussed on one lesson. The groups were pretty big and class was not as effective as with one cohort participating in a training session.<br>3. I intend to use this lesson to teach 'rates' - a 7th Grade math unit so that students understand that rates are comparisons between two units. Also, we can use it to compare reflexes; even where distances and times are different, we can calculate unit rate to determine the student with the best reflexes.<br>4. Probably look for another activity that uses other units other than meters and seconds.<br>5. Challenges in implementing AMP<br>- resource unavailability<br>- class seems out of control and i have to remind students to ensure they collect data as they enjoy the activity.<br>- pressure to cover planned content, and pressure to ensure my kids pass STAAR vs time consuming inquiry lessons.<br>6. I prepared a lesson titled, 'Impossible to do' where my students were seated in groups of 4, 5 and 6. They had to think of four things that are almost impossible to do with the human body. e.g. wiggle ear, raise one eyebrow, lick own elbow... and prepare a table to show how many people in their groups can do that activity. We used the data to understand fractions, decimals and percents as parts of wholes. My students were all very engaged and students who had been struggling with division were motivated to work and learn so that they can represent their data. There were several comments from students that they now understand what a fraction and percents | Most useful was the explore activity, 'building a figure' using the interlocking base ten tiles. Using the data collected (figures to number of cubes, and figures to exposed square faces) to identify patterns, having connections to proportionality, constant rate of change and linear equations made the math very practical and therefore more meaningful.<br>Improvements - clearer explore directions than 'build a figure' or set up different groups with different number of tiles.<br>Implementing. I teach 7th grade math. I will definitely use the tiles to teach constant rate of change and y=kx equations. Once my students build figures and discover patterns, I believe they will have a better understanding of the representation of linear equations and the vocabulary like constant of proportionality will not seem abstract.<br>The related TEKS are soon to be covered. |

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| | mean as related to the data in their tables. I enjoyed watching their enthusiasm and loved the participation and willingness to work at a task they thought was previously challenging. | |
| **NO LOG ENTRY** | 1. Being able to see effective ways to use technology.<br>2. I would have liked to been able to have a little bit more time to explore using the things we looked at today.<br>3. My science teacher and I have already discussed doing part of a lesson in science, and then when they get to my math class, they take out their experimental work from science to be able to perform calculations and apply the math to the science they have already done.<br>4. We would have to think of ways to plan around the possibility of not being able to use higher-level technology because our school doesn't have the best network connection.<br>5. I am a first year teacher, so almost everything is a struggle for me right now. I would have to make sure my students can behaviorally handle doing interactive things like what we did today.<br>6. As of right now, since today was my first day, I have yet to try out or experience success in any of these areas. I will begin to implement things like this going forward.<br>7. I am so glad to be a part of this so far! | I like how Allen showed us the advanced, Calculus questions that we are to lay the foundation for so that our students can easily answer those kinds of questions using what we have taught them as a foundation.<br>NA<br>I loved the idea of showing students a map where streets run parallel to one another and using a map of an area of which they might be familiar. It would make the material more relevant to them and they would have more fun with it.<br>Soon to be covered in two weeks. |
| For the mentoring component, I would like the visits as needed. The AMP! goals that I would like to set for myself would be getting the students to more engaging. In addition to that, designing higher order thinking questions. | The aspects that were most beneficial were the Fast and the Curious projects. This would be very useful in my classroom with my students.<br>There are no aspects that I would like changed. Everything was great and useful.<br>My plans to implement the Fast and the Curious in my classroom, would be to have the students measure the time the cars will make it to a certain distance. I will do this by using stop watches and cars. Some cars will have weight added while in motion.<br>To make the Fast and the Curious Activity work better in my classroom, I would assigned tasks to each group member. Each student will be responsible for completing each task that is assigned.<br>The challenge that I experienced in the AMP lesson today was time. It would take a few days to do this with my students in the classroom. | The most useful thing about tonight's presentation was the manipulatives. I can really use these in my classroom for surface area. My students will really grasp the concept through use of these manupulatives.<br>I will be implementing the manipulatives in my classroom through use of groups on the surface area objective. The students will explore the definition and visually see the true meaning of surface area.<br>The TEKS that were covered tonight will be taught close to the end of the school year. |
| In terms of the mentoring program, I think monthly visits would be good. This task of running an inquiry-based classroom along with | I liked this lesson, especially when we we able to use inquiry. We looked at the materials and wondered which materials would be the best to produce the best car | **NO LOG ENTRY** |

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| these lessons can be a daunting task. Having access to a mentor to come by and see how things are can be helpful. I like someone who is available for assistance rather than just being tossed to the side and having to figure out things on my own.<br><br>I have already decided to flip my classroom this year, so adding inquiry-based instruction is an added bonus. I want to be a facilitator of learning rather than lecturing for much of the year. I want my students to be excited to come to math and be engaged in the process of their own learning. My main goal is to run a class that is well-organized and self-sufficient. I want to feel as if I can leave the room and the class would run itself. I want to challenge my students' thinking and want them to achieve levels they would have never dreamed! | possible. There were a lot of materials laid out so that we could discuss how to make a good car. I would perhaps expand the selection of materials so that more possibilities can occur and more unique cars can be produced. | |
| Mentoring during planning and execution of the activities planned. | The use of technology<br>Pacing, moving form one room to another, better explanation of the technology to be used would have been helpful<br>I plan to use the activity on reaction time this following Thursday and the Car Race sometime next week. LOVED the movie and how students will be expected to investigate and decide which car will win the race<br>The APP was helpful but not friendly user, maybe the use of another app that does the same would be more beneficial<br>Use of the App<br>Students are finally realizing that we also do Science in the Math classroom. They are more open to it now than at the beginning of the year. | The Systems of equations activities is something I could use in the classroom. Looking at the scaffolding TEKS was also very insightful. The volume activity could have been approach a different way, 8th grade TEKS do not assess changing dimension of cylinders, instead I would have found more beneficial an activity on how to develop the understanding of volume and surface area. This is something that the kids really struggle with.<br>Staying until 9 pm is a little much when you have been working all day long with children!!!!! |
| I would like to see the mentoring component of the program structured with monthly in-class visits. This would help with getting feedback on what can be changed to make my questioning skills better. That is one area that I always get docked on in my invest walk-thru. My goal for this up coming year is to incorporate a little more inquiry into my math classroom and less of me talking all the time. | My classes are shorter time, it is harder to do the lesson or they take to many days. There are parts to the lesson that can be really helpful for my students. This was a great lesson. | The activities tonight was very hands on and would help those learns that need to see visuals and interact with the material. What could be improve is the direction can be clear and a little more student friendly for those students that are not on level. These TEKS are soon to be covered on our campus. I will be taking this back to the math team on my campus. |
| Having read chapter 7 over again, I believe the | I thought this Saturday session was great for many | I thought the info given to us regarding slope was |

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| AMP program on the whole was and will be a positive potential for my students and for myself to experiment with. I think the way the program was administered was extremely helpful to not only myself...sort of a seasoned teacher...and for some of the new teachers. I personally do mind monthly visit, for we get as it is now, weekly visits from our on administrators to the district administrators...no problem here. For me, I would have like the examples to be tied in closer to the TEKS...maybe I am a little lazy...but wow...it would have been a great benefit...t<br>Again, not matter what, I do wish to thank the staff...great presentations and most of all a sincere attitude to help all of us help our kids...again, No Kid left behind. | reasons...one of course to see other individuals from other cohorts and to hear their thoughts. My major concern...issue...is that the projects that we did this past Saturday and in other sessions are great for the GT..higher level students. Hear comments from others, I believe they share many of the concerns I do....most of our students are just..."average" and what we are doing in our meetings are really above their head. Speaking only for myself, I would see ,more down to earth projects that my students can understand. My students are not at the level to comprehend what we do in our AMP sessions. Also a factor is time. My classes are 70 minutes in duration. Time is essential and the project we due must consider all aspects including classroom time. One thing I really did like is that we are seeing the TEKS that go along with the hand outs. Why this is important is that at the appropriate time in connection with our Scope and Sequence, I can pull out the project with the appropriate TEKS. Would like have this on all the work that has been already presented. Would be nice if we could somehow coordinate what we have done in some organized booklet. With what the schedule I have, I need things quickly and in an organized matter that makes it easy and convenient for me to find. Would like to get the website and code to use the Fast and Curious Activity.. | without a doubt the best for me and my students. It could be presented to my on level kids and with some coaching, would be able to understand and comprehend the information. The information presented to us was at the level I, and my students, need....it is on level and can be taught and understood by the kids. Unfortunately, much of the information in the sessions are above my kids understand and thus would not get the full benefit that is desired. Personal thanks to Dan. |
| I would like to either meet once a month or have a web cam meeting. Also I'm hoping that you guys are accessible through emails for some every now and then questions.<br>The goals I have set for myself include (not limited to):<br>- Identify student misconceptions prior to beginning lesson<br>- Have at least two great open inquiry lessons<br>-Collaborate with my partner to create awsome collaborative lesson plans | 1. The experimental part of the session was most beneficial.<br>2. The directions were a bit fuzzy. We were told to research the momentum of the vehicles using any or all the items laid before us. However, while doing the experiment another person informed us to only use the cars and sticky dots??<br>3. Not sure at the moment cause i do not cover momentum but the graphing portion can be used in an array of different assignments.<br>4. Not sure<br>5. My main roadblock is the students inability to try on their own. They still want to be 100% guided.<br>6. Me and my counterpart had a blast doing some of the team building exercises with our students. | I really liked the salad tosser that was turned into a centrifuge. I am not covering those particular TEKS at the moment however this would be a great lesson to use. Not sure what I would change at the moment. |

| Day 10—10/6/2015—Reflection | Day 11—11/7/2015 | Day 12—11/18/2015--Evaluation |
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| **1. Which aspects of today's session were most beneficial to you?**<br>**2. Which aspects would you like changed? Please explain.**<br>**3. Share your plans for implementing today's lesson(s), Honey, I Shrunk The Length or Scaling the Universe.**<br>**4. How could you implement some of the aspects of today's art exhibit, Intersections, in your lesson design?**<br>**5. How are your students responding to increased inquiry based learning in the classroom?**<br>**6. Anything else you would like to share? (optional)** | **1. Which aspects of today's session were most beneficial to you?**<br>**2. Which aspects would you like changed? Please explain.**<br>**3. Share your plans for implementing today's NASA lessons.**<br>**4. What is one thing you would do to make the activities we presented today work better in your classroom?**<br>**5. Please share any challenges you experienced in implementing AMP! lessons to date.**<br>**6. Please share your AMP! success stories. We want to share your successes with CoP.**<br>**7. Anything else you would like to share? (optional)** | **What was most useful about tonight's presentation?**<br>**What part of tonight's presentation could be improved in future sessions?**<br>**Share you thoughts on implementing any portions of tonight's Mathematics or Science sessions.**<br>**Are the TEKS that were covered this evening currently be covered on your campus, soon to be covered, or already finished?**<br>**Please provide any other feedback you would like to share. (optional)** |
| 1. I liked Honey, I shrunk the length.<br>2. I wish we had time to work on our projects. I also think we had too much time moving from one thing to the next.<br>3. We are starting our transformation unit so I will be able to use it especially during dilations.<br>4. It will be easy to relate it to dilations. I would ask the students between what ranges could the scale factor not be in.<br>5. I know that I don't feel completely comfortable so I'm working on challenging that because I know the kids can sense it. I have some plans for our upcoming transformation unit. I'm thinking it's going to go much better. | 1. I enjoyed the space arm suit but I'm thinking of ways I could incorporate it to my class. Most of these activities seemed like fluff activities.<br>2. I would find activities that are more in line with 8th grade TEKs.<br>3. I want to find ways to able to mathematically incorporate it.<br>4. Im still thinking of ways I could incorporate these lessons with my Geometry or 8th grade academic classroom.<br>5. I want to see my co-teach and low kids be a little more independent.<br>6. I get excited it when some of the kids see the connections I am wanting them to see before the explanation. I still think I have kids struggling with this particular concept we are working on right now but definitely feel like it went much better then it did last year. | I like it because the activities pertain more to math.<br>I wish I had more time to do the kite activity to get more out it. Since it got dark so quickly and the field was wet, I was not really into it. (You didn't really have control over that.)<br>I would like to implement the Pythagorean activity (cutting squares) especially with my struggling kiddos.<br>We had already cover these TEKS. |
| I liked the math lesson about dilation. I also liked that we had time to play with the pathogram before the actual lesson. I would implement the honey, I shrunk the length and have students compare their dilation with other students. Some of my students enjoy increased inquiry, while others are still skeptical/hesitant. | **NO LOG ENTRY** | **NO LOG ENTRY** |
| 1. I will definitely use the pantographs. I really like who many different concepts can be covered.<br>2. I really like the idea of the students coming up with their own questions. However, I am | I feel as though Activity 1, Bag of Bones, was the most beneficial to me as it seemed to have more mathematics involved than some of the other activities.2.<br>Criteria needs to be specified as to what a piece of unaffected cereal looks like. | While I was absent from this evening's activities due to an emergency room visit, a sprained ankle and being on crutches, the Pythagorean Theorem is one of my most favorite concepts to teach. There are so many real world scenarios that apply this concept. I |

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| concerned about the time it might take to sift through the questions that the students asked to find good questions.<br>3. We will use these activities, not only in 8th grade, but also when we teach scale drawings to 6th and 7th grade.<br>4.We can use a lamp and make cut out designs, measuring the lengths of the cut out and lengths of the reflections.<br>5. More inquiry will be implemented once our school finishes going through accreditation next week.<br>6. I am so enjoying doing these hands on activities. Thank you for making us be the student, and get in the learners' mindset. | The main inquiry based activity I have done was when my students asked if the surface on which a car is traveling will affect the car's speed while we were using the speed formula during a formula discussion. The following days I allowed my students to do experiments to answer and discuss their conclusions. | find myself collecting more and more activities on the Pythagorean Theorem. The questioned posed each year is which activities to use. |
| **NO LOG ENTRY** | **NO LOG ENTRY** | What I enjoyed about tonights presentation was that we used Pythagorean Theorem to solve for the height of the kite.<br>The only thing that could be improved was to choose a night that the wind factor would be 8 mph or higher.<br>I am going to use this lesson in my math classes the students will really like it.<br>The TEKS were already covered for this lesson |
| 1) The most beneficial aspects of today's session were the exploration of the pantographs, and the scaling the universe ball measurements and conversions. Although this wasn't necessarily part of the learning objective, I think that discovering diameter from a sphere (by measuring the circumference with a string and then solving for r) is a really important skill. One of the things students are expected to learn in 7th grade math this year is the understanding that the diameter of a circle comes from the ration of that circle's circumference and pi. It's a difficult concept to grasp on paper, but using the balls, the string, and the yard sticks could be really valuable.<br>2) I think the exploring of the pantographs was fun and valuable. Allowing us in groups to change things, make predictions, play around with sizes of dilations and placement of the pantograph arms etc. was good. What I would change, though, is I would turn it more into an | **NO LOG ENTRY** | I am going to use the squares lesson as soon as we get back from Holiday Break. I really liked this exploration. What I plan to change, though, is I'll have the squares already cut out to make sure that I have a variety of sizes, and to ensure that they are in fact squares. Since I only have 45 minutes, I think it'll save a good amount of time to have them pre-cut. I'll have students select one square on their way in, and then I'll randomly assign groups like Allen had us do in class.<br>These TEKs are soon to be covered. We start Geometry of Planar figures at the start of the second semester. |

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| experiment. Instead of just developing questions of inquiry, after the exploration, have each group develop a hypothesis and then test it out. This would allow for more science tie-ins for that activity. The inquiry exploration was OK, but I didn't love it. I didn't feel like I was working towards a goal. We were able to draw conclusions, yes, but I think utilizing the scientific method would have been a more effective and more valuable approach.<br>3) I don't know that I would use the pantograph's in my classroom. I do a dilation activity that I've used in the past that has been really good. I do plan to use the piece of the scaling the universe activity that I mentioned in question 1: looking at the relationship between circumference, radius/diameter, and pi. I would also use the proportionality So I could have student write their answers in both scientific notation and standard notation.<br>4) The art exhibit could be used as a reflective piece after students learn about dilations. The conversations we had at our table would be one that I would encourage students to discuss. Things like, what do you notice about this artwork and its relationship to what we just studied in class?<br>5) It depends on the class. My low levels classes don't respond to it well. They give up quickly. They don't want to have to think critically or on their own. My PAP classes have enjoyed some of the struggles. It varies. | | |
| Most of today's lesson is applicable/ beneficial to me. Since I teach only PAP Algebra, I would have to connect the dilation and scale factor to graphs, but that comes out easily in the lesson. I would use figures that are easier for the kids to work with or a different enlargement device.<br><br>The art exhibit creates a lot of discussion. I may offer students extra credit to visit the exhibit and share their experience in class.<br><br>I did the volume and surface area lesson with | I was so excited that NASA was coming to present especially because my partner's classes had been following the New Horizon's mission. Originally we wanted our project to center around this mission. Unfortunately after our experience with the presenter, we changed our mind.<br>I really thought the mission game was on target for this age group and it hit several Math TEKS so that was probably the best part of the presentation. Is this available to us? I don't have it and I don't see it in the lesson. I would really like to do this with my kids. | Although I was unable to attend this night, I have read the lesson and will be implementing parts of it for my final project over surveying.<br>Since I only teach Pre-AP algebra, the Pythagorean theorem is used but not directly taught. So while it is not part of my current TEKS, it does contribute to the "Real World Applications" piece.<br>In my final project we will use slope and right triangles to determine height and distance of objects in 3D space so that they can be plotted on a topographical map. |

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| my classes last week and they really enjoyed it. Of course, they hate surface area so this gave them a little different aspect . I used Unefix cubes rather than base ten blocks because I only have about a 50 min class so I was on a time crunch.<br><br>So I have a concern about "State Testing". I have never been a teacher who teaches to the test, but I try to make connections to the real world. I often here in this class that "It's not tested " so we are not going to worry about that.... I would like to set my students up for future success and I believe there are many thing that are not tested that connect and will help them be more successful in future courses. | One exciting thing I would like to share is that I implemented the "Stair Stepping functions" lesson in my class. Teaching Pre-AP Algebra I included the surface area piece and it really created some great discussion. The kids were not thrilled when they realized they had to do surface area. But, once they got into the lesson and began to make connections to the functions we were studying, the ohs and ahs started happening.<br><br>While I realize that Rice did not choose the presenter, she was very rude and condescending not only while presenting, but when trying to talk with her individually. I thought she was not a good choice to be a liaison for NASA when trying to get the community interested in their work. | |
| I really enjoyed using the Pantograph. It was a new tool I had never seen! I would like to modify the Engage due to time and have groups either do reductions or enlargements and tell me what they discovered. Dilations are in the 3rd 6 weeks right before the holidays. If I am able to get these tools I would use the lesson to introduce dilations. This would really be a great way for students to actually see the enlargement and reduction and talk about scale factor and how a reduction is less than one and an enlargement is greater than one. Intersections is a little harder and I will have to think on how I could incorporate this wonderful art exhibit. Unfortunately, I have not been able to do it as much due to being an inclusion teacher. I am still working on convincing my fellow teachers. I also lost my one improvement class because of the paper work I have to do. I will try to incorporate inquiry more when I am able to teach full lessons in my co- teachers classroom. Enjoyed the history of Rice as we toured the University. I also enjoyed all the ways we looked at proportions today and this is an extremely important concept that our students struggle with daily. | I really enjoyed the Bag of Bones activity. I fill that I could relate more 7th grade math TEKS in the Getting the Right Fit. I just need more explanation of what the students goals would be for Mission to The Red Planet. I liked figuring things out, I just didn't know why. But maybe that was the point-Inquiry. I discussed with my partner that the Getting the right fit, is a great Explore activity leading into planning. I could also tell them to measure the distances in customary and have them do metric conversions. Group activities I would actually have the sticker pictures set at each table or card so students would not spend so much time finding their match. Lessons, I would like to do the bone density activity when we go over percent increase and decrease. It is a nice alternative to shopping activities that seem to be the norm when we teach this lesson. My main challenge again is that I am a co-teacher and my partners are not as open. However, my AMP partner is going to let me teach a couple of math lessons to her students and my first one is coming up in a few weeks. My partner is doing awesome and the entire science department has revamped the way they teach and look for inquiry in every lesson. So far, I'm really enjoying thinking outside my box. Can't wait to see what is next! | I enjoyed the kite activity and the cutting squares to explore Pythagorean Theorem! I think that we could really expand on the lesson by using a real world activity like Google maps of your home town and applying Pythagorean theorem to developing maybe cable lines and total length. I don't think it will be that hard to implement the lesson as long as the supplies are available for use. The square activity is super easy to implement. Kites a little harder because you must have them! Yes, this TEK will be covered the 4th 6 weeks. Enjoyed the night. Thanks! |
| 1. Today i had a better understanding on creating questions that can be investigated. | 1. The Bag of Bones Activity was beneficial and timely as i am currently teaching percent change in 7th grade math. I | Most useful about tonight's presentation i was enriched by the questioning strategies used by the |

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| After making observations on the pantograph, the class went through the questions generated by the team. i believe that once you identify a variable that can be manipulated, you can observe changes and create questions that can be tested.<br>2. I think it would be beneficial to explore two or three ways to teach the same lesson. Instead of having all the teacher groups work on the same explore activity, the teachers could present different explore activities that would lead to the same general conclusion.<br>3. I plan to use the pantograph as an explore tool for similar figures lesson in 7th grade math. It gives a perfect illustration on same shape, different size (similar, not identical)concept.Students can also measure the dimensions of the two figures and observe that there is a proportional relationship between similar figures.<br>4. Application of similar figures in the real world. How an artist uses similar figures in their practice.<br>5. Students are motivated learners now that i am using inquiry method. I have noticed an enthusiasm and self motivation to work out the math, and i know this is because they begin with an explore activity that is exciting and connected to them physically/personally manipulating information, objects... | liked that the activity was connected to a real life situation, and that it involved actual counting where decreases were manipulated. The explore activity using the corn puff cereal where physical count had to be done alongside percent calculations would bring about an understanding of percent as a 'parallel language' to amount of bone remains and bone loss.<br>2. I would like to see a modeling of the percent changes in new ways than percent strips. My students had difficulty conceptualizing that an increase from 7 to 14 represents 100% and an increase from 7 to 21 represents a 200% increase.<br>3. I plan to reteach calculating percent change using this activity that has hands on activity and interaction. When I taught it, i had my kids write down how many instagram followers they currently had and how many they would like to have by the end of the year. We then discussed their increase in terms of instagram followers, and consequently introduced 'the language of percents' as an equivalent way to represent the increase.<br>4. For the bags of bones activity, i would incorporate another activity that would represent percentage increase.<br>5. Challenges implementing AMP lessons. In my school, there is a lot of pressure to take several tests, pass tests and cover a lot of content in a short amount of time. AMP lessons take a lot of time, in creating , preparing and teaching. There is a conflict in what the leadership in my school wants to achieve and the sensible learning that occurs with AMP learning. Another challenge is resources. There is no allocation of funds in my school for instructional resources, so hands-on activities are too few. I also find that i have no time to just plan and get creative ways to prepare explore activities.<br>6. AMP! success stories.Students are motivated during explore activities when we talk about experiences that are exciting in their life. Once their attention is captured, new concepts can be learned. | instructors to get the students think critically during cutting squares activity. For example, cutting out two congruent squares and ordering them from smallest to greatest, then asking what standard did you use to order them....; size, area, length, perimeter..., would lead to meaningful mathematical conversations surrounding this topic. Also providing one leg of a right triangle and asking what the other two dimensions can possibly be as opposed to always providing 2 legs and having the students calculate the third was a beneficial perspective. Finally, the table where students had to square the measures of the three sides and discover patterns was useful.<br>Possible improvements on tonight's presentation<br>As much as this program is primarily focused on 8 the grade math, I believe there are excellent enquiry topics in other grades that can be briefly explored in our sessions to enrich teachers<br>Thoughts on implementing portions of tonight's mathematics lessons even though I am not assigned an 8 the grade class I intend to reteach the square of a number using elements of the cutting squares lesson.<br>TEKS covered this evening are already covered, however area of a circle is coming up where the students have to understand what the square of a number is. |
| | The part of the session most beneficial to me was the Kix activity where we measured percent change of bone density. Percent change is something that is very important for student to understand, and I think they would enjoy it.<br>I did not think that the presenter's method of choosing winner for activities was appropriate; I would never have students racing to see who can finish tasks first, because | The hands-on proof that we did for Pythagorean Theorem<br>More wind outside so that we could fly kites better!<br>Since we are in the middle of teaching Pythagorean Theorem, tonight's lesson gave me a lot of ideas on how I can better explain things to my students.<br>Currently being covered. |

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| | that would almost always yield poor quality work.<br>Judging work based on quality instead of speed | |
| The aspects that were most beneficial were the dilation activities. The chart and pantograph were my favorites. These are great manipulatives for my students. There are no aspects that I would like changed. I will implement "Honey I Shrunk the Length" with my students by using the pantograph and chart paper. By using the chart paper, students will see a great visual of scale factor. I would love to bring my 8th grade students on a field trip to physically see the art exhibit, Intersections. I would incorporate the field trip in my lesson plans for sure. Students are responding with great positivity to the increased inquiry based learning. | The aspects of today's session that was most beneficial to me was BONES UNDER PRESSURE. I could really use this in my classroom for the percent of change objective. BONES UNDER PRESSURE is a great visual learning to for my students to grasp exactly what percent of change is.<br>All aspects were great. All lessons are very useful.<br>I am planning on using the BONES UNDER PRESSURE lesson for my students to grasp the percent of change objective. I will not modify BONES UNDER PRESSURE because the lesson has been designed excellent for my students to use in my classroom.<br>One thing that I would probably change for my students, would be to have some activities prepared and ready to condense some of the time.<br>I did not experience any challenges today with implementing the AMP lessons.<br>My students have mastered the Pythagorean Theorem objective through following the step by step protocol: Engage, Explore, Explain, Elaborate, and Evaluate | The most useful activity about tonight's presentation was the kite activity. My students would love to use the pythagorean theorem to find the missing side of this kite activity. The kite activity is fun and outside which my students would love as well.<br>All parts of tonight's session were great.<br>I will implement the kite and congruent square activities with my students for sure. These activities are very visual and hands-on. In addition to that, students will master The Pythagorean Theorem objective easier by implementing these activities.<br>We are already finished with the Pythagorean Theroem. |
| I like the idea of using scale factor. This can definitely be used when we discuss dilation and how to write the algebraic representations for both enlargement and reduction of a figure. I would have liked to show my students the Intersections or used it as a quick field trip experience. Even as an adult, I got a lot out of the visit and I think the students would have enjoyed it as well. | **NO LOG ENTRY** | I liked the kite experiment and how it related to Pythagorean Theorem. It put into perspective how students could use such a recreational activity and put into perspective. This is definitely something I would try next year as an explore activity. Not only would the students have fun, but they would be inquiring as to the appropriate length so that the kite flies the highest. From there, students can make the appropriate measurements. This covers the TEKS over Pythagoream Theorem and its converse. |
| Great Scale Factor integration with Science skills | **NO LOG ENTRY** | Based on the resources it seems like a great EXPLORATION of the Pythagorean Theorem |
| The different way of teaching the topic of scale factor. I would like the students to have a chance to create a tool that they think may work. There is a lesson that I already teach that I would like to implement parts of the lesson today into mine. | I thought the most beneficial part to me was the budget activity. This will show students the real world application. I would have better instructions on the bone density activity that defines what is broken. I would do the budget activity to better explain budget. I want to that as a class project. The bone density one I will have them take the mass before and the mass of the residue. | The teks cover are soon to be covered at my school. The activities done tonight will be very useful and the students could get a lot out of it. |
| Honey, I shrunk the length or Scaling the Universe. I thought was one of best this year...best because it is I can bring back to my students and they will enjoy and learn from the | The NASA presentation was very informative,very well put together...and very ejoyable. For me being a math teacher--middle school--I find it to be a little more of a challenge to directly use this presentation. I will use the | NO LOG ENTRY |

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| exercise. I find most all of the work we do in class are great, but not all will my kids be able to relate to, nor will they be able to do the work. My kids, on level kids, will be able to do this assignment...I do believe they will be engaged in task. This is the kind of work I prefer to see more of...something for on level kids to feel good about them self and be engaged in the work. | information given as a added value of math and science teaming up together. I know my comments are lacking tact but I look more for a direct correlation to my students. | |
| I enjoyed the thought of the pantograph but I doubt I would actually use it in the way it was presented to me. The app for scaling the universe is more helpful in my class of course. Students will enjoy it because they can actually view the stars and their current location. I would use this app as I teach the astronomy TEKS and throw in the distance calculations that Christina implemented. Currently the inquiry design is working great in my class but it's still very guided. Couldn't do anything with the intersections. Although it was cool. | The lessons today were very fun and informational. The one I liked most was the Bone Density activity. I can use this assignment for density as well as skeletal system lessons. The only thing I did not like about this particular lab was the having to determine how many broken cereals were present. I believe I would have students find the mass of the residue in the bags after crushing them win the book instead. This will yield more accurate results in my opinion. To date the AMP lessons have been more advanced for my students and I have found that dumbing it down is not effective. Oh yeah, the Mars budgeting activity was time consuming and I would only use it if I needed some extra fluff. Looking foward to next time | I liked the three methods you guys used to explain wavelength, frequencies, and energy. You incorporated supporting vocabulary as you went through the lesson as well. The first method with the coil gets the students out there desk and gives them the opera unity to make there on waves. The second example with the moving walkway really drives frequency home. Then the little video put everything into perspective. I would definitely use this lesson because it does follow our TEKS. I would use slinky or rope instead of the coil because it's cheaper. Overall great lesson. |
| **Day 13—12/5/2015—Reflection** | **Day 14—1/23/2016** | **Day 15—1/27/2016--Evaluation** |
| **1. Which aspects of today's session were most beneficial to you?**<br>**2. Which aspects would you like changed? Please explain.**<br>**3. Share your plans for implementing today's lesson(s), Honey, I Shrunk The Length or Scaling the Universe.**<br>**4. How could you implement some of the aspects of today's art exhibit, Intersections, in your lesson design?**<br>**5. How are your students responding to increased inquiry based learning in the classroom?**<br>**6. Anything else you would like to share? (optional)** | **1. Which aspects of today's session were most beneficial to you?**<br>**2. Which aspects would you like changed? Please explain.**<br>**3. Share your plans for implementing today's NASA lessons.**<br>**4. What is one thing you would do to make the activities we presented today work better in your classroom?**<br>**5. Please share any challenges you experienced in implementing AMP! lessons to date.**<br>**6. Please share your AMP! success stories. We want to share your successes with CoP.**<br>**7. Anything else you would like to share? (optional)** | **What was most useful about tonight's presentation?**<br>**What part of tonight's presentation could be improved in future sessions?**<br>**Share you thoughts on implementing any portions of tonight's Mathematics or Science sessions.**<br>**Are the TEKS that were covered this evening currently be covered on your campus, soon to be covered, or already finished?**<br>**Please provide any other feedback you would like to share. (optional)** |
| 1. I really like the Aurasma app. I want to find ways to incorporated it on my classroom.<br>2. The math lesson confused me a bit, but I could have been distracted and not get the whole gist of the lesson. :)<br>3. I feel like this is more of a science lesson | 1. I enjoyed most of the activities we did especially the one Zombie one. I already used it with my students. I modified it to talk about non-proportional linear functions.<br>2. On the Hares Everywhere activity, I would probably eliminate the websites that does show a "balance" with food, water and wolves. The scenarios that I used did not | I like the activities that show that volume is area of the base times height of the prism/volume.<br>The publish books activity seem a little overwhelming. I felt like it would go over my kids head so maybe looking for ways to simplify it a bit to where it more manageable for kids. |

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| than math. I really liked it. The engage part of the lesson has us writing equations to represent the two levels of the mountain ranges. This goes with what we are doing now so it is definitely something the students would be able to do. I also like that its a real world scenario in which the graph would include negative numbers.<br>4. My favorite station was making the Christmas tree. I also really liked the mystery box activity. :)<br>5. Well I am really looking forward to using Aurasma with my students. | go long enough to show what would happen when there were too many wolves or an abundance of food for the rabbits.<br>3. I like the tables comparing simple interest with compound interest. I think it provides a better understanding for the students. I also like the question that would challenge my advance students as well. :) This unit is coming up soon for us and I plan to use especially the explain portion of the lesson.<br>4. I'm not sure. Are they wanting to be in the schools more or just work with the teachers more? | I liked the idea of creating the shapes from the folded paper especially focusing on lateral surface area. These TEKS were covered last semester. |
| **NO LOG ENTRY** | By all accounts was beneficial, because I think I can implement part of this activity into a lesson when talking about financial responsibilities. I would like ConocoPhillips and its employees to be more involved by coming to an AMP session and maybe sharing more information about what is done at ConocoPhillips. | The most useful part of the the session was the volume and surface area portion. This activity was helpful because we are covering volume soon and some of the activities discussed will be helpful to my students. I also enjoyed the get published activity. |
| 1. The most beneficial aspect of the lesson from 12-5-15 was Station 2 where the Aurasma App allows students to determine if their predictions about nets and 3-D shapes are correct.<br>2. According to the Archdiocese standards that I work with, I feel the nets for 3-D shapes would be used during then 6th or 7th grades rather than the 8th grade.<br>3. We have not yet covered 3-D solids and their nets yet this school year. Since this is an important concept to master because of the future concept of surface area, it is crucial that students can visualize turning nets into solids. Aurasma seems to be the perfect app for this.<br>4. I mostly enjoyed Station 2, Mt. Topomas. However, topography is not covered in our Archdiocese standards, so I'm not sure if it would be a viable activity.<br>5. I can also see myself using Station 3, Building blocks with the 8th grade Pre-Algebra and 8th grade Algebra classes to teach three dimensional distance. | I really enjoyed the lessons from Jan 23rd. The students would be able to see the difference between linear and exponential changes in data. They would show interest since the activities could be introduced by zombies. These activities should be implemented as an introduction to functions.<br>I would like to see ConocoPhillips more involved by providing speakers to discuss the different job opportunities available in the the studies of STEM. Many students at the middle school level are still indecisive in their choices of careers. More students may take their STEM studies more serious if they were aware of the the differenct career possibilities. | My current 8th grade class has undergone a lot of disruptions to their middle school math education, having their math teachers leave mid-year in both their 6th grade and 7th grade years. Knowing this and working with these students this year, I do not feel that the students have the prior knowledge to do the activities. Hopefully, the current 7th grade students will have the prior knowledge needed to complete these activities next year.<br>As the Archdiocese requires reteaching benchmarks if 80% of the class doesn't score at least 80%, I am doubtful that I will get to 3-D geometry with this year's 8th graders. |
| 1. The aspects of today's session that was most benificial to me was the cardboard virtual reality, | **NO LOG ENTRY** | **NO LOG ENTRY** |

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| and aurasuma; Mt. Topomas; and Building Blocks.<br>2. The aspect that I would like to change is to show more math incorporated in to science lessons at the same time/same lesson.<br>4. The station I enjoyed the most is the Cardboard Virtual reality.<br>5. I see using in the classroom is Building Blocks<br>6. I enjoy coming to the classes and learning how to make the students more interactive. | | |
| I really liked the gallery walk where we had to try to find our box based on the topographic maps that were drawn. Although it was a science lesson, I like the idea of having to find something that was originally yours by using somebody else's description as a graphic. The gallery walk was also a really cool way to see how other groups represented their original box. I feel like I could do something like this with 3D geometry. Each group gets a shape, or a composite figure and sketch it out. Then objects are hidden and switched... My wheels are spinning with that...I'm glad we didn't present the posters. The gallery walk was WAY more effective, and allowed us to - as a group- walk around and have conversations about each poster. Definitely keep it this way.<br><br>The lesson that Allen lead was great. My counterpart is about to teach topographic maps and I just finished proportional and non-proportional relationships. Slope is something that is a heavy focus in 8th grade math, so the Building Blocks is a great way to refresh their memory on slope and to reinforce what they are learning in science. | 1. I think the discussion group that we did with Christina was really valuable. It was a cool way to get students to "talk about the content" and "talk to learn". Even though this was a science lesson, I think it could be something I could do in math class. I also really liked the Zombie activity. I think the kids would think that it's really cool (and silly) - a great way to examine linear and non-linear functions.<br>2. A little less time on the science activity so that the math activity doesn't feel so rushed at the end. I guess I'm a little biased because I'm a math teacher, though.<br>3. Honestly, I don't think I'd use exactly what we did today into my math class (for time sake purposes). I could see my partner using this exploration it in her science class, and then in math class I could create some graphs that exhibit positive and negative correlations based on the discoveries that they found in science. It could be used as an interdisciplinary connection. We'd look at positive correlations, negative correlations, linear and non-linear functions, rate of change, etc.<br>4. It'd be cool to have some employees come in and speak to my kids. They always ask me "why do I need to learn this?" and I think having a professional come in to explain how they use math in their careers could be valuable.<br>5. Nope. Keep on rockin'! | The most useful part of tonight's presentation was the two activities presented. The scaffolding Calculus activity and the Get published.<br>The scaffolding calculus is difficult for me to do, but I love a challenge. Fortunately, I have attended several Laying the Foundations workshops and have the material from those to implement.<br>Although it was not the intent, this evening reminded me that there are several publications out there that include mathematics. It occurred to me that getting a reading list together that not only includes practical application, but theory and fantasy would be helpful in getting the kids interested in math and science. Also a science current events type activity.<br>I did like getting to chose the math people we worked with.<br>The time to get together with others about our observation was helpful, but I wish it was throughout so that we could better coordinate with partner groups. The video was helpful in knowing what questions to ask and how to present to our colleagues. |
| This was one of the most productive days. I really like the stations and the fact that we got to move around. The fact that there was a lot of information given.If my partner had been there the time to work on the project really would have been beneficial.<br>This was my favorite of the classes because | Today's lessons were all beneficial.most of the science was already being implemented by our science teachers in their curriculum. I liked the technology aspect, but again it was mostly science focused.<br>One thing I think to implement math into the Zombie activity I would have done it linear and exponential and then collected the data each time to compare. I know we | The most useful part of tonight's presentation was the two activities presented. The scaffolding Calculus activity and the Get published.<br>The scaffolding calculus is difficult for me to do, but I love a challenge. Fortunately, I have attended several Laying the Foundations workshops and have the material from those to implement. |

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| there actually math present throughout the lesson. Many times in the sessions, the science is done and there is very little math.<br>I will be implementing parts of this lesson in my final project on surveying.<br>I can't say there was a favorite station per say, but I was glad we had some technology present. I will be getting the cardboard VR cases with some of the AMP money.<br>I will be using the Mount Topomas activity in my project.<br>One thing that I would change would have been the group that I was working with maybe. Although they were not assigned, there were some communication issues.<br>I took this course to have the opportunity to work with the science teacher at my school so that we could create and implement lessons for our population. Maybe other teachers get more cross curricular time, but we don't and the fact that we were constantly separated during this process was VERY frustrating. | sort of did that missing the data collection. Sometimes the math gets lost in the presentation.<br>Also so much math in the Hares every where part, but much of it got lost in the science.<br>We will be doing exponential growth and decay in Algebra later this year and I would like to do the Zombies piece, but I would add some sort of data collection during the activity. Maybe even add another factor to show the difference between experimental and theoretical expectations.<br>There are so many practical applications that CoP could help with. I think there polymer products are so important there are so many applications that come from those that there could be a number of lessons developed. They could visit the schools and present to the kids. They could do something similar to what NASA does with the educational liaison and/or the online lessons for educators like NASA has. | Although it was not the intent, this evening reminded me that there are several publications out there that include mathematics. It occurred to me that getting a reading list together that not only includes practical application, but theory and fantasy would be helpful in getting the kids interested in math and science. Also a science current events type activity.<br>I did like getting to chose the math people we worked with.<br>The time to get together with others about our observation was helpful, but I wish it was throughout so that we could better coordinate with partner groups. The video was helpful in knowing what questions to ask and how to present to our colleagues. |
| I really enjoyed the mystery box. I might give them a smaller box and really explain to them that it must be level or lower then the rim. I really liked the rotations to. I am a math teacher and I hope I am able to work the Saturday school with my partner. She plans to incorporate this lesson then, so students can have enough time to complete the mystery box. Loved the Aurasma and the Mt. Topomas. I can easily incorporate both these activities in class, plus cost of supplies are minimal! Wish there was more time in the centers, but really would not have wanted to shorten the mystery box activity. Thanks for another enjoyable day. | As a math teacher, I really enjoyed the interest lesson. I really can't say that I would change what we did today. I like that we continue to talk about the lesson. If only we could convince other educators of how important that discussion is! We have not covered simple and compound interest, so I can't wait to use that lesson when the time comes up weeks. I would love to see more employees come out and share their knowledge while we participate in these activities. Or actually lead a lesson or two. I enjoyed our day there over the summer. I enjoyed the day again. Thanks for sharing all these great lessons with us. | Oh my, there was a lot. I liked the visual of the relationship between a sphere and a cylinder. I liked the folding activity and the book activity. I am not sure. Really like math nights. We are about to start volume and surface area in 7th grade and surface area in 8th and all of these can be used. I definitely will do the student visuals and I also really like the folding and book activity and will use it in my math improvement class. Yes, TEKS are currently and soon to be covered. Loved the activities. |
| 1. i liked the keeping things in perspective - engage 1, explore and explain 1 activities. They were all structured around students making observations and the questioning strategies gave students an excellent opportunity to make reflections and have a clear, gradual development of meaningful knowledge. I enjoyed this lesson most because | 1. Todays brief session on making the shift to inquiry was very encouraging. I often get frustrated that I am not churning out full inquiry lessons because of the pressure to produce 100% pass results from my schools leadership. I also have time constraints. The opportunity to prepare lessons that are to the standards provided by the AMP program instructional team seems impossible. Todays presentation on 'Making the shift' really hit home because I | Most useful was the discussion where teachers were asked what ways they introduced the study of volume and surface area in their classes. Teachers shared interesting introductions like slicing a rectangular prism to create triangular prism, stacking up cubes into a rectangular prism and filling a cylinder with m&m's and asking students to calculate volume without a ruler. I also liked the activity where we |

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| the flow was awesome and information made sense!<br>2. i would like to see a presentation of three different inquiry ways to teach the same lessons.<br>3. i plan to use the general structure- students examine, compare and predict. I will be thinking of ways to incorporate this into a probability lesson in 7 grade math.<br>4. Station 1- Part 2-Aurasma app - predicting the shapes the images would fold to<br>5. i will definitely be using the aurasma app to teach volume of geometric shapes. Students will love having to use their phones to watch a video of a net of a geometric shape transform into a 3-D form right before their eyes. This will clarify their thinking about the base of shapes when they have the opportunity to watch these transformations over and over again. | truly believe in 'Explore before Explain' and now I feel its OK to make small manageable changes into inquiry instead of diving all in. I know I want to promote my students to be the ones who determine questioning, procedure and analysis. If I can present these opportunities in my lessons then I believe I will have cemented my success in inquiry based instruction.<br>2. I would like to have the AMP Program Instructors take us through the 'raw' process of developing their lesson plans. The lessons are so creative and interesting. I wonder if it takes a lot of time to prepare.<br>3. I will use the Math presentation to reteach percent of change and simple interest to my class. I like how data is first presented in tables and the questioning strategies. I would pay attention to finding patterns in the data tables; for example in Simple Interest - Year 1=300 + 30, Year 2 = 300 + 30 + 30 Year 3 = 300 + 30 + 30 + 30 to have students understand that the interest is always applied to the initial deposit as opposed to Compound Interest where earned interest is added to the principal and then rates are applied. Year 1 = 800 + 80 Year 2 = 880 +88 Year 3 = 960 + 104.80. If they can break down the patterns in this was then the formula will make sense as they will see the patterns and use them to solve problems easily.<br>4. During a visit to Conoco Philips we had a presentation from an analyst on the importance of data collection, analysis and prediction for the purpose of making decisions (where to drill for oil...,) . He made algebra come alive! If we can have various people from different fields within the oil industry sharing these real life scenarios that clearly require the application of mathematical knowledge, students will be motivated to 'get the math'. | folded paper and created prisms, and then developed surface area formula. I usually use a prism and cut it out, but i think creating a prism is a more effective inquiry method.<br>Improvement in todays session would be to incorporate technology into the lesson. 3-D animations in slow motion would interest and intrigue our students and create great opportunity to visually comprehend surface area and volume. Also a clear activity to develop the meaning of volume would enhance the lesson.<br>i will definitely use the folding paper to create prism activity and use it to develop the concept of surface area and how to calculate it. There is an algebra concept in using perimeter to come up with the formula and this activity can bring that to light. It will also clear the misconception that area has nothing to do with addition but everything to do with multiplication.<br>I teach 7th Grade Math and the TEKS are soon to be covered. |
| **NO LOG ENTRY** | 1. I liked how interest was introduced. I think it would be helpful to introduce interest that way so that students would ultimately have a better grasp on what interest accruing actually means.<br>2. I would have liked to talk more about introducing interest to students. My students are having trouble understanding it, and I would have like to have heard a little more on how I could explain it to them.<br>3. For math, this would be a good way to talk about the difference between linear relationships and exponential relationships. I think it would be beneficial to talk to them about it during our bridging to algebra unit that we do after | **NO LOG ENTRY** |

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| | STAAR.<br>4. I would like to hear more from them in general. Maybe have someone come talk about their business processes, like how the NASA person came and talked to us. I think it would be important for us because that type of business is very common. | |
| The aspects of today's lesson that was so beneficial to me was the rotation of the grouping. Different learning styles were incorporated in the activities.<br>No aspects need to be changed.<br>I would implement the grouping style for my lesson. I would use the surface area objective because they would have to find the lateral and total surface area of different prisms and cylinders.<br>I enjoyed all station activities.<br>I would implement the grouping style for my lesson. I would use the surface area objective because they would have to find the lateral and total surface area of different prisms and cylinders. | The aspects of today's session that was beneficial to me were the graphs.<br>No aspects need to be changed.<br>I would implement today's by using the linear function objective.<br>I think that the Conoco Phillips visit was great. By the employees being involved in that aspect was spectacular. | The different activities for different learning styles is what was most beneficial about tonight's presentation.<br>All parts of tonight's presentation was great.<br>I would implement the bouncy ball activity through the scatterplot objective.<br>The TEKS that were covered this evening are soon to be covered in my class. |
| **NO LOG ENTRY** | **NO LOG ENTRY** | **NO LOG ENTRY** |
| Great resources and ready to use activities to take straight to the classroom. Love the QR codes and the integration of MAth and Science in the Topographic maps! | | |
| The mystery box was most beneficial to me. It was a great hands on activity. I know that my students would get a lot out of it. They would have a good time looking for their box. There were many part to this activity to keep students attention. I wouldn't change anything about that lesson. I enjoy the video station, where we used our phones and the boxes to watch the videos. It maybe it feel real and like you were right there. | The zombie lesson was great. One thing that I would change is having more rules for the students. Add on another activity. We would like to do this activity real soon. Have the employees come to talk to the students, to let the students know the importance of math and science. | The breaking down of surface area. Showin a different way to get students to understand what it is. We are currently in our geometry unit. We just finished surface area and will be going into volume. |
| Thought this was more or science related then math. Did enjoy the lesson...thought I could use some of the thought process shown in science and possibly convert to math. To say which stations I liked best...thought they were all good. I think this would be helpful in 7th grade in that perspectives are now part of their TEKS. Do | This was an excellent class. The nice thing I got from this is that the level of information is something my kides can understand. In the past some of the information was "way above" the comprehension level for my students. The Leaps and Bounds (interest) is good. It gives me another approach to present simple and compound interest. My recommendation is that some of the beginning classes we | Saturday had a lot of good info. I found it most rewarding when we were talking about volume and the different examples we did and listening to my fellow teachers talk about their experience. This brought some new thoughts that I had not considered...Interesting. A suggestion for improvement...if this a GT/AP class, it might be OK, |

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| not have an immediate answer of where I am going to implement today's work but do like the thought of using the boxes to attempt to present this TEKS.<br><br>**NO LOG ENTRY** | had be re-thought when dealing with on-level students. I thought I was the only one until I started talking to my peers...Again, a darn good Saturday.<br><br>**NO LOG ENTRY** | but for the majority of us, we are on level. Having info that can actually be used is more important then discussing things that will have no meaning to my students. When we stay on level...the info is great...after that then ??? As for the TEKS, this is right on schedule where we are...this was nice...and I can use immediately.<br>Tonight was good...very useful...enjoyed listening to my peers on what they are doing...got some good thoughts.<br>**NO LOG ENTRY** |

# Appendix E. Professional development (PD) logs—selected science participants

(Note: Participants completed the logs online. Their responses presented are verbatim, so any typos or grammatical errors were not corrected.)

| Day 1 | Day 2 | Day 3 |
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| **What immediate steps can you take to begin to align your mathematics and science terminology? After participating in Woodles, what changes might you make in your instructional delivery of new vocabulary?** | **What similarities did you see between the NGSS Scientific Practices and Common Core Standards for Mathematical Practice? After participating the Standards Circus, what changes might you make in lesson preparation in regards to focusing on sound mathematics/science practices?** | **Reflect on the misconceptions we have discussed today. How can common misconceptions in mathematics and science be used to create more engaging lessons?** |
| Some things my Math partner and I discussed was maybe meeting a few times a 6 weeks and discuss different ways we could integrate math in science and vise versa. Finding a way to get the students more comfortable in the math content area would be great for the students who struggle in math. | A few steps you could take to align math and science terms could be first meeting with your partner teacher and discussing vocabulary terms. Some terms are similair such as independent and dependent variables and are used in both subjects. Other key terms can be discussed throughout the year and talked about during class. You may also include some key terms from your partners subject or your word wall so they are getting exposure to them multiple times a day. After completing the Woodley activity i clearly see how important vocabulary is to students success. I was in the good group and while she was going over the terms i had a very clear idea of what each thing meant even though I had never heard of them. This is exactly how most of our students feel when we introduce them to new key vocabulary. I will definitely be including more visual aids and hands on objects for better understanding of terms. I also liked the way that the definition was never written down by the teacher. It was demonstrated and the students came up with what made sense to them. Vocabulary is crucial in students success and we as teachers must finds different ways to deliver a more meaning experience to help them better retain them. | Even though process standards are embedded in most Teks or asks as dual coded questions it is still important to be evaluated on an individual assessment. Some similarities I noticed was that most of the standards were found in both. Also there were standards that can be pulled from one subject and taught in the other. Many of these standards are being done in both math, science, and every day life and the students have no idea they are taking place. After completing the standard circus I realized how easy it was to incorporate and assess these process in every lesson. A few things I can do during lesson preparation is be fully aware that these standards need to be assessed and make sure I am including them in most if not all of my lessons. The circus we did I thought was more science based and I struggled finding the math in most of them. I think several of these could be used with the students in a science classroom. |
| Today we looked at how science and math TEKS can be merged together to do cross curriculum lessons. | One immediate step that can be taken to align mathematics and science terminology, is to take a deep look at the TEKS for corresponding terms. For example, in math TEK 8.8A and science TEK 8.5F, the term coefficient is used, but you must first determine if it is being used under the same context for both subject matters. Once the relevance of the term has been validated, they | After participating the Standards Circus, what changes might you make in lesson preparation in regards to focusing on sound mathematics/science practices? Both the NGSS Scientific Practices and Common Core standards for mathematical practices have similar requirements of the scholars. Both require the scholars to not only use higher level |

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| | corresponding term can be added to your word wall, on a different color paper to show that it has a connection with math, and the math teacher can do the same it their classroom as well. After participating in Woodles, I am going to try to incorporate as many manipulative as I can with new vocabulary. Students are already required to draw pictures and define using their own words, the manipulative addition will enhance the vocabulary learning experience. | processing skills, but they must also be able to communicate using those same skills. To be successful, they must also be able to not only think outside the box, but do so while thinking critically and be inquisitive. After participating in the standards circus, there a very few changes that I would make to make it useable in my classroom. I really like the usage of stations, keeps the students moving is a good thing, keeps blood flowing to the brain. I would display a timer, so that they knew how much time remained at each station. The questions would need to be made more precise, and not so vague. In the development of the questions, I would use a variety of levels of questions to better assess knowledge attained from this activity. |
| Meeting with my math partner to share ideas. See how we can have the students practice concepts in both of our classes. Take time to understand math teks so I can relate them to my science.. | We talked about ways to reinforce vocabulary in both our classes. How we can share the load when it comes to exposing our students to different ways of thinking. Seeing it in two classes can help them better understand why and how we are coming to conclusions. As far as the woodles, I understand now how confusing science terminology can be even to a student I may think knows what I am teaching. Even if a student retains the definition I gave them, they may not truly understand what they are learning about or why/how is works. So for my future classes I will try and allow them to explore what I am teaching before I just tell them answers. Have them manipulate and develops their own understanding. | They are both requiring higher thinking skills of our students. you can use multiple standards for each content. There are also some lessons we can use both a math and science side helping to integrate concepts in our own classes. Comparing them makes it easier to see how I can provide some math strategies in my classroom. Changes I will make will be addressing these as a tool or loose guideline when I am writing lessons for a unit. Think of a end result, a "what am I trying to get the students to do" guide. How is this lesson helping them in their observations or in their argumenting with evidence skills. Think of ways I can incorporate math practices in when I can. How can I sharpen their skills and make them more effective in math and science? |
| Today, I felt that I really was able to make strong connections between what happens in math and science classrooms. By having the opportunity to sit with a math teacher from my campus and go over the TEKs that our students are responsible for knowing in both math and science and seeing the connections that can be made, I have a much better understanding of ways in which I can support math content in my science classroom. I also think it was beneficial to see what challenges the math teachers might have and ways that we can support or spiral in their content to our Science lessons. I think that | I think it will be fairly simple for me to begin aligning my science vocabulary with mathematics vocabulary in the next school year. I find myself trying to use math words like slope when I am showing them pictures of topographic maps and looking at speed graphs. I think that when students hear math vocabulary in science classes and vice versa, they can make connections on their own in addition to being less intimidated by concepts that might have seen "foreign" to them in the beginning. I had a really great experience with the Woodle Activity being in the "Active Learning" group, whereas my partner was in the "traditional" setting and had a very different experience. By being able to see and touch and make my own opinion of a | After looking at the NGSS Science Practices and the Common Core Standards for Math Practices, I noticed that they both involve higher level thinking skills on the part of the student. Both of them are asking students to be active participants in their learning by making connections, observations, and explaining or reasoning what they have noticed about an investigation. While preparing a lesson now, based on the NGSS Practices, I would make sure to look at the list of best practices to make sure my students have opportunities to do multiple things, not just making observations, but being able to reason and explain their thinking. I want my students to have the |

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| while I am planning for next school year, I have a common focus in trying to integrate math concepts, vocabulary, etc into the activities and investigations that we do in my classroom. | definition, I was very successful in remembering information and being able to use it. It resonated in me because of my ELL students and how if you don't use their prior knowledge to scaffold upon or give models/pictures/etc. for students to see while they are learning, they won't have anything to make connections to. I currently teach my students hand motions that go along with each of our words and they represent the meaning of that word. I have noticed that this tends to help them find a connection between words and their meaning. This school year, I want to make sure I do this again, but let students create their own definitions by interactions with the content material, not just being told by myself what the word is, what it means, and what motion we would use to represent it. | opportunity to "do science" and I think they will be able to best do this by doing multiple "Best processes" instead of just one. |
| Communicating with the math teacher, being more aware of what TEKs are being taught in math and spend some time co-planning with the math teachers continuously to find ways to integrate the two classes. | In regards to the Woodles, some changes that I might make in my instructional delivery of new vocabulary is have students come up with their own definitions of words based on observations from what is being taught/seen. Students will test their hypothesis and come to their own conclusions about what they see/hear/feel, etc. This allow students to retain the information better and allows them to relate to the context and definitions. This will also provide assistance with ELL students mastering new vocabulary words. Immediate steps that I can make with aligning math and science terminology is using math terminology in the science classroom and referencing math content/terminology in the science classroom. Also maybe adding math terminology questions on a do first and apply it to science terminology (like explain how this math word relates to a science word). Allowing students to see the correlation between math and science and understanding the importance of having a strong foundation in math and attribute success in science. | The similarities between the two is that both used a lot of the same terminology with words like evaluating, constructing, observing, and arguing. The processing skills used in science will assist with the common core standards for math. Students will receive an ample amount of repetition and exposure to the skills due to it being applied in both classes. Based on the activity I will be able to identify where students will struggle and be able to provide accommodations in order to ensure they are successful on the activity. I will also be able to see where math and science overlap. |
| The small steps that I would take to shift some of my science lessons to be more connected to math would be to collaborate more with the math department and brainstorm in order to make connections at the same time. Also, during an engage activity incorporating math as well. | The steps that I would begin aligning both subjects terminology would be to look at both of the scopes and sequence of the TEKS and plan lessons that incorporate the terminology at the same time.<br>After today's session, I will not begin with giving the definitions to my students, but have them do an engage to explore the terms so that they can brainstorm and come up with a definition for the terms and draw pictures with analogies. I will also implement my word wall in a different way make it student derived. | The similarities that I had seen were included skills that require students to analyze, create models, and explain various activities. After this activity, I will be more aware of my terminology as well as include math as an extension of the lesson and explore section |

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| Today I learned several engaging activities that will allow my students to inquire about their learning. Utilizing the modeling lesson will connect science and math. I will begin by aligning science and math TEKS for better alignment. | When aligning terminology we should analyze similarities and differences among the terms. Then when presenting concepts and terms we should initially allow students to explore various probes so that they are able to formulate their own concept of the various meanings. So that they are own the meaning of each term. I would allow students to explore content without telling them the book meanings of concept. Once they have a grasp on their own meanings then it is time to connect their meaning to the true meanings. | Common practices are among the processing standards. These standards include planning, implementing, collecting, recording, and analyzing content. Changes are not necessary but I will include aligning similar and dissimilar content or vocabulary. When identifying content professionals are able to communicate these variances to their students. |
| Collaborating with my math partner to review our existing curriculum calendar has been helpful. We discussed what the TEKs require and how we are addressing them. From there we can brainstorm connectedness | Essentially I need to coordinate with math to review curriculum and how the terms are addressed. In doing so we noted similar concepts. As an example, I discussed terms/vocabulary used with my math partner. one example we discovered is the use of terms like positive and negative slope when reviewing speed and acceleration graphs | I am continually looking for better Engage activities. The Standards Circus provided several that I can use directly as well as modify for further development. |
| NO LOG ENTRY | NO LOG ENTRY | NO LOG ENTRY |
| Looking at TEKS for math and science to see where correlations can be made. Once those correlations are located then go to the specific lesson and add/make changes where possible to incorporate more math into science lessons. | To align math and science terminology you can make a list of terminology needed for each subject and see where things overlap or relate to each other so that you can formulate similar definitions for each words. This will link the definition from one content area to another and further solidify the understanding.<br>After doing the woodles activity it makes me want to look over my vocabulary lists and see in what areas I can devote a day to the exploration of these words so that the students can have the opportunity to formulate their own definitions and have practice with them so that their understanding of them becomes deeper than a dictionary memorization. | I missed the beginning math portion of the activity, but from what I gathered it was a lot of concrete exploration with solving equations. From what we did in science it brought to light all of the connections that can be made from solving equations in math and the process of formulating a chemical equation. There are ways to tie vocabulary terms together and use terms in math to explain science and vice versa. |
| Start with more hands on activities. | Combing the answers to those 2 questions; finding a hands on approach for vocabulary while giving a visual representation would be extremely beneficial. I also believe that allowing the students to manipulate the definitions in their own heads to make their own connections would benefit the students in a remarkable way. | A basic fundamental approach that we can tie together. |
| Small steps to take now to shift existing lessons: Make a conscience effort to be aware of math connections that can be used in science Communicate with math teachers to make sure we use the same terminology<br>Identify opportunities for students to connect what they are learning in science to what they are learning in math. | Increased communication between math and science teachers would help align terminology. The woodle activity was interesting. I was in the note taking group. I am going to make sure students get to experience vocabulary and build their own definitions for science terminology.<br><br>I am also going to have students create a word wall of common terminology that they do not know - I feel that I | I saw that math has processing skills embedded in their standards like we do in science. Many of the processing skills used in math correlate to what we do in science with regards to measuring, using instruments correctly, calculations, and analyzing data. A change that could be made during lesson preparation would be to look for specific math process skills that could be included in a science lesson and |

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| | assume they know "common" words and this is not always the case | use the same terminology with the students. I also think it would be good to post the processing objectives along with our content objectives so that students are more aware of them as they use them throughout the year. |
| The small step which is more of a major step is to hahave the teaks side-by-side. Then look at which two can connect with one another. | I think it's important to include active learning, when it is possible, to introduce vocabulary. Anytime there is an opportunity to give a tangible or real life experience it is great. To continue to support vocabulary retention that is when you can use more traditional methods. | Today was a day full of information I needed. This is my first year teaching 8th grade science and I haven't had to use this terminology since college! The lessons today connected science and math well but it was helpful to you if you were confident in one or the other. The only thing I would change is doing an example or two before letting my student have at it. |
| Moving forward I believe that collaboration with my Math partner would be the right way to go to look at how our teks are related. The planning piece will be an important factor to the beginning of this partnership. | I believe doing a comparative list of vocabulary words in both content areas would be a great starting point to identify how each word is used and define. Woodles was a great eye opening experience. The repeativness of the words being described helped me to understand how we must allow students to interact more with their vocabulary in order for them to fully understand. | The similarities I recognized between the math and science process skilled where almost pretty much the same. For example using analyzing and interpreting data. This skilled can be used to interpret graphs in both the science and math classes. Before I can answer this question I would like to reflect a little more. |
| I can collaborate with the math teacher as starting a new unit to see where we can work together to include both math and science. For example, I would like it if we can make sure that I am not covering a topic such as speed or acceleration before the students have been introduced into how to solve algebraic equations.<br>Also, I think I will look through the math tells as I'm planning so that I can try to include math tells in my lessons. | Some immediate steps that I can take to align math and science terminology is to work in collaboration with the math teacher and see what concepts we have in common and try to use math vocab in my class, so that they're being exposed to the terms in both classes and not just one. The same can be done in the math class with science vocabulary.<br>After participating in Woodles I would not introduce new vocabulary to the class by simply writing it on the board and explaining it in my own way and expect them to understand and retain the information. I was one of the students in group 1 which had to write everything down and had no idea what a woodle was, which put me in the seat of a student who sits in class and looks at the teacher as if they're talking gibberish.<br>I instead believe that it would be more meaningful if my class was given the opportunity to explore the concepts that are being covered in that unit before any vocabulary is introduced. That way when the vocabulary is brought up, it will be more meaningful and understanding more concrete. | Both NGSS scientific practices and Common core Standards for math focused on problem solving through investigation and evaluation of observations. The both included the use of models and reasoning and being able to come up with conclusions based on given data.<br>I think that in my class I need to be more deliberate about it and making sure that I am integrating the process skills in each my activities. Based on how well student do in activities I can decide whether they are doing well in the process skills and which ones I need to put more emphasis on. |

| Day 4 | Day 5 | Day 6 |
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| **What real-world applications did you see during your tour of ConocoPhillips that can potentially be expanded upon for a lesson? What other real-world connections to the TEKS came to mind during the week?** | **Today you have had the opportunity to work on a lesson that is a mixed between a guided and open inquiry. What are your immediate thoughts on this type of lesson, its potential, and its practical implementation?** | **How would you like to see the mentoring component of AMP! structured? (Monthly visits from AMP! teachers, as-needed visits, in-class visits, planning visits, phone conferences, etc.) Think about all you have done in AMP!. What are the AMP! Goals you would like to set for yourself to achieve in the upcoming year?** |
| In order for teachers to address common misconceptions they must implement more inquiry based learning in the classroom. Since students need for engagement and hands on activities to change any preconceived notions this would create more engaged lessons. Another way to address misconceptions is allowing students to communicate with one another to allow them to figure the correct answer to a misconception. | I had a hard time seeing many real world situations that could be used for my students that they don't already learn about. While they are learning about energy sources would be a good time to incorporate the Conoco visit. You could also spend some time discussing geology of different types of rocks/sand that they would be drilling through. Other than that most of the stuff I saw that would be grade appropriate is already being taught. | On one hand as an adult and knowing the topic I really enjoyed getting to work though the entire inquiry proceess. On the other hand I have mixed feelings about the inquiry process with students. I believe the inquiry process needs to begin at a much younger age. Middle school students are already battling with several other things so asking them to think differently could be an overload. If the students started inquiry earlier then by the time they reached 8th grade they wouldn't have to learn anything new. I love how hands on inquiry is and i believe the students learn better this way but I am very leary with teaching them a new way of thinking and them shutting down. This method is very practical especially if lower grade levels use this method also. |
| Misconceptions can be used to create a more engaging lesson because you are aware of what the misconceptions may be, allowing you to be ready to play devils advocate. By playing devils advocate, you will not be directly giving the correct answer, but providing them with questions to make them think. In this process, gently nudging them towards the correct answer. By allowing them to come up with the answer, and not just being given the answer, they will formulate better connects and hence eventually storing the correct answer instead of the misconception. | The panel of experts that we had the opportunity to address could be implemented into a lesson, that will address real world applications of scientific processes within their field of study. This would address TEK 7.8C, which deals with man's impact on the watershed. This would be a question posed by the kids, because they equate oil drilling with water pollution and destruction of the environment. So, by addressing the panel of experts, misconceptions can be addresses as well as a new found respect for the jobs performed by the experts wether it be in science or math. | Mixed guided and open inquiry is something that I can implement into my classroom in very small doses. My students are at a level that they will not be able to fully understand how to utilize the time given to develop their own set of questions about a particular concept, not matter the concept. This is because they lack the rationalization to make the real world connections to the concept at hand. So, inquiry is going to be hard for them, but not impossible. My class sizes are too large to allow as much development time, as we had today during our investigation. |
| If I know where their misconceptions are I can better work to change those ideas. It'll make me more effective in that I know where to direct my students in their learning process. For example if it is a vernacular problem I know it's a matter of changing their way of understanding a words meaning if it's a preconceived notion I need to help make different connections instead of the | I have always told my students it's not always what I'm teaching them that's hugely important it is how they are learning. The skill set and inquiry skills will follow them to high school and maybe even careers. From touring and talking to different employees a lot of their jobs were using math, science, AND those analytical skills to be successful. Not every student who has my class will become a scientist or mathematician but in my class they are scientists! They | I think the level of inquiry will be based on where i am with my students. The students need to be comfortable with asking questions and experimenting. I like the teacher guiding as they come around. As soon as the students may be going in a frustrating direction the teacher can help them out of their rut without actually giving them the answer. I hope I am able to help guide my students to an answer as |

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| one they've previously developed on their own. | are thinking, questioning, and coming to a higher understanding in learning the TEKS. I think this tour reiterated what I've already known that how I plan my lessons and engage my students will help them with their futures no matter what path they choose. | opposed to giving them the correct answer. I kn ow they need to struggle a certain amount to build better ideas. |
| I think that by knowing the misconceptions that our students have prior to coming to our classes, we can create engaging lessons that challenge their thinking. I really like doing this with vocabulary for different units. Just like what Christina did today with the word "satellite" and seeing what different people thought what it meant and then guiding discussions based on it was really insightful. I think that by posing questions that challenge what many students believe leads to insightful conversations and helps to make stronger connections for "why" something is happening and are not just being told that their original thought is "wrong". I like to do this by playing "Four Corners" with my students. I pose a question and they asked my students to go to the corner that they most agreed with. Then those students tried to come up with a justification of why they picked that answer and they would be able to debate with other groups until a consensus was reached with the correct answer. | Something that stood out to me during our time at ConocoPhillips was how real world application and problem solving was stressed. Each of the different speakers, although they had very different jobs within the company, all mentioned how they had to look at data to predict changes and base decisions off of patterns. During the panel discussion, they mentioned skills that future employees would need in order to be successful. The main one that each of the members spoke about was the ability to work in groups and be critical thinkers when it came to problems they were facing on a daily basis. I think this directly relates to what we are doing in our classrooms. It is so much more vital to our students education to teach them how to think, not just what to think. We want our students to be able to relate what we teach to their daily lives and see that there is a strong connection to everything that is going on around them and the information they are learning in our classes. In relation to the TEKS, I think they really focused on the process skills of both math and science, not really just content. The speakers talked about how students are excepted to come in with the base knowledge, but show that they can really think for themselves and solve problems by looking at data. This is something that I will focus on more in my classroom throughout the year to help my students be better thinkers for the future. | Today I had very mixed emotions about the Inquiry project we worked on in class. I have done full inquiry projects before and have had very different experiences. Starting by being asked to develop questions that we had about the original experiment which we could test, I felt very confident with. I teach science to my students, so I find it pretty simple to find questions that would be testable with an independent and dependent variable. When it came to testing a question that we found around the room, my frustration began to build. I felt as though the question my group chose was such that a single answer would suffice, and not much experimentation and data collection had to occur. My group went through multiple phases of changing our question that we would investigate and then finally settled on something we felt we could test. The most frustrating thing to me during this activity was not the lack of direction or guidance, but that the materials we were given were not working as we had hoped. We had many logistical issues that we had to confront in the engineering portion before we could even do our experiment that by the time we figured them out, my brain had "checked out" of the project. I like giving my students opportunities to do inquiry based learning, but with these materials, I would not feel comfortable doing it with my students. When I first tried to do inquiry projects in my class, I went for a "full inquiry" approach and didn't scaffold in as much help as they needed. This was a big challenge, but when I started out the year doing small inquiry steps and then building up to this full inquiry, I had much more success. |
| Misconceptions in math and science can be used to create more engaging lessons by creating a culture of error in your classroom. If students are comfortable with having misconceptions and misunderstandings they are more likely to be engaged in the lessons | The real life applications that I can expand on in my classroom is that I am able to provide my students with job opportunities available in the math and science field besides doctor and engineering. I can also use the information provided about locating cracks and oil and use ConocoPhillips as a resource for students to understand | My thoughts on this type of lesson is I would have to incorporate a lot more guided inquiry in terms of what students will be investigating and the engineering of the contraption. I wouldn't give students the procedure and how to obtain their data and students would present their findings and we would have a |

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| because they won't feel the pressure and judgment from their peers and/or teacher. Also, it can provide a forum/space for students to have discussion about their misconceptions and come to a consensus on why their misconception is incorrect which will then hopefully open up a space for them to want to actively learn/correct the misconception. | how the work that they are doing will be used in future jobs. I can implement an avenue for students to research ConocoPhillips so that they can actually see the real life applications. | class discussion. During the lesson our group become discouraged and disengaged because of the engineering barrier which led to us not being very successful in thinking critically and reaching the full inquiry experience. Due to this I would offer more guidance to my students. |
| Misconceptions can make lessons more engaging, by presenting students with common misconceptions of general real world scenarios. Then have the students make predictions, and give them the opportunity to explore their predictions using science and mathematics. While exploring, the students will be guided by questions to help them go into the right direction. | The real-world application that could be expanded upon for a lesson would be the presentation of the geophysicist utilizing graphs, probability, and composition of the Earth. Other real-world connections from this past week were engineering techniques for designing race cars; calculating the real value of coins (pennies, nickels, dimes, etc.); and investigating different types of satellites and their relation to topography. | I believe that inquiry lessons are an excellent way for students to make connections about various concepts that would be put in their long term memory versus short term memorization. However, developing and implementing inquiry lessons is a process that takes time not only for the instructor but also for the students. When first implementing lessons with inquiry, there should be guided questions until the students adjust to this type of teaching and then gradually be led to performing open inquiry lessons. Inquiry based teaching is a challenging and different way of presenting material to students, but I feel that it will be very beneficial to the student for learning and retention of material. There is great potential for these types of lessons, and I am very excited about implementing these principles into my lessons. |
| Misconceptions are common occurrence in the classroom. These misconceptions can be linked to individual perception, background, and learning abilities. In the science classroom engaging lessons can be developed through student generated interactions and conclusions. If a student learns through inquire they are able to formulate their own opinions of the topic as well as making the connection with very little guidance in order to own their learning. | I loved the team building activities. | This lesson allowed me to visualize the scientific inquiry with variances in experimentation, understanding that students can come to the same conclusion different ways. It's potential leads to independent inquiry within the classroom. As stated in class we will have to expand the students prior knowledge in order to flow through the inquiry. |
| engage activities designed to address misconceptions via the encountering of discrepant events can often have students actively questioning and predicting. By adding some challenge questions after the discrepant event, the teacher can guide the inquiry. | Being in the greater Houston area means we will have many students with family in oil industry occupations. The tour, speakers and forum allowed the opportunity to connect concepts like human use of the environment and dependence on ocean systems with the importance of collaboration in addressing issues.<br>Additionally, I noted the importance of math and science connectivity from conducting pure research and charting data, to understanding geologic structures through technology applications and communication that | I found guided inquiry to be much more managable in terms of ensuring students are focused on desired objectives.i believe the potential for student success is high because students are making more connections to the knowledge obtained. |

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| | knowledge with standardized mathematic concepts and models.<br>I enjoyed seeing the fruition between connections of math and science standards to applications in business. | |
| **NO LOG ENTRY** | **NO LOG ENTRY** | **NO LOG ENTRY** |
| One of the misconceptions is the preconceived notions. This is something I feel would be the most challenging to overcome in the classroom. In the reading it talked about how the longer our misconceptions go unchallenged the less likely we are to change them. When students have gone 12-15 years of life thinking a particular way about something, or the past 6-7 years of schooling thinking something by the time they get to me in the 8th grade they will probably be more likely to think I am the one with the misconception. Because teachers need to break down these neurotransmitters and essentially rebuild them they need to develop lessons that not only captivate the students but also be presented in such a way that they students are more receptive to the notion they might be the ones with the misconceptions. | I think all of the activities we did could be used as team building at the beginning of the year, then once we go over topics such as speed velocity and acceleration we can tie it back to the mint mobile activity and the marble madness activity. I think the mint mobile and marble madness are more aligned with science TEKS than the tower activity, and both would be used as an excellent explore and/or engage activity to get the students minds thinking about the topic they are about to learn, target their previous knowledge, and get/keep the student interested. I also look forward to using the scales for teaching balancing equations, spinning the water buckets for a physics lesson, the pencil sharpening explore in the beginning of the year to talk about scientific method, and paper clip in a baggie to introduce coefficients and subscripts. | I personally prefer the guided inquiry and think it would be more effective in my classroom. I feel like guided inquiry would cut down on time wasted on directions it wasn't intended on going and provides a guideline on which to operate. I personally work better with this kind of structure and having SPED kids it provides the availability to scaffold and modify easier. I also feel like a guided inquiry would work better for students that are untrained in scientific inquiry and need to learn and practice the skills of developing questions, determining variables, determining testable hypotheses, and creation of an experiment. Once the guided has been done a few times and the students learn what is expected of them they can move closer to a more open inquiry because they have developed the skill set for that to be productive for them. |
| Listening to their misconceptions can allow for us to engage in discussion to rectify the discussion. | **NO LOG ENTRY** | I found the lesson to be a good thought experiment with following instructions. It would be a good assignment to do in the beginning of the year. |
| Addressing misconceptions in science can lead to more engaging lessons because it gives us a starting point. If we force students to confront their misconceptions it increases their ability to solve problems. I enjoyed the article and thought it made many good points. | I think that the information about fracking would be interesting to the students. I feel that this could easily fit in to our curriculum when we are teaching plate tectonics. | I thought today's lesson was interesting. I could see using something like this but worry about management. 8th graders on their own can make interesting choices. |
| Misconceptions can be used to heighten the engagement of lessons because of the enormous ah-ha possibilities. Discovering something is one thing but discovering something different about something you once thought was true is another. The engagement factor is up because the anticipation of the student feeling as though they will not be proven wrong is an element that works with the teacher. | **NO LOG ENTRY** | Today's lesson offered a great example of how one lesson can allow for students to gather data, write down data and interpret data according to their investigation. |
| Misconception are not wrong; the information is usually needs to be reorganized to make sense. | The experience at Conoco Phillips was a great! The lessons conducted this week can be implemented in many | Guided inquiry is more teacher directed and less student directed. This type of inquiry should be a |

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| After the reading selection misconceptions can be used to get students thinking an talking and testing their thoughts. If students are able to work through their misconceptions they will have a better understanding of the concepts and it would make more sense to them. | different aspects. For instance the marble mini lab can be used as an engage to balance and unbalance forces as well as speed, velocity, and acceleration. The marble lab can also address Newton's Laws of motion. I believe all the lessons introduced this week can be used to broaden the students and teachers way of thinking and apply them to any real-world application such as a ride on a roller coaster. | starting point for students. Students should gradually move towards an open inquiry this allows the students to investigate and communicate more. The potential of these ideas can foster the essential questions that the students need to be able to answer at the end of the lesson. |
| As we discussed today in class, misconceptions arise when people are faced with information that do not fit within any of their current schema, their brains then work to rearrange them to make them fit. When these misconceptions are left alone and not addressed, they become imbedded and very difficult to change. These misconceptions should be caught when formative assessments are done at the beginning of a lesson. These misconceptions can then be used to create meaningful inquiry-based activities that can address the misunderstandings. This will give the kids hands on experience that will allow them to reconstruct their understandings. | I think that it was very beneficial to tour the ConocoPhillips facility and be able to hear from people who are using science in their fields. It will be great to be able to go back to my class and tell my students how they will be able to use what they know in science in the future. | I really liked the activity that we did today in class, however, I do prefer guided inquiry to the more open inquiry. I think that it allo s the teacher to provide a focus for the students with respect to what the outcome of the activity should be. This is especially important when we have to worry about making sure that objectives are covered before the star test. I think an open inquiry would be good to use to introduce how investigations are conducted in science and the use of graphs in the class. |
| **Day 7** | **Day 8—9/26/2015** | **Day 9—9/30/2015--Evaluation** |
| **1. Which aspects of today's session were most beneficial to you?**<br>**2. Which aspects would you like changed? Please explain.**<br>**3. Share your plans for implementing today's lesson, "The Fast and the Curious".**<br>**4. What is one thing you would do to make the Fast and the Curious Activity work better in your classroom?**<br>**5. Please share any challenges you experienced in implementing AMP! lessons to date.**<br>**6. Please share your AMP! success stories. We want to share your successes with CoP.**<br>**7. Anything else you would like to share? (optional)** | **What was most useful about tonight's presentation?**<br>**What part of tonight's presentation could be improved in future sessions?**<br>**Share you thoughts on implementing any portions of tonight's Mathematics or Science sessions.**<br>**Are the TEKS that were covered this evening currently be covered on your campus, soon to be covered, or already finished?**<br>**Please provide any other feedback you would like to share. (optional)** | **1. Which aspects of today's session were most beneficial to you?**<br>**2. Which aspects would you like changed? Please explain.**<br>**3. Share your plans for implementing today's lesson(s), Honey, I Shrunk The Length or Scaling the Universe.**<br>**4. How could you implement some of the aspects of today's art exhibit, Intersections, in your lesson design?**<br>**5. How are your students responding to increased inquiry based learning in the classroom?**<br>**6. Anything else you would like to share? (optional)** |
| Some goals I have set for myself this year is to be more open to the inquiry based learning style. This is my 5th year teaching and I have spent all of them doing directive teaching so this | 1. I loved how the students were able to just use to cars to test whatever variable they are curious about, I think this would allow them to be more comfortable once the teacher releases them to full inquiry. | 1. I loved all the hands on labs that could be incorporated into the classroom. The precipitation lab would be a great visual for the students to see, because they typically struggle with two liquids |

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| method is going to be very new and different for myself along with the students. Thought out the year I would like the mentoring piece to be as needed. | 2. Maybe chunking the lesson so it wasn't so much information for the students.<br>3. We already have those buggy cars, and since I have been there we have not used them. I plan to do this lesson but more guided due to the fact that our students struggle with this TEK.<br>4. Maybe figure out a way to help the cars go in a straighter path. During our investigation we spent alot of time redoing our trials because our car kept going diagonal so our data was thrown off. Also include a chart to make sure the students are doing 3 trials.<br>5. I have not been able to implement any lessons yet.<br>6. Since I have been in the AMP program I am thinking more about how to integrate math into my lessons. While teaching food webs I had a thought about after my students completed a food web they could take it to math and calculate the percentages of producers, consumers, predators, prey, etc. | creating a solid.<br>2. I really enjoyed the lesson. The pace and length is great for my classroom.<br>3. I will be using this lesson in rotation in my classroom when we teach chemistry.<br>4. We will be teaching the chemistry TEKS after Christmas. |
| I would like a mentor to drop in on an as needed bases to provide feedback on inquiry processes being used.<br>AMP Goals<br>- Introduce inquiry in small chunks into my classes.<br>- Take college Algebra, again...my math is really rusty.<br>- Write better lesson that are inquiry based<br>- Better understand shifting of lessons.<br>- Achieve and maintain a level 2, by the end of the program. | 1. The fact that TEKS that wil be addressed soon, where addressed :)<br>2. I would have to download the application to my Ipad and and do that portion of the lab as a demo.<br>3. I will be using the race as an engage piece to get students excited about physics.<br>4. It would be nice to have a class set of Ipads and an endless budget, but we can all dream. I would take this lab outside, using the sidewalks, for more room to explore. | I did not find any part useful for my scholars.<br>This lesson works well with a group of scholars that have a higher level of math. A majority of my scholars have a 4th grade reading level and struggle to do simple division and multiplication, without a calculator.<br>Pantographs |
| Visits as much as possible really. I would prefer in class or face to face meetings over phone. Perhaps lesson design hell followed by watching implement it in class would be helpful to make sure I'm following through with an inquiry based class. Also in class would be helpful to identify where I can are up higher level thinking I may have missed. I hope to become better at helping my students reach a higher thinking level. Building a healthy and safe environment for my students to feel comfortable to share, think, and explore in. | 1. Exploring a new app and different technology pieces I can use in the classroom.<br>2. I felt a bit rushed today but overall everything worked fine<br>3. I like using the video then having them predict who will win. Also having them create a real life scenario to go with the graphs would help me understand their thinking process for why a graph looks the way it does. (Is the care moving, how fast, did it stop, etc.)<br>4. Break it down into chunks with guided questions<br>5. students wanting to explore on their own as well as me letting go of some of the control/spoon feeding<br>6. Students understanding the content on a deeper level, I can hear their conversations during hands on exploration | Getting to experience the lab/changes hands on. Playing with lab equipment I wouldn't usually get to.<br>Maybe share with other groups, get our ideas/experiences out<br>I would use the video at the beginning (heating test tube). Also the sulfer/iron mix with a magnet. Let the kids view the video and share their ideas of what will happen next.<br>soon to be covered<br>the discussion at the end was nice. Hearing all the different ideas with just some leading questions... |

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| | and they're forming understandings of the vocabulary not just learning definitions. I'm also able to hear where their problems are.<br>7. nope | |
| I would most like the opportunity to have as-needed in person visits from our mentors. I think we would also benefit from just phone or video conferences (Skype) or a planning meeting to address questions as we are planning upcoming lessons. This upcoming year, my goal is to integrate as much math into my science classes that would really build on math and science concepts, instead of just "shout-outs" to math that is being used. I also want to make students see the relationships between math and science concepts to make students who think they are "bad" at one or another subject and support them by showing connections between the 2 subjects. | 1.The most beneficial aspect of today's session was "The Big Race" stop motion video and activity. I definitely liked the Video Physics app that we downloaded to track the motion of our cars. I could see myself using this with my 8th grade Science students when we talk about speed and how the graph interprets different data.<br>2. I believe that we really don't need to spend as much time "doing" the activity as if we were students and more time being able to discuss how we would change or adapt lessons to fit our individual needs with other teachers. I learn so much from the other teachers and things that they have tried and work or tried and didn't work, then the time I spent "doing" each of the lessons.<br>3. I feel like I would use the stop motion video as an engage part of my speed lesson for my 8th graders. I think giving my students the opportunity to see a real life situation involving speed, and challenging them to think about the things that influence speed without just giving them a formula first would be very beneficial. I think I would then continue my lesson on speed and bring this video back at the end and see if their thinking has changed about how to solve the problem now that they have background knowledge of the speed equation.<br>4. To make this lesson better for my students, I would have them compare graphs for different vehicles to see what a speed graph looks like when one vehicle is faster. I would also like to give my students the opportunity to set up their own experiment to test and then share their results with the group based on different scenarios like what would a graph of speed look like if a car stopped moving, or began fast and slowed down as it traveled, etc.<br>5. My students have struggled with taking ownership of their work and not being given a true set of directions. When I try to do true inquiry lessons with them, they are consistently worried about giving the "correct" answer and not knowing what process that we, the teacher, want them to follow. I think this will get better as the year goes on since we are going to continue doing this inquiry process and they should become more comfortable with student guided learning. | 1. The most useful thing about tonight's presentation was the real life connections of chemical and physical properties of Sulfur to the news article. I think that by giving my students the opportunity to see how people interact and see elements in real life helps them form connections to their properties.<br>2. I would not be able to let my students do the type of experiments that we did because of the type of chemicals and Bunsen burners. I really liked that we could see the different evidences of chemical changes, but I wish this could be done with chemicals that I would be able to trust with my 8th graders.<br>3. I like being able to show my students how the Science we learn about in class relates to their real life, like the news article about the Sulfur in the volcano. I think this was a very interesting engage lesson for my students that would also help their reading comprehension. I also like to give my students the opportunity to do these experiments(Modified) to make their own reasoning about what evidence of chemical change that they see.<br>4. I am currently in the middle of my Chemistry Unit. I begin chemical reactions tomorrow, with something I do called a "Chemistry Magic Show". We do this in our Teaching Theatre and have students watch different "tricks" to decide if a chemical change or a physical change has occurred and why. |

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| | 6. I did the "Ice Balloons" Inquiry lesson with my students the second week of school and it was challenging for students at first, but they really were able to develop their own observations and connections by developing their own questions to test and experimenting. I had to do this in steps with my students to guide them through the process, first I had them develop the questions that they could ask or that they wondered about the Ice Balloons, then I let them go into a more guided inquiry with doing the experimentation and data collection. | |
| I would like to continue to explore my STEM activities/programs for myself and my students. A goal that I would like to set is for my students who are interested in STEM to go on one STEM field trip this year. I'm actually in the process of planning a STEM educated field trip to iFLY for a small group of my students. So goal accomplished! | I would use the engage component of the fast and curious lesson.<br>The rigor/content for the math lesson seemed too rigorous for students.<br>I would love to use a lot more technology in my classroom, however finding ways to implement technology when technology is not that accessible is a challenge.<br>I was able to do the scale of the universe lesson successfully. I had students download a QR reader code on their phones, able to make a connection to math with scientific notation, and students were able to correctly organize themselves.<br>Looking forward to the chemistry lessons on Wednesday. I love chemistry and we are currently in our last unit in chemistry. | The most useful part about the presentation was when we explored the mixtures, elements, and compounds.<br>I would implement the lesson because it is a TEK and concept we cover in class, however I had already taught the lesson and would have needed the materials earlier. |
| I would like to see the mentoring component as a once every two months in-class visits. | 1. The most beneficial aspect was leaning about the App that helps incorporate technology in another aspect when teaching speed, velocity, and acceleration. I also liked the way how the group was divided into quadrants and then into smaller groups.<br>2. I would have liked for the presenters in each quadrant to have rotated rooms each session; and I would have liked for everyone to have had the opportunity to access the app today to their device.<br>3. I will implement this lesson in the 4th SW when discussing speed, velocity, and acceleration by creating this as a station in a circus.<br>4. I would take more time and ask more guided specific questions emphasizing the math aspect at each station.<br>5. The challenge I experienced was trying to remember the difference between velocity and acceleration as well as trying to figure out the app.<br>6. My science team has embraced inquiry based teaching as a whole department. The students seem more excited | The most useful information about tonight's presentation was being able to introduce chemical reactions with an engage of a 6th grade TEK mixtures and properties.<br>I would keep everything the same-great lesson.<br>I am definitely using this lesson to introduce chemical reactions in the third six weeks along with balancing equations.<br>These TEKS are covered in the third six weeks.<br>Tonight's lesson was very exciting and inquiry based that I believe my students would enjoy. |

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| | about learning science and they are able to relate vocabulary to their previous experience. Ice Hands activity was a success and other schools in my district incorporated this activity in their lessons as well the first six weeks. | |
| I would like to see th mentoring program structured as as needed, Edmond page, as well as a video presentation illustrations questions, concerns, or updates of student questions that can be addressed as a whole staff update.<br>I love the inquiry based learning and I will implement this in the classroom. My main goal is to develop an amp lesson per unit. | Today's beneficial piece included the extended collaboration between other teams. In addition to collaboration, science/math integrated content activities are great. There aren't any changes needed at this time. I plan to implement this lesson throughout my force and motion lesson, which students are able to graph and analyze motion of a moving vehicle. An experienced challenge includes time management. My students are engaged to the point in which it is very difficult to cut them short with their inquiry activities. We are having success with student excitement and engagement. Awesome! | I loved the chemical reaction activities. These activities will provide my students with an engaging activity. In science class I will allow students to make connections related chemical changes. We are going to cover these TEKS will be cover soon. |
| Please come visit me anytime. I enjoy visitors. However, I understand the logistics issues, so in terms of my needs I am open. Perhaps what would be best for physical visits would during the longer time periods in which we will not gather as a group.<br>Additionally, I like the idea of recording lessons and submitting them for feedback which can be discussed via skype (or similar program).<br>Another option could be a web meeting with the teachers from the same district and the STEM staff (mentors).<br>My AMP goals include improving my instruction to the next level. Currently, I am part of a campus and district that seems to be continuously working harder and harder for smaller and smaller gains along the concept of the law of diminishing returns. Along the same line, I want to continue to expand my professional network so that I may collaborate for ideas. | I liked the use of a google form to collect and then then graph small and whole group data.<br>The lecture hall was a bit crowded<br>Thinking in progress, however, this activity meets several needs for applications of the laws of motion. I think I prefer (for science) using vehicles that are not traveling at constant velocity. The stop motion video can help with that. I also intend to video the local coal train and the rodeo tonight to use with the Vernier app.<br>For the big race video activity I would provide a finish line distance as well as a requirement to determine the time and the distance both vehicles would be in a tie.<br>The challenge thus far has been to get students to develope their own questions as well as solution procedures. They consistently insist on the teacher providing a location (internet or book) to find a knowledge level answer.<br>The success is related to the challenge. I'm more stubborn than the kids, so I am seeing them learn to think thru their responses. Ex I provided a low level (mostly knowledge) quiz to students during the ecology unit. Students generally did poorly with class averages from 55% to 73%. I followed up with another quiz of all released STAAR questions with class averages of 73% to 91% | Most useful was the additional ways to build existing chemistry into inquiry<br><br>suggest that we can bring our own better fitting lab coats and safety glasss<br><br>i intend to incorporate this next week as we are beginning our chemistry unit tomorrow. However, I am concerned about the costs involved with disposal of wastes and will have to use some different substancesor some of the rfeactions.<br><br>The TEKS were covered in this lesson. However, the time spent on mixtures should be reduced (not eliminated). It is not in the TEKS for 7th or 8th grade, though still important to activate prior knowledge.<br><br>I also enjoyed the Scince World article. I need to find out what happened to my class suscription this year. |
| **NO LOG ENTRY** | **NO LOG ENTRY** | **NO LOG ENTRY** |
| I personally work best with an as needed mentor program. I am fairly critical of my performance so I think maybe an initial visit to | 1. The breaking up into the groups seemed beneficial to me because I feel like working in smaller groups is more effective. We were able to take care of our business more | a way to introduce chemical changes with a reading as an engage, something they would be interested in none, everything we did is something I want to use in |

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| observe then get what was done right and where I could improve then move on to a more electronic relationship via email or video conference or something that way I can get initial feedback as soon as I could so that I can improve throughout the year when I have time to improve rather than having no time to correct mistakes or misunderstandings of what is happening via word description vs actually seeing what is going on.<br>One goal that I want for this upcoming year is to loosen my reigns a bit and allow more student centered investigation rather than me presenting information and students taking notes and the typical "sit and get" that I lazily lean towards. A lot of times I want to get to the point rather than let the students get there because I think they won't get there or feel crunched for time. Allowing students to come to their own conclusions gives me the opportunity to enhance my questioning skills to ensure they are going in the right direction. | efficiently with less interaction with so many people<br>2. Being in the large group setting was more difficult. There were a lot of people talking over people so hearing was a difficult part of being in such a large group setting.<br>3. I want to use the cars and meter sticks in gathering their on data to calculate speed. once we have our data we can create the graphs and talk about the motion of the cars. The kids will then take their graphs made in science and in math find slope and make equations.<br>4. I am going to give them the graphs created in AMP for the students to analyze. My school isn't technologically advanced so using the motion app and creating their own graphs would take longer to explain how to work and get done than giving them data to analyze. it will fit better in the curriculum.<br>5. I haven't had problems implementing things in my classroom. My only issue is that we have spent the first month in ecology so there hasn't been many amp lessons in that category to try anything out.<br>6. I used the parachutes activity to teach scientific method during the first week of school It worked as an excellent engage activity and got a lot of my students excited for science and I have seen a much higher work ethic in general than my students last year that we did scientific method over worksheets and "kiddy" labs" | my class<br>Setting up stations for the students to see different chemical reactions to learn all the evidences of a chemical reaction rather than just videos<br>we start covering them next week! :) |
| **NO LOG ENTRY** | **NO LOG ENTRY** | **NO LOG ENTRY** |
| My partner and I would like monthly visits if possible - I would like feedback on how I can improve. My goals are to increase the amount of inquiry and choices for my students. I am also going to focus on asking good questions - the students would get so much more out of my class. I would like to work on the students doing more of the explaining in class than me. | 1. The most beneficial activity was learning how to use the graphing app. I will try it with the students if our school will pay to load it on our iPads.<br>2. I would have sent the app download in advance so we could have explored more before hand.<br>3. I would like to incorporate this activity in our physics unit - I feel that the students would find working with the cars more engaging than lab activity we normally do where the students collect data of themselves walking in different ways.<br>4. I would like to include Newton's 1st and 3rd law as well so the students realize all 3 laws can be applied in any movement situation.<br>5. Challenge - getting some of the kids that are less excited about school to participate in the activities and converse about the given topic rather than topics of their own choice.<br>6. I did an atomic structure activity where students built a model using materials of their choice. They had to alter | The TEKS are being covered right now. I think the most useful was getting more examples of chemical reactions. I like the article as well. The only thing I would change is the time - I would have rather stayed longer on Saturday than come back tonight. |

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| | their model and then do a gallery walk to analyze what was wrong with all the models. | |
| I would like in class visits as needed or phone conferences. This is a new subject for me so learning the content is first of course. However, science is different than math. With math there is one answer , there are different ways to arrive at your answer but its still just one answer. In science there is so much room for student misconception and confusion. Making sure that I explain the content correctly is something I am trying to make sure I get correct the first time.<br>Goals:<br>1.Gain an in depth knowledge of the content<br>2. Be careful not to create mis-conceptions<br>3. Help students become effective critical thinkers | **NO LOG ENTRY** | **NO LOG ENTRY** |
| The mentoring component of AMP should be structured on an individual need. For myself I would like for my mentor through conference calls by video. The goals I would like to set for myself is recreating the information given to me and share it with my team of teachers. This is a great program to be apart of. I believe the instructors are doing a great job through their investigative approach to inquiry. I would like to do the same thing with my team of teachers and then some. | 1. The most beneficial aspect to todays session was having an opportunity to break out into our quadrants to work through and investigate the lessons.<br>2. At this time I would not changed anything, I beleive the sessions are right on target.<br>3. Due to an emergency at my house I was unable to complete the activity, but I will give ffedback once I complete the activity.<br>4. N/A<br>5. The only challenge I had was determining the students that will be apart of the Rice Program since I am responsible for all students on my campus.<br>6. My AMMp success story was introducing inquiry to my Science Department, which has open the door to redo our labs to be more of an inquiry base lesson.<br>7. I believe the presenters for the AMP program are representing the program well with their enthusiasm and the wealth of knowledge for Math and Science. | **NO LOG ENTRY** |
| I would like for the mentoring component of AMP to consist of as-needed visits, phone conferences and/or emails.<br>My goals for this year will be to make my lessons more inquiry based, I want my students to investigate and come up with their own conclusions instead of being spoon fed by me. I would also like to put more focus on making sure that my questions are more meaningful | 1. I liked the engage activity for science as well as the integration of technology.<br>2. I can't really think of any.<br>3. I think that it would be a great lesson to use when covering motion.<br>4. I don't think that I would have such a large number of students working together to come up with the real world scenario. There wasn't enough work for all students to have something to do. | I really liked the science article, I think that it would be great to have more reading and writing done in science class. Also, the article provided real world applications to what's being covered in science class, which makes the information relevant and more likely for my students to put to memory.<br>I didn't really like the sulfur and iron activity, our iron and sulfur didn't really separate much with the magnet, they still stuck together. |

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| and will allow for my students to think critically. Another goal that I have for this year is to work more closely with my partner to include math objectives in my class, and also make sure that science is being added into her class. | 5. We didn't get any of the materials so I didn't try any of the lessons that we did during the AMP program in summer. However, I did use some of the lessons from the website (clemson.edu) that was included in the book that we read over the summer, and one of the things that I realized was that my students didn't like to have to put so much thought into their work and would rather that I just "tell them what they need to know".<br>6. I have tried some inquiry lessons in my class and have noticed that my students have a greater depth of understanding in topics that they're playing an active role in learning about. | I would love to use the article for my students to go over in class along with some of the activities when going over physical and chemical changes.<br>I haven't yet started these TEKS, but will be covering them soon. |
| **Day 10—10/6/2015—Reflection** | **Day 11—11/7/2015** | **Day 12—11/18/2015--Evaluation** |
| **1. Which aspects of today's session were most beneficial to you?**<br>**2. Which aspects would you like changed? Please explain.**<br>**3. Share your plans for implementing today's NASA lessons.**<br>**4. What is one thing you would do to make the activities we presented today work better in your classroom?**<br>**5. Please share any challenges you experienced in implementing AMP! lessons to date.**<br>**6. Please share your AMP! success stories. We want to share your successes with CoP.**<br>**7. Anything else you would like to share? (optional)** | **What was most useful about tonight's presentation?**<br>**What part of tonight's presentation could be improved in future sessions?**<br>**Share you thoughts on implementing any portions of tonight's Mathematics or Science sessions.**<br>**Are the TEKS that were covered this evening currently be covered on your campus, soon to be covered, or already finished?**<br>**Please provide any other feedback you would like to share. (optional)** | **1. Which aspects of today's session were most beneficial to you?**<br>**2. Which aspects would you like changed? Please explain.**<br>**3. Share your plans for implementing today's lesson, "Keeping Things in Perspective".**<br>**4. Which station activity did you enjoy the most?**<br>**5. How can you see yourself using any of the concepts or programs presented in the station activities for upcoming lessons in your classroom?**<br>**6. Anything else you would like to share? (optional)** |
| 1. I enjoyed the inquiry with the pantagraph.<br>2. These lessons would have to be modified and shortened before my class would be able to do them.<br>3. I don't think I could use the math lesson but with some guided instruction the scaling the universe could be implemented<br>4. I didn't see how I could use the Intersection in my science class.<br>5. We are still doing guided inquiry because my students are still having trouble thinking on their own | 1. I liked the first lesson where we built the robotic arm. I don't see how it would directly relate to our science teks other than investigation/experimental but the students would really enjoy working together to build the arm.<br>2. Maybe change the cereal to m&ms because they would be easier to see if they were broken<br>3. I would have to change the rocket game board to fit more to the TEKS. Maybe using cars with force/motion<br>4. I would use different materials for the bone density lab. Also instead of having the students make rockets they could create cars using the same idea just instead of power use force/acceleration/mass | I loved the gas emission tubes lesson. This has been by far my favorite lesson throughout the program. This is a great way to get the students interested in the elements found in our stars. This would be a great engaging lesson. (Kuddos to both Christina and Amber for all the spectra cards)<br>Maybe have the students draw what they see first then give them all the cards and have them look again at the tube<br>While looking at wavelengths I will make sure each group records their wave to watch it in slow motion<br>With my students I may limit the amount of spectra strips because I found it somewhat over whelming trying to look through 20 cards to figure out what gas tube we were looking at. |

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| | | We will be covering stars and galaxies closer toward the end of the school year so I will have plenty of time to order my supplies.<br>We haven't got to any of the TEKS so I could use the lessons most of them are after Christmas, but we will be teaching moon phases after the Thanksgiving break so I am very excited to use parts of the moon phase lesson. |
| 1. Scaling the Universe activity and connecting real world items (art display) determining dilation.<br>2. Explain important vocab, i.e dialation.<br>3. Not sure if I would use any of the Honey, I shrunk that Length, because I personally spent a majority of the time confused, but I understood it more after our field trip.<br>4. The Engage and Explore pieces can be used to connect math and Science by allowing the students to see the usage of exponents and how they relate to both science and math.<br>5. They are afraid to think independently, because they are afraid of being wrong. | **NO LOG ENTRY** | The videos that were presented with the activity were amazing.<br>I will more than likely delete some portions for my special ed, ell and low preforming students.<br>Soon to be covered at the end of January, start of February. |
| 1. It was fun to use the tool, I never had before<br>2. More practice time.<br>3. Maybe as an intro, the students have a hard time visualizing size variations. Processing skill builder<br>4. Field Trip! Explain how the box s the image on te wall are made. Have them create their own predictions about changing the box or light, and what will it affect.<br>5. It is it or miss. They are very scared of being "wrong" and have a hard time trying new things without me spoon feeding them. They think wrong= failure and I'm trying to get them away from that.<br>6. How to convince my students it is okay to try | 1. Getting a first hand idea of hat NASA does and is doing.<br>2. NASA trainings always have lots of pretty resources but too much content/info all at once. I would for sure need to chunk these assignments or take away parts of it completely<br>3. Possibly as a extension piece<br>4. I answered this on number 2, Chunking or deleting parts of the lesson.<br>Moon phases: I always like them moving around first for introduction. I would probably just change the order of these activities.<br>5. How often would you do inquiry based lessons?<br>6. Students becoming better at small groups | 1. I liked the card sort and gas emissions tube.<br>2. To modify I would limit the amount of cards when trying to determine the gas tubes and elements<br>3. For teaching us the last part kind of lost a lot of people<br>science: I would use the card sort math: calculating wave lengths<br>we will cover these teks next |
| 1. The part of the lesson that was most beneficial to me today was when we got to make the math and science connection between scale factors and light years, My students have a difficult time remembering that light years are really a measure of distance and not a measure of time, even though the name has the word | 1. The most beneficial aspect of today's lesson was the engineering challenge with the mobility of the spacesuit arm. I think that this lesson would work well with my students because it didn't need a lot of set up or background information to have them complete it.<br>2. I would not have spent the time talking about bone density. This is a 7th grade TEK and not anything that | 1. I really liked the star composition strips as a problem solving activity. I think my students would be able to get something out of it in order to think about how a star might be made of more than one element and how we know this.<br>2. I think that we didn't need to go into as much detail of the math component of the speed of light, since it |

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| "year" in it.<br>2. I felt that the whole inquiry lesson using the pantographs would not be a beneficial tool for me to ever use with my students. We experienced many technical difficulties with the using of the device, which took away from my overall experience of the lesson.<br>3. In my science class, I would use the concept of scale factor from my student's math classes when I into distances in space. However, I would not be able to do anything with the numbers since my students really struggle with using such large numbers and the TEK does not ask students to ever find light-years, just know what it is.<br>4. I really did not see a science TEK connection between the art exhibit and anything that I cover in 8th grade with my students. I see a lot of connections that could be made between the exhibit and what students are expected to learn in their math curriculum, like scale factor, dilations, etc.<br>5. When I do inquiry in my classroom, I am still having to do lessons that are "guided inquiry" instead of closer to a full inquiry like I would hope to guide towards by the end of the year. My students still are struggling with not knowing what I want them to "find" because they are concerned about having the "correct" answer, not just developing their own ideas. | relates to 8th grade curriculum. The space rocket game was interesting, but not something I would be able to spend time doing with my students, since there is not a direct correlation between it and our TEKS. When I taught 6th grade in the past, I believe that they would have benefited from that lesson.<br>3. I am going to try to implement the "spacesuit challenge" with my students later in the year. I feel that they will be able to problem solve and find connections between the engineering and science aspects.<br>4. To make the lessons work better for my classroom, I would actually pick aspects that related more to the 8th grade TEKs, dealing with Newton's laws, force and motion, etc.<br>5. Nope!<br>6. We did the Woodles activity with our staff at professional development. It went well with them and we got a lot of good feedback from them! We used the woodle boxes with our students to make observations and hypotheses, and it also worked very well. | was a bit too high level for my students.<br>3. I have been doing some of the car building lessons with my students. They seem to really enjoy the engineering aspect and they are going to be calculating speed, etc within the next few weeks.<br>4. I do not cover space until the 3rd 9 weeks, so I will still be able to use some of the activities. |
| My students are enjoying inquiring. A student from my class informed another teacher they wished they had more opportunities in their other classes to explore things on their own and "teach themselves".<br>They are also understanding material more and are very engaged with concepts and class. | I did not attend this lesson so I am unaware of the content. However, some challenges that I have had implementing AMP! lessons is they are too long, so I just use components of the lesson (mainly the explore) to implement into my lesson for the day. | I would implement the part when we created the wave with the cord/rope.<br>I could introduce vocabulary during this demonstration/model and have them explore what observations they notice. |
| 1. Learning about the Star Constellation app was most beneficial to me.<br>2. I would not change anything.<br>3.I would implement this lesson as an engage before teaching the TEK covering the star chart (graph).<br>4. The art exhibit was great. This would | 1. The information was very interesting. However, the lessons seemed to pertain more to 7th grade.<br>2. The directions for the last activity could have been clearer. I also would have liked to start off doing the lunar phase activity first- something that pertained to 8th grade.<br>3. I would give this activity to my 7th grade teachers, but maybe use one as an engage before reviewing space. | 1. The most useful part of this lab was learning about the spectrum bands.<br>2. Lesson can be done in stations.<br>3. I would use this as a station lab.<br>4. It will be used later. |

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| definitely be an engage and could be incorporated as a Nancy Motley lesson "Talk, Read, Talk, Write" lesson.<br>5. My students are responding very well with the inquiry based learning. However, I still have to use a lot of guided questions because this is a new way of the students learning TEKs for my school.<br>6. I am implementing a quite a few lessons from the AMP program, but I can incorporate more math concepts. This will be my goal for the next Six Weeks. | 4. When dividing up into groups with the candy, I would have large pictures in the center of the table so it would not take as long to find your group members.<br>5. Some of the activities are great but getting access to the various equipment is a challenge.<br>6. Students really loved the Ice Hands Activity | |
| The aspect of today's session covering scaling the universe. This activity allows us to relate the size of the universe to the size of a realistic item such as the basketball. I love the constellations but I would like to change or add a chart for collecting the star information. I plan to use scaling the universe during our modeling the universe section. I can ask students to explain the relationship between the earth and the basketball as related to the abstraction of the square image. My students love inquiry based learning, however the process is very time consuming. These activities are awesome for the classroom by increasing the student's rigor. Awesome | 1. Today's session provides me with an extension to our earth and space section. This extension provides students with a review of previous teks.<br>2. I would not change but emphasize additional data based on bone density, life in space, and cost/budget functioning.<br>3. I will use landing under pressure in class to emphasize various aspects of problem solving skills related to human existence.<br>4. I would reduce the extended instructions so that students are able to focus on main procedures and content verses having additional information. (student focus)<br>5. Implementing AMP lesson challenges are only concerning class time.<br>6. Using AMP Lesson results providing students with the ability to problem solve while strengthening their science skills. | The most useful activity tonight was the explore section when applying a stars chemical characteristics to the element emissions front the periodic table. I would remove the section when making waves because it doesn't apply to the 8th grade tek standards. Yes this activity is perfect for illustrating the electromagnetic spectrum. |
| Star map comparison for using lightyears and other terms fro space unit, but enjoyed the proportions activities.<br>It might be nice to bring some digital tools to the art to record some observations and measurements. Ex. take a picture with a scale and mark up the pictures later, or perhaps use a motion detector to calculate scale.<br>I intend to incorporate the scaling the universe activity into my constellation activity where students use colored yarn (the color of the star per HR diag) to show relative distances of those stars from the sun (Earth)<br>Students are getting better at thinking for themselves, rather than being told what to write. However, lower performing students are more | 1. ideas to modify existing lessons and activities according to current issues<br>2. i was hoping for more collaboration time with a few teachers not at my campus. we sat together initially and had to be split up. Let us stay together.<br>3. I'm not sure yet. Some modifications will need to be made for 8th grade science, but there tie ins to many standards.<br>4.I will be sharing today's activities with 7th grade teachers at my campus.<br>5. The biggest challenge is still getting kids to process their thoughts and develope their own responses without being exactly what to say or write at a specific time/place "What do I put here?"<br>6. My class average for 5 out of 7 classes on the 2nd six weeks exam administered by the district was above 90% | The prepared spectral images for use with the spectrum tubes<br>I had problems with the reasonableness of having .025 persons exiting a conveyor belt every second. I understand the intent is mathematical reasoning, but causes confusion in jr high students.<br>Most of tonight's standards will be taught in the 2nd semester. |

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| chatty and off topic when group discussions are expected. I would like to incorporate more of a written response to the discussion. I need help with that. | | |
| 1. I benefited from this session because I was able to see how scale can be proportionally changed.<br>2. I would have given the activity a shorter time to be implemented.<br>3. I can use this lesson to demonstrate the scale of the universe and how its proportional to places on earth.<br>4. I think the projection aspect of the lesson could be used in my classroom. I could project a portion of the universe to and represent the earth with a speck on the entire board to model the magnitude of space.<br>5. I think they are responding by becoming more independent learners. They are discovering answers to questions rather than having facts crammed down their throats. | 1.The density lesson was applicable to 8th grade curriculum.<br>2. I would have made the plastic bags smaller to simmulate the nucleus of an atom more.<br>3. We worked together and just as NASA does we picked the person most suitable for a space suit<br>4.Less activites with more depth and practical application to the classroom. The time spent on the activities was not realistic.<br>5.The large amount of people was a challenge. Constantly moving with your personal belonging and electronics was a challenge.<br>6. We were able work together and finish the bendable arm. We all worked together. | The use of spectrum cards<br>Spent too much timeon the spectrum cards<br>Scientific notation could have been used when discussing the speed of light<br>The TEks will be covered in December |
| 1. the part we did to show that llight years are a distance.<br>2. the constellation portion of this lesson isn't generally covered in 8th grade teks and is not something we put much emphasis on. I personally see the connection but I feel like the kids may not.<br>3. the shrunk the length can be used in math for scale factor and proportional relationships and that can be liked to the activity done to show that light years are a distance not a time.<br>4. I want to give the informational pamphlet to the ELA teacher to dissect as anexpository text, then tie that to the shrunk the length activity, then bring in the relationship to the part of the science activity that lets the kids see for themselves how light years are a distance<br>5. Their critical thinking skills are improving. they are able to be given a basic and vague introduction and then apply to other things.<br>6. I am absolutely LOVING this program, it has inspired me to try so many new things! I am not only working with my math partner but other | 1. the resources on the NASA website<br>2. more 8th grade specific activities or activities that require less technology for low income classes<br>3. I don't know that I can use any of these specific lessons but I do plan on utilizing the NASA website to coordinate a cross disciplinary lesson for our family of teachers<br>4. adapt them for our limited technology and provide accommodations for sped students<br>5. Time has been my most challenging factor. I feel like my activities are either rushed or segments get left out because of the timing each one takes<br>6. I had extreme success with using the parachute activity to teach scientific method, and all the activities we did at Conoco Phillips I have done in advisory | The spectrum strips and mystery elements<br>the wavelength calculations were a bit higher end and my students are primarily SPED so I would need to do some modifications.<br>I REALLY want to get the different tubes of different elements and compare with the spectrum strips<br>soon to be covered after Christmas break |

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| subjects in my family, academic coaches, and curriculum specialists | | |
| **NO LOG ENTRY** | **NO LOG ENTRY** | **NO LOG ENTRY** |
| 1. The space math calculations were most beneficial.<br>2. I liked the activity but would have liked to spend more time on science activities and I would have liked to get to work on our project.<br>3. I may be able to use some of the math calculations to help with understanding the concept of light years to measure distance - although I feel that many would struggle with the calculations.<br>4. I don't see having time to implement the sculpture activity. Maybe the students could do something with shadows and scale factor using flashlights?<br>5. We have done a couple of the activities and they seemed to enjoy them - we had them experiment with different materials to describe motion and they liked that. I wish that we had more class time - with 45 minute periods it is hard to get through the exploration and give time for presentations. Our planning calendar from the district does not give us a lot of wiggle room on spending more time on each concept. | 1. The plickers and the information on the nasa site were most beneficial.<br>2. I would change the activities so they align better to the 8th grade standards.<br>3. I passed the bone density lab on to 7 th grade teachers and they seemed to like it.<br>4. Time is the biggest hurdle.<br>5. Successes - I used the motion explore and the kids did well. I also used the parachute activity with the science club. | 1. I liked both activities that we did - the diffraction/spectra and the wave demo. I liked that you could really see that to increase the frequency of the waves you had to add more energy. I also liked your spectra activity better than the one I usually do.<br>2. The only thing that I did not like was having to come on Wednesday evening. I would rather you add additional Saturday sessions or sub days instead of rushing down to meet after teaching all day.<br>3. I will be using both activities in some way - I don't know if we have it in our budget to order the lights. I think a jump rope would work well for the wave activity.<br>4. We are going to be covering the TEKS presented right after Christmas break. |
| **NO LOG ENTRY** | **NO LOG ENTRY** | **NO LOG ENTRY** |
| Our students are responding very well to inquiry base learning. This technique has open the eye's of many on my campus. | The session that was most beneficial tome was the creating arm for the space suit.<br>I would not change anything just yet until I have tried the entire activity.<br>My plan's for implementing today's lesson would be used during second semester when we begin human body systems.<br>I would like to make the space budget presented today work better inmy classroom.<br>I have not experienced any challenges yet. | |
| 1. The most beneficial part of today's activities was going to the art exhibit that showed how you can use light to enlarge an image. Although I do not teach math, I think that this would be a good activity that I would use to teach that.<br>2. I think that way too much time spent on the activity with the pantograph. We finished our | 1. Although the activity that looked at creating a budget was interesting, I do not think that I would use any of the activities today in my classes. Some of the information shared was interesting, but I'm not sure it was very beneficial.<br>2. I would have liked if the activities were more geared towards the TEKS. | 1. The part of the activity where we were used the spectrum cards and had to determine the elements that made up the mystery stars.<br>2. I think that a lot of the material that was covered would not be used in an 8th grade class.<br>3 The TEKS have not been covered yet in my classroom. |

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| investigation early and we kept having more questions added to what we had done.<br>3. I think that I could use the activity "Scaling the Universe" to help my students make sense of the distance of objects in space.<br>4. I'm not sure how I could use the art exhibit to teach anything in science.<br>5. My students have a greater interest in science, and are more investing in their learning. Since it does require them to think more, some of them aren't so happy about it. | 3. I wouldn't use any of these lessons in my class to help teach a TEKS, however, I may use them at the beginning of the year just for fun.<br>4. Again, I wouldn't use them, they didn't relate to the TEKS.<br>5. Coming up with ways to implement the lessons in a time efficient manner. | |
| **Day 13—12/5/2015—Reflection** | **Day 14—1/23/2016** | **Day 15—1/27/2016--Evaluation** |
| **1. Which aspects of today's session were most beneficial to you?**<br>**2. Which aspects would you like changed? Please explain.**<br>**3. Share your plans for implementing today's lesson, "By Leaps and Bounds".**<br>**4. In what capacity would you like ConocoPhillips and its employees to be more involved in AMP!?**<br>**5. Anything else you would like to share? (optional)** | **What was most useful about tonight's presentation?**<br>**What part of tonight's presentation could be improved in future sessions?**<br>**Share you thoughts on implementing any portions of tonight's Mathematics or Science sessions.**<br>**Are the TEKS that were covered this evening currently be covered on your campus, soon to be covered, or already finished?**<br>**Please provide any other feedback you would like to share. (optional)** | |
| 1. I enjoyed the topography mystery box and making the topographic mountains with the skewers. I think the mystery box is a great way to get the students engaged and curious about the learning. They love competing against each other so they would really enjoy the mapping section and trying to guess which map goes with each box, and then comparing their findings to see how were they did. I also enjoyed the 3D movie glasses that can be used with their phones. This is a great way to incorporate technology in their lessons.<br>2. Include different shapes that were not as hard to cut out for the topographic mountain on the skewer. I think they would spend more time cutting out the shape and losing instructional time.<br>3. Give the students different types of shapes for their mountains and also taping the boxes extra because even as an adult I wanted to look inside so I know the students would. | 1. I enjoyed the do it like a zombie. This could help the students see populations growth. Also I liked the different types of websites to see how populations change due to amount of resources.<br>2. This was a good lesson I believe it would be used to review TEKS from earlier grades. This could be used with Oh Deer to help them get a better understanding of how resources change population<br>3. Maybe using larger graphs for the students to be able to fully graph their findings. Also walk through each program so the students know what they are looking for or at because seeing all the links and everything on them were some what overwhelming.<br>4. More guest speakers and opportunities for teachers and students to explore what Conoco has to offer. | I enjoyed looking at the case studies. This would be a great lesson in the 7th grade while teaching DNA and alleles or it could be used as a quick review over short and long term changes for an 8th grade science class<br>Making the words in the case study a little more kid friendly so they could understand the case study while reading.<br>This would be difficult to implement in our everyday classroom due to it not directly relating to the 8th grade TEKS. I would like to show my students the magic fruit because I though it was a great way to get the students engaged in the lesson.<br>Covered at the beginning of the year. |

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| 4. I really enjoyed both topography lessons. | | |
| 1. All items addressed today were very beneficial and will be incorporated in some form or fashion.<br>2. In the Keeping Things in Perspective lesson, I would give students a piece of foam that is half the size of what we recieved and provide more in depth instructions.<br>3. See above comment<br>4. Mt. Topo was great! I loved how simple it was, yet very informative.<br>5. The connection with math and drawing topographic maps based on a student created item. Gives it ownership. | 1. The discussion on population growth and crrying capacity that was had as a group.<br>2. No changes will be made to any of the Science section used today.<br>3. I will utilize this lesson to it's entirety. I absolutely love this lesson. The zombie intro was amazing, so loved it and I believe that my students will enjoy this.<br>4. It would be nice to have a set group of employees that would be assigned to certain schools. This would allow a strong relationship between the participants and the employees. This would also make it easy for the participant to contact the employee for questions reguarding ConocoPhillips and their future employees, our students. | |
| **NO LOG ENTRY** | **NO LOG ENTRY** | **NO LOG ENTRY** |
| I really enjoyed the topographic map activity that we did in Amber's group and the connections that students could make between math and science when talking about slope of mountains and how that could be calculated mathematically. I also liked the video that Christina started with showing how satellite maps change over time due to erosion. I would probably change the first activity that we did with the shoeboxes and making the maps, just to implement due to time restraints in my classroom. I plan to start my unit with topography by using the video and pictures that Christina started with and seeing if my students can make their own connections between what they see and what causes it. I liked Amber's station the most. I do a very similar activity with my students and they really seem to understand why we draw topographic maps the way we do, making a 2D figure in a 3D representation. | I really enjoyed the rabbit simulation activity. This is something that my students would really enjoy looking at and testing, where we can bring in the vocabulary of biotic and abiotic factors and how they influence a population of organisms. I am planning to use this with my students as an inquiry investigation at the beginning of my ecology unit. The issue I have with this lesson is that my students cover ecology at the beginning of the year, so I will not be able to do this with my students this year.<br>I would like to see the Conoco Phillips be more involved with AMP! By providing more connections between real-world issues that they are trying to solve that we could adapt into lessons. | The most useful thing about this lessons presentation was the relationship between human impacts and the environment. I liked the article that we read relating Earth to a woman with multiple medical issues. I think this would be a really engaging way to have my students begin seeing how humans impact the Earth and problems that it causes both long and short term. I did not feel that the lesson over Sickle Cell was very related to the TEKS. I might use this when I intro genetics, but that is a biology TEK that we just prepare our students for before they finish 8th grade. I cover Ecology and Human Dependence in the 1st 9 weeks, or at the very beginning of the 2nd 9 weeks, so this content is already covered in my classes. |
| | The aspects of today's session that were the most beneficial to me were when we did the zombie activity and the rabbit activity (abiotic & biotic factors). The aspects of the lesson that I would have changed is the amount of time given to do each part of the lesson. I would have also given students a little bit more of guidance of what factors they should change/study. I would have modeled what testable questions look like. I would have introduced the vocabulary | |

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| | and asked how did today's lesson connect to our vocab words abiotic and biotic. Instead of having the groups separate into 3 groups, we would have done a whole class discussion.<br>ConocoPhillips could be more involved with AMP by providing opportunities to be guest speakers at campuses that AMP students are teaching at. They could come speak about job opportunities that incorporate math and science and provide a forum for students who are interested to ask questions. | |
| 1. I feel like every lesson was beneficial because this is the TEK that I will be covering with my students this week.<br>2. I would make the box smaller for the students to carve land features.<br>3. I am going to use some activities as an engage and for Saturday school tutorials for STAAR.<br>4. I enjoyed the stations with the 3D apps and aurasma.<br>5.I will use these as Explore activities. | 1 The most beneficial part of the lesson was learning how to make simulations into inquiry based lessons.<br>2. I would change the zombie engage.<br>3. I will implement this lesson this for STAAR tutorials.<br>4. I would like for some of Conoco Phillips employees to have opportunities for the participants' students to be involved in an inquiry activity that Conoco develops. | |
| The station rotation will benefit the growth and development of my students processing and collaboration skills. | Today I enjoyed our conversation analyzing our predator and prey relationships. I would not change anything. I would implement the relationship between math and science content. ConocoPhillips involvement is important for our connection so that we are able to develop the relationship between us and the kids such as class visits. | Most useful was understanding and learning about surface area. This concept will provide me with the necessary understanding to apply the relationship between surface area and density of an object or population in science. |
| 1. I saw applications for classroom use in all parts of today's lesson, as well as simple ways to integrate the math and science<br>2. The material used to make the topo box is too cumbersome for the time allotted and messy. I suggest clay or prebuilt models to hide in the box<br>3. I liked the concept and will choose substances (possibly chips) with equal size and shape and set the paper on the table. Students will squat to eye level of the table.<br>4. 3d mapping videos<br>5. I will use the Mt Topomas activity with take apart models of Mt Shasta I already have. I have 3d viewing glasses for satellite images and now use them for the 3d video activity. | 1. Math applications to my ecosystems unit<br>2. Change the zombie activity to an invasive species activity.<br>3. I intend to incorporate it into my "Squirrel Island" activity on niches. I want to add the population growth portion to the islands that students design and describe.<br>4. Perhaps a school visit.<br><br>1. I think today's lesson demonstrated that it is important to | **NO LOG ENTRY**<br><br>1. The most useful part of tonight's presentation was |

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| | allow students to experience the process of population growth in order to completely understand it.<br>2. I would have made the habitat being modeled more complicated to include multiple prey and predators.<br>3. I plan to use the zombie activity to demostrate population growth.<br>4. I think the could benefit by explain the real life applications of the things we are teaching. They could come in during lessons on chemical reactions or fossil fuel. | the inquiry lesson on how we affect and are affected by our environment via the sickle cell inquiry lesson<br>2. I think the pacing is an issue many of the inquiry lesson are not tailored for 45 min class periods.<br>3. I think probability is the Math connection I observed. Your environment can affect the probability of contracting and surviving certain adverse conditions.<br>4. Environment is a TEK we will cover later in the yearl |
| The activity with the box was very interesting and the most beneficial to me. I really wish that my school had money in the budget for students to participate in this activity because students seem to have difficulty going from 2D to 3D or from 3D to 2D. I feel like this activity would really solidify their understanding and give the students a chance to manipulate things to create a more concrete understanding. If I was in a more affluent district where each student had a smart phone or accessibility to ipads, and spent the time to put together the required pieces needed, I would want to use the Aurasma app and the box view finder things. I think the kids would really enjoy the exploration with them. | 1. The zombie introduction game. It not only gets students thinking about competition but also incorporates the linear and exponential growth ideas as well.<br>2. I would have to change the amount of technology required for this activity because I am lacking those capabilities. I would like to know of some other ways students can get this information without using a computer.<br>3. I would like to use this as a staar review game now that my students are aware of the vocabulary. I would take it and use it as a time to really emphasize the vocabulary and ensure the students have a good grasp on it and are using it in the correct context.<br>4. it would be very interesting if they were to visit some of our school and do presentations on the company and things their company does. | |
| **NO LOG ENTRY** | **NO LOG ENTRY** | **NO LOG ENTRY** |
| I thought this was one of the best lessons of all that we have done - everything was engaging. Students always struggle with topographic maps and satellite images and I think the activities that we did will increase their understanding of the material. I will be using the before and after pictures for analysis of satellite images. If time allows I will also use the box activity. I enjoyed the Mt. Topmas station and the app station the most. | 1. The aspects of today's lesson that were most beneficial to me were:<br>Discussing the guidelines for the final presentation<br>The inquiry lesson using the computer simulations<br>The shifted lesson example<br>2. I would not change anything about the lesson today - the pacing was good, the activity was something I could use in my classroom. My students need more experience analyzing data and I thought that giving us the options of using the different simulations to gather data and compare results was great. I hope to get to the point with my class that they could communicate their findings through small group discussion like we did in our "making meaning" session.<br>3. I plan on using the activity when we get to our environmental science unit towards the end of the year.<br>4. I would like them to offer students the opportunity to tour | |

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| | the facility or to come to our campus to discuss their jobs and explain to the students the value what we are doing in class. | |
| **NO LOG ENTRY** | **NO LOG ENTRY** | **NO LOG ENTRY** |
| I have adjusted the learning process to adhere to the activities provided to me by AMP. I will continue to encourage my students and teachers to look beyond the right and wrong answers. | 4. I would like for Conoco Phillips employees to come out to our schools to visit with the students.<br>5. I would like to say that this has being an amazing ride for me. I know that you guys truly love what you do and it shows. I still believe Science tops math without a doubt, but they work so much better together. | |
| 1. I liked the part of the activity where we were able to view before and after satellite images, to see how the land had been changed as a result of natural disasters.<br>2. Nothing<br>3. I'm not sure that I would be able to do the activity with the boxes and foam, it seems very messy and time consuming. I have a similar activity that I do that I got through lab aids.<br>4. I likes the one where you created a 3D image of a topographic map. | I think that the zombie activity was the most beneficial, I really think that the students would have a great time with it.<br>I would not change any of the activities today.<br>I think that I could use this lesson to go over changes in a population, I liked the online simulations. However, I think I would limit the simulations that they can use. | I think that the activities done in class were geared more towards a higher grade, I'm not so sure that I would use this activity for my 8th graders.<br>I have already covered the TEKS covered this evening in my class. |

## Appendix F. AMP! portfolio presentation—rubrics and summaries

Participants presented in their mathematics/science teams, except for three instances when individuals presented—2 without their partner and one who did not have a partner. The videos and photographs imbedded in the Powerpoint or Presi presentations demonstrated student engagement in the inquiry-based lesson process. Teachers were expected to share their goals, lesson shifting ideas, questioning and vocabulary ideas, and future steps or goals.

The totals shown are the *average* number and percentage of teams that demonstrated growth in each of the rated areas. Following each rubric is a presentation of repeated pedagogical and leadership behaviors, elements that impacted scores, and unique challenges shared and/or observed.

**AMP! lesson presentation rubric, cohort I, 03/2/2016**

| Artifacts demonstrating growth | Sufficiently present = 3 | Minimally present = 2 | Not present = 1 |
|---|---|---|---|
| Implementation Goals with the mathematics/science connection | 10 | | 1 |
| Inquiry-based Lesson shifting towards mathematics/science connection | 11 | | 0 |
| Changes in Questioning and Vocabulary development | 8 | 3 | 0 |
| Shifts in beliefs, practices, and perceptions | 9 | 2 | 0 |
| Future steps or goals for continued implementation | 8 | 1 | 2 |
| **Total Average Scores** | **46 or 84%** | **6 or 11%** | **3 or 5%** |
| Comments: Video or still photo demonstrations of students engaged, enjoying learning, working together | | | |

**Teacher behaviors & demonstrations presented**

- Demonstrations of inquiry
- Increased wait-time
- Became facilitators of learning (guiding instruction vs. use of direct instruction)
- Vocabulary – Students shifted from experiencing, to owning, to knowing; using academic vocabulary in their writing
- Increased number of higher order questioning
- More self- and peer evaluations
- Helped students discover "everyday" mathematics/science connections
- Students experienced lessons that demonstrated the mathematics/science connection
- Lessons allowed for more discovery and reflection
- Lots of hands-on activities were provided

**When presentation scores were impacted**

- Behavior not explicit or only minimally present
- No explicit implementation goals were presented
- Changes in questioning, shifts in beliefs, practices, and perceptions were not explicit or only minimally provided

**Unique challenges expressed**

- One team had a partner resign from the program, but she carried on alone
- Schedules did not allow most teams to actually team teach students at the same time or on a regular basis.

**AMP! lesson presentation rubric, cohort II, 03/8/2016**

| Artifacts demonstrating growth | Sufficiently present = 3 | Minimally present = 2 | Not present = 1 |
|---|---|---|---|
| Implementation Goals with the mathematics/science connection | 12 | 0 | 0 |
| Inquiry-based Lesson shifting towards mathematics/science connection | 12 | 0 | 0 |
| Changes in Questioning and Vocabulary development | 9 | 3 | 0 |
| Shifts in beliefs, practices, and perceptions | 12 | 0 | 0 |
| Future steps or goals for continued implementation | 9 | 2 | 1 |
| **Total average scores** | **54 or 90%** | **5 or 8%** | **1 or 2%** |
| **Comments:** Video or still photo demonstrations of students engaged, enjoying learning, working together | | | |

**Teacher behaviors & demonstrations presented**

- Developed more inquiry-based lessons
- Displayed evidence of shifting lessons toward the mathematics/science connections
- Increased reflection regarding practice
- Vocabulary – Students shifted from experiencing, to owning, to knowing; using academic vocabulary in their writing
- Improved student engagement and learning
- Discovered it's "ok to let students struggle" to learn a concept
- Increase in students' higher level thinking

**When presentation scores were impacted**

- Behavior not explicit or only minimally present
- No future steps or goals for continued implementation were present. Changes in questioning and vocabulary development, as well as shifts in beliefs, practices, and perceptions were not explicit or only minimally provided

**Unique Challenges Expressed**

Schedules did not allow most teams to actually team teach students at the same time. So, teams improvised:

- One team was only able to bring students together during an advisory period and that was only with advisory students they shared;
- Another did only one lesson all day in the library; or
- They planned together and taught separately

**AMP! lesson presentation rubric, cohort III, 03/09/2016**

| Artifacts demonstrating growth | Sufficiently present = 3 | Minimally present = 2 | Not present = 1 |
|---|---|---|---|
| Implementation Goals with the mathematics/science connection | 15 | 0 | 0 |
| Inquiry-based Lesson shifting towards mathematics/science connection | 15 | 0 | 0 |
| Changes in Questioning and Vocabulary development | 13 | 2 | 0 |
| Shifts in beliefs, practices, and perceptions | 14 | 1 | 0 |
| Future steps or goals for continued implementation | 12 | 2 | 1 |
| **Total average scores** | **69 or 92%** | **5 or 7%** | **1 or 1%** |
| **Comments:** Video or still photo demonstrations of students engaged, enjoying learning, working together | | | |

**Teacher Behaviors & Demonstrations Presented**

- Learned inquiry techniques that are student-centered
- Teachers became facilitators of learning (guiding instruction vs. use of direct instruction)
- Vocabulary — Accessed students' prior knowledge regarding new and previously unknown terms; use of Word Walls; Used pre-assessment to identify misconceptions; more use of science vocabulary by mathematics teachers and vice versa
- More student engagement and student-centered learning
- Went beyond YES-NO answers to more higher order questioning
- More wait-time used

**When Presentation Scores were impacted**

- Behavior not explicit or only minimally present
- Changes in questioning and vocabulary development, and shifts in beliefs, practices and perceptions were not explicit or only minimally provided
- No future steps or goals for continued implementation

**Unique Challenge Expressed**

- Most schedules did not allow most teams to actually team teach students at the same time.

# Appendix G. Interview protocol—ConocoPhillips Rice University Applied Math Program AMP! Post-PD and Post-teaching Interview Protocol

**Introduction 1**

Hello. This is [**INSERT INTERVIEWER NAME**] from Decision Information Resources, Inc. (DIR), and I am calling for our scheduled interview regarding your Program AMP! professional development experience. Is this time still good for you?

IF NO, ADDRESS CONCERNS AND RESCHEDULE INTERVIEW.

IF YES, THEN PROCEED TO INTRODUCTION 2 AND INTERVIEW.

**Introduction 2**

The objective of this interview is to learn about your Program AMP! summer professional development experience and how you might have applied what was learned throughout the 2015/16 school year.

I want to be sure that you know that your participation in this interview is voluntary and that you may refuse to answer any questions or conclude the interview at any time. Your answers will be confidential. No individual names will be used in our reports and all names will be kept confidential.

With your permission, I would like to record this interview to be sure that I capture all of your comments accurately. The only person who will hear the recording will be [**INSERT INTERVIEWER'S/NOTETAKER'S NAME**].May I record our conversation?

IF YES, TURN ON AUDIO RECORDER.

For the record, would you please confirm that you are aware that this interview is being recorded?

OK, let's get started.

## Interview Questions

1. Are you a teacher of science or a teacher of mathematics?

**SAY:** ***The following questions ask specifically about your summer professional development experience.***

2. What were some of the difficulties (if any) you encountered when teaching your assigned content in the past? **PROBE:** In what ways did your participation in the AMP! professional development (PD) program lessen any difficulties you previously faced in your assignment?

3. Do you feel you developed stronger pedagogical skills (i.e., more effective teaching tools) as a result of your participation in the AMP! professional development program? **PROBE:** Please provide specific examples.

4. At the start of the school year, did you feel more confident in your ability to teach your assigned content as a result of your PD experience? Why or why not?

5. On a scale of 1 – 10, how confident did you feel about your content knowledge prior to participating in the AMP! course, with **1** being **not at all confident** and **10** being **extremely confident**? **Rating =**_____

6. After completion of the AMP! course, please rate your content knowledge confidence level; **1** = **not at all** confident and **10** = **extremely** confident.

Rating = _____

**PROBE:** Did you strengthen any aspect of your content knowledge through AMP! lessons or conversations with instructors?

7. How relevant did you feel the summer PD was to your teaching assignment?

8. Were there summer PD activities that you found less useful, or could have been changed in any way to make them more useful?

**PROBE:** Would you have liked more or less emphasis on anything during the summer PD? What, if anything, would you change about the course?

**SAY:** ***The following questions ask about your implementation of AMP throughout this school year.***

9. Do you feel more confident in your ability to shift inquiry-based lessons towards a mathematics/science connection? **PROBE**: What aspect(s) of your AMP! participation (i.e., PD experience, planning, teaching, teaming, etc. ) do you attribute to supporting your level of confidence? **Please provide *specific examples* of practices, processes, or**

**techniques you engaged in as a result of what you learned or experienced during the program.**

10. On a scale of 1 – 10, how confident do you feel about developing *and* facilitating inquiry-based lessons now that you have implemented AMP! teachings, with **1** being **not at all confident** and **10** being **extremely confident**? **Rating =_____**

11. .Describe how your facilitation of mathematics/science connected lessons changed right after the completion of the PD course to now that you have implemented AMP!

12. What would you say has been the value in connecting mathematics and science in lessons?

**SAY:** ***The following questions ask about your overall AMP experience and suggestions for program improvement.***

13. What part(s) of your overall AMP! experience (i.e., from PD to implementation) did you find most valuable?

14. Describe how you have shared AMP! teachings with colleagues on your campus and/or the district? **PROBE**: Do you plan to continue (or start) sharing?

15. Is there anything else you'd like to share about your AMP! experience that you feel we should know?

Decision Information Resources, Inc.

# Final Assessment of the Applied Math Program (AMP!) 2015/16

# Part II: Analysis of student state assessment results

**November 2016**

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# Highlighted results

This report presents an examination of the relationship between student test results on the State of Texas Assessments of Academic Readiness (STAAR) and their teacher's participation in AMP!.

Statistical analyses were guided by three research questions:

**1.** Did the AMP! program impact student achievement on the STAAR exams?

- Compare by averages, passing rates, and advanced passing rates the 2015/16 student data of AMP! teachers in the 2015/16 cohort vs. students whose teachers did not participate in AMP!. This compares students of the AMP! teachers vs. students of non-AMP! teachers for the 2015/16 school year.
- Compare by passing rates, and advanced passing rates the 2014/15 students vs. 2015/16 students of AMP! teachers in the 2015/16 cohort. This compares the student results the year before and year during the AMP! teachers' participation in AMP! .
- Compare by passing rates, and advanced passing rates the 2013/14 student data vs. 2014/15 student data vs. 2015/16 student data for AMP! teachers in the 2014/15 cohort. This compares the student results the year before, year during, and year after the AMP! teachers' participation in AMP! .

**2.** Did the AMP! program impact student achievement on the STAAR exams of specific demographic groups of students?

- Compare as in 1a. But by demographic groups (ethnicity, gender, econ dis, LEP, bilingual, ESL, Spec Ed, G/T); Compare by averages, passing rates, and advanced rates.

**3.** Did AMP! Math vs. Science vs. Math and Science teacher impact student achievement in the Math vs. Science STAAR exams differently?

Compare 2015/2016 students of AMP! math teachers vs. AMP! science teachers vs. AMP! math and science combined teachers; Compare by averages, passing rates, and advanced rates

Overall, results appear to indicate that a teacher's participation in AMP! did have some impact on student STAAR scores. Highlights of findings follow:

- There is evidence that there is a significant improvement in the pass and pass advanced rates for the students of the AMP! teachers and the students of non-AMP! teachers for math in 2015/16.
- The math treatment group (that is, students of math teachers in AMP!) in 2015/16 is not statistically significantly better than students of the same teachers in 2014/15 on pass rates; however, there is evidence of improvement in pass advanced rates.
- In 2015/16, students of AMP! teachers who were in the program in 2014 (math teachers in the 2014/15 AMP! cohort with students in 2015/16) had statistically significantly greater than

pass advanced rates in math as compared to the students of the same teachers in 2013/14 and 2014/15.

- The treatment group (students of science teachers in AMP!) in 2015/16 is statistically significantly better than students of the same science teachers in 2014/15 based on pass rates.
- The pass rates for science show that there was a decline from 2013/2014 to 2014/2015 and an improvement from 2014/2015 to 2015/2016. These results indicate an overall trend toward improvement; however, due to the drop in the pass rate during the treatment year, the improvement should be viewed cautiously.
- Students, receiving special education services, performed better if they had AMP! math and science teachers in 2015/2016.
- Generally, students with an AMP! science teacher or AMP! mathematics teacher differ from students without AMP! mathematics and AMP! science teachers even when the different demographics are included.

## Analysis of student achievement test results

This portion of the Applied Math Program (AMP!) report examines the relationship between student test results on the State of Texas Assessments of Academic Readiness (STAAR) and their teacher's participation in AMP!. The research questions were:

**1.** Did the AMP! program impact student achievement on the STAAR exams? Three outcomes were used for each analysis: (1) the raw score, (2) whether the student passed (that is, achieved the Level II Performance Standard: Satisfactory Academic Performance), or (3) whether the student passed advanced (that is, achieved the Level III Performance Standard: Advanced Academic Performance). For each sub-question, two groups of AMP! teachers were compared to comparison groups. The outcome measures were (1) the math results for the math and math/science AMP! teachers; and (2) the science results for the science and math/science AMP! teachers. The sub-questions are:

   - Compare 2015/16 student data of AMP! teachers in the 2015/16 cohort vs. students whose teachers did not participate in AMP!. This compares students of the AMP! teachers vs. students of non-AMP! teachers for the 2015/16 school year.
   - Compare 2014/15 students vs. 2015/16 students of AMP! teachers in the 2015/16 cohort. This compares the student results the year before and year during the AMP! teachers' participation in in AMP!.
   - Compare 2013/14 student data vs. 2014/15 student data vs. 2015/16 student data for AMP! teachers in the 2014/15 cohort. This compares the student results the year before, year during, and year after the AMP! teachers' participation in the AMP! program.

**2.** Did the AMP! program impact student achievement on the STAAR exams of specific demographic groups of students?

   Compare as in 1. But by demographic groups (ethnicity, gender, econ dis, LEP, bilingual, ESL, Spec Ed, G/T); Compare by averages, passing rates, and advanced rates.

**3.** Did AMP! Math vs. Science vs. Math/Science teacher impact student achievement in the Math vs. Science STAAR exams differently?

Compare 2015/16 students of AMP! math teachers vs. AMP! science teachers vs. AMP! math and science combined teachers; Compare by averages, passing rates, and advanced rates

## Question 1: Did AMP! impact student achievement on the STAAR exams?

This section reports results for mathematics and science.

### Math Results

Program administrators obtained AMP! participants' students' data as well as the data for their entire campus (eighth grade only) for the current year (2015/16). For the students of non-AMP! teachers, program administrators requested their students' data for 2015/16.

The STAAR results for math were examined for the students of the 2015/16 AMP! group and the other teachers that were not part of the program. As shown in Table 1, the students of program participant teachers had a higher average score, pass rate, and pass advanced rate compared to the students of teachers not included in AMP!. Also, the table shows demographic differences between the two groups and results of a chi-square analysis that tests if there are significant differences between the groups. The basic comparison of the average score and the pass rates show that AMP! participants performed better on the STAAR test in math. However, the chi-square tests show that the two groups are significantly different based on the proportion that are economically disadvantaged, racial composition, and those that receive services for limited English proficiency (LEP), special education (SPED), and gifted and talented (GT). Due to differences in the two groups, it is essential to control for these differences analytically.

**Table 1. STAAR math scores and demographics of AMP! and program selected comparison group students**

| | AMP! 2015/16 | Comparison 2015/16 | Chi-square p-value |
|---|---|---|---|
| **Sample** | **2,156** | **18,589** | |
| **Outcomes** | | | |
| Average score | 2,161.9 | 1,716.4 | |
| Number (percent) passed | 1,441(66.8) | 10,027 (53.9) | |
| Number (percent) passed advanced | 455 (21.1) | 1,572 (8.5) | |
| **Demographic variables** | | | |
| Number (percent) male | 1,174 (51.2) | 10,128 (52.2) | .3927 |
| Number (percent) African American / black | 582 (25.6) | 6,521 (36.0) | **<.0001** |
| Number (percent) American Indian | 148 (6.5) | 1,547 (8.7) | **.0006** |
| Number (percent) Asian American | 191 (8.4) | 887 (4.9) | **<.0001** |
| Number (percent) Hispanic | 1,129 (49.3) | 9,319 (48.0) | .2533 |

| | | | |
|---|---|---|---|
| Number (percent) White | 753 (33.0) | 5,092 (27.7) | **<.0001** |
| Number (percent) economically disadvantaged | 1,061 (54.6) | 11,685 (68.6) | **<.0001** |
| Number (percent) limited English proficiency | 369 (16.2) | 3,599 (18.6) | **.0047** |
| Number (percent) ESL | 245 (10.8) | 2,231 (11.5) | .2646 |
| Number (percent) special education | 174 (7.6) | 1,876 (9.7) | **.0013** |
| Number (percent) gifted/talented | 267 (11.7) | 1,887 (9.7) | **.0035** |

**Bold** highlight p-values < .05.

A two-level hierarchical linear model (HLM) was used with the STAAR average test scores and a two-level logistic HLM was used with the STAAR passing rates. Each basic model was examined and student-level covariates were included to control for the demographic differences. The results are shown in Table 2. Without covariates, the basic model indicates that the group of students of AMP! teachers performed significantly better than those of the comparisons for the pass rate. When student-level covariates were included (the full models), the program selected treatment group continued to significantly outperform the comparison group based on their pass rates. Therefore, there is evidence that there is a significant improvement in the pass and pass advanced rates for the students of the AMP! teachers and the comparison group for math in 2015/16.

**Table 2. HLM math results for AMP! and program selected comparison group students**

| | **STAAR scores** | | **Pass** | | **Pass advanced** | |
|---|---|---|---|---|---|---|
| | **Basic model B (p-value)** | **Full model B (p-value)** | **Basic model B (p-value)** | **Full model B (p-value)** | **Basic model B (p-value)** | **Full model B (p-value)** |
| Fit statistics | 315,062.9 | 268,264 | 96,184.71 | 82,509.8 | 130,788.23 | 112,720.2 |
| Intercept | 1,852.43 **(<.0001)** | 1948.98 **(<.0001)** | 1.161 **(<.0001)** | 1.4369 **(<.0001)** | –2.4786 **(<.0001)** | –2.4274 **(<.0001)** |
| Comparison | 18.38 (.2107) | 21.14 (.1844) | –0.5735 **(<.0001)** | -0.6791 **(<.0001)** | 0.2192 (0.0594) | 0.302 (0.0193) |
| Male | | –6.23 (0.4494) | | –0.0589 (.0947) | | 0.0752 (0.2566) |
| African Am./black | | –78.95 **(<.0001)** | | –0.6687 **(<.0001)** | | –0.7951 **(<.0001)** |
| Am. Indian | | –19.67 (0.2931) | | 0.0464 (.5685) | | –0.1132 (0.3646) |
| Asian Am. | | 207.31 **(<.0001)** | | 0.7821 **(<.0001)** | | 1.0524 **(<.0001)** |
| Hispanic Am. | | –57.60 **(<.0001)** | | –0.1184 (.0643) | | –0.0914 (0.2915) |
| Economic disadv. | | –60.48 **(<.0001)** | | –0.0925 **(.0325)** | | –0.4714 **(<.0001)** |
| ESL | | –25.39 (0.0687) | | –0.8972 **(<.0001)** | | –0.9185 **(<.0001)** |
| Special ed. | | –159.58 **(<.0001)** | | –1.5876 **(<.0001)** | | 0.4426 **(.0005)** |

| | | | | | | |
|---|---|---|---|---|---|---|
| gifted / talented | | 272.72 **(<.0001)** | | 2.0302 **(<.0001)** | | 2.1412 **(<.0001)** |

**Bold** highlight = p-values < .05.

The students of AMP! math teachers in 2014/15 were compared to math students of AMP! teachers 2015/16. Since the STAAR test varies year to year, these results should be viewed cautiously especially in comparing the scores. Table 3 shows the AMP! group had a higher average score (2391.69 vs. 2192.97), pass rate (76.7 percent vs. 75.6 percent), and pass advanced rate (33.1 percent vs. 22.4 percent) compared to the students of non-AMP! math teachers in the same school.

**Table 3. Comparison of students in 2014/15 and 2015/16 for AMP! math teachers in 2015/16**

| | **AMP! 2015/16** | **Prior to AMP! 2014/15** |
|---|---|---|
| **Sample** | **768** | **843** |
| **Outcomes** | | |
| Average score | 2,391.69 | 2,192.97 |
| Number (percent) passed | 589 (76.7) | 637 (75.6) |
| Number (percent) passed advanced | 254 (33.1) | 189 (22.4) |

**Bold** highlight p-values < .05.

The HLM results without covariates are shown in Table 4. Since the STAAR assessment does vary year to year, only the pass rate and the pass advanced rate were used as dependent variables. Without covariates, the treatment group (students of teachers in AMP!) in 2015/16 is not statistically significantly better than students of the same teachers in 2014/15 on pass rates. However, there is a statistically significant improvement in pass advanced rates.

**Table 4. HLM math results for students of teachers prior to AMP! and during AMP!**

| | **Pass** | **Pass advanced** |
|---|---|---|
| | **Basic model B (p-value)** | **Basic model B (p-value)** |
| Fit statistics | 8760.2 | 8066.6 |
| Intercept | 1.2895 (.1163) | –2.0901 **(.013)** |
| Comparison | .0055 (.9702) | .3212 **(.0186)** |

**Bold** highlight p-values < .05.

For the cohort of teachers who were in AMP! in 2014-15, the 2013-14 students of AMP! mathematics teachers in 2013/2014 were compared to the 2014-15 math students of AMP! teachers in 2014/2015 to the 2015-16 students of AMP! mathematics teachers. Since the STAAR test varies year to year, these results should be viewed cautiously especially in comparing the

scores. Table 5 shows the students with the year after AMP! had a higher average score of 2,639.15 compared to 2,211.26 in 2013/2014 and 2,337.36 in 2014/2015. Additionally, they had a higher pass advance rate of 39.2 percent as compared to 24.8 percent in 2013/2014 and 30.3 percent in 2014/2015. However, it had a lower pass rate of 70.2 percent as compared to 87.8 percent in 2013/2014 and 71.5 percent in 2014/2015.

**Table 5. Comparison of students in 2013/14, 2014/15 and 2015/16 for AMP! math teachers in 2014/15**

| | **After AMP! 2013/2014** | **AMP! 2014/2015** | **Prior to AMP! 2015/2016** |
|---|---|---|---|
| **Sample** | **351** | **396** | **342** |
| **Outcomes** | | | |
| Average score | 2,211.26 | 2,337.36 | 2,638.15 |
| Number (percent) passed | 308 (87.8) | 283 (71.5) | 240 (70.2) |
| Number (percent) passed advanced | 87 (24.8) | 120 (30.3) | 134 (39.2) |

**Bold** highlight p-values < .05.

The HLM results without covariates are shown in Table 6. Since the STAAR assessment does vary year to year, only the pass rate and the pass advanced rate were used as dependent variables. Without covariates, the year after the treatment (students of teachers a year after they were in AMP!) in 2015/16 is statistically significantly less than comparison groups on pass rates. Results a year after AMP! (students of mathematics teachers a year after they were in AMP!) show scores in 2015/16 that are statistically significantly greater pass advanced rates from a year before their teachers were in AMP!.

**Table 6. HLM math results for students of teachers prior to AMP!, during AMP!, and the year after AMP!**

| | **Pass** | **Pass advanced** |
|---|---|---|
| | **Basic model B (p-value)** | **Basic model B (p-value)** |
| Fit statistics | 5633.5 | 6088.0 |
| Intercept | 1.9816 (.0664) | –2.3133 (.1181) |
| Comparison | –.5921 **(<.0001)** | .5023 **(<.0001)** |

**Bold** highlight p-values < .05.

Overall, the results were mixed. There is evidence that there is a significant improvement in the pass rate for the students of the AMP! teachers and comparison group of math teachers within the same schools in 2015/16. Without covariates, the treatment group (students of teachers in AMP!) in 2015/16 is not statistically significantly better than students of non-AMP! teachers in the same school in 2014/15 on pass and pass advanced rates. When comparing STAAR math results for students of last year AMP! teachers, the year after the treatment (students of teachers a

year after they were in AMP!) in 2015/16 is statistically significantly less than comparison groups on pass rates. However, the year after the treatment (students of teachers a year after they were in AMP!) in 2015/16 is statistically significantly greater than pass advanced rates.

### Science Results

Program administrators obtained AMP! participants' students' data as well as the data for their entire campus (grade 8 only) for the current year (2015/16). For the students of non-AMP! teachers, AMP! administrators requested their students' data for 2015/16.

To address the first question, the STAAR results for science were examined for the students of the 2015/16 AMP! group and the other teachers that were not part of the program. As shown in Table 7, the students of program participant teachers had a higher average score compared to the students of teachers not included in AMP!. Additionally, the table shows demographic differences between the two groups and results of a chi-square analysis that tests if there are significant differences between the groups. The basic comparison of the average score and the pass rates show that AMP! participants performed better on the STAAR test in science. However, the chi-square tests show that the two groups are significantly different based on the proportion that are economically disadvantaged, racial composition, and those that receive services for limited English proficiency (LEP), special education (SPED), and gifted and talented (GT). Due to differences in the two groups, it is essential to control for these differences analytically.

**Table 7. STAAR science scores and demographics of AMP! and program selected comparison group students**

| | AMP! 2015/16 | Comparison, 2015/16 | Chi-square p-value |
|---|---|---|---|
| **Sample** | **3,486** | **9,975** | |
| **Outcomes** | | | |
| Average Score | 3,824 | 3,799 | |
| Number (Percent) passed | 2,413 (69.2) | 6,950 (69.7) | |
| Number (Percent) passed advanced | 546 (15.7) | 1,684 (16.9) | |
| **Demographic variables** | | | |
| Number (Percent) male | 1,822 (52.3) | 5,251 (52.6) | 0.7024 |
| Number (Percent) African American / black | 769 (25.6) | 2520 (28.1) | **.0084** |
| Number (Percent) American Indian | 271 (9.3) | 1,396 (15.9) | **<.0001** |
| Number (Percent) Asian American | 249 (8.4) | 531 (6.0) | **<.0001** |
| Number (Percent) Hispanic | 1,782 (51.1) | 5,293 (53.1) | .0479 |
| Number (Percent) White | 1,359 (43.4) | 4,156 (45.4) | .0554 |
| Number (percent) economically disadvantaged | 1,508 (54.3) | 4,621 (59.7) | **<.0001** |
| Number (percent) limited English proficiency | 536 (15.4) | 1803 (18.1) | **.0003** |
| Number (percent) ESL | 311 (9.0) | 521 (5.3) | **<.0001** |

| | | | |
|---|---|---|---|
| Number (percent) special education | 231 (6.6) | 986 (9.9) | **<.0001** |
| Number (percent) gifted/talented | 390 (11.2) | 1,045 (10.5) | 0.2413 |

**Bold** highlight = p-values < .05.

A two-level hierarchical linear model (HLM) was used with the STAAR average test scores and a two-level logistic HLM was used with the STAAR passing rates. Each basic model was examined and student-level covariates were included to control for the demographic differences. The results are shown in Table 8. Without covariates, the basic model indicates that the comparison group of students of non AMP! teachers performed significantly better than the students of AMP! teachers for the pass advanced rates. When student-level covariates were included (the full models), the comparison group outperformed the treatment group based on their pass and pass advanced rates. Therefore, there is no evidence that there is a significant improvement in the pass rate for the students of the AMP! teachers and the program selected comparison group for science in 2015/16.

**Table 8. HLM science results for AMP! and program selected comparison group students**

| | **STAAR scores** | | **Pass** | | **Pass Advanced** | |
|---|---|---|---|---|---|---|
| | **Basic model B (p-value)** | **Full model B (p-value)** | **Basic model B (p-value)** | **Full model B (p-value)** | **Basic model B (p-value)** | **Full model B (p-value)** |
| Fit statistics | 212,039.7 | 144,840.3 | 62229.2 | 46,842.3 | 69393 | 51,693.1 |
| Intercept | 3,782.3 **(<.0001)** | 3,893.5 **(<.0001)** | .893 **(<.0001)** | 1.2536 **(<.0001)** | –2.3405 **(<.0001)** | -2.2608 **(<.0001)** |
| Comparison | –17.96 (.2532) | 29.78 (0.0806) | .0585 (.3069) | 0.2857 **(.0002)** | .1984 **(.0049)** | 0.382 **(.0001)** |
| Male | | 21.43 (0.0655) | | 0.06042 (.2565) | | 0.2394 **(.0002)** |
| African Am./black | | –159.19 **(<.0001)** | | -0.6938 **(<.0001)** | | -0.6895 **(<.0001)** |
| Am. Indian | | 36.23 (0.0769) | | 0.1127 (.2246) | | 0.1625 (.147) |
| Asian Am. | | 139.9 **(<.0001)** | | 0.2821 (.1082) | | 0.8536 **(<.0001)** |
| Hispanic Am. | | –120.69 **(<.0001)** | | -0.3836 **(<.0001)** | | -0.4885 **(<.0001)** |
| Economic disadv. | | –85.06 **(<.0001)** | | -0.1558 **(.0166)** | | -0.3769 **(<.0001)** |
| ESL | | –249.16 **(<.0001)** | | -1.1555 **(<.0001)** | | -2.0995 **(<.0001)** |
| Special ed. | | –917.04 **(<.0001)** | | -2.2468 **(<.0001)** | | -2.0007 **(<.0001)** |
| Gifted /talented | | 578.47 **(<.0001)** | | 3.125 **(<.0001)** | | 2.2272 **(<.0001)** |

**Bold** highlight p-values < .05.

The students of AMP! science teachers in 2014/15 were compared to science students of AMP! teachers in 2015/16. Since the STAAR test vary year to year, these results should be viewed cautiously especially in comparing the scores. Table 9 shows the AMP! group had a higher average score (3,932 vs. 3,851.6), pass rate (73.6 percent vs. 66.6 percent), and pass advanced rate (22.4 percent vs. 21.4 percent) compared to the students of the same science teachers.

**Table 9. Comparison of students in 2014/15 and 2015/16 for AMP! science teachers in 2015/16**

| | **AMP! 2015/16** | **Prior to AMP! 2014/15** |
|---|---|---|
| Sample | **1,652** | **1,561** |
| **Outcomes** | | |
| Average Score | 3,932 | 3,851.6 |
| Number (Percent) passed | 1,201 (73.6) | 1,037 (66.6) |
| Number (Percent) passed advanced | 366 (22.4) | 333 (21.4) |

The HLM results without covariates are shown in Table 10. Since the STAAR assessment does vary year to year, only the pass rate and the pass advanced rate were used as dependent variables. Without covariates, the treatment group (students of teachers in AMP!) in 2015/16 is statistically significantly better than students of the same teacher in 2014/15 on pass rates. However, there is no statistical significance between pass advanced rates.

**Table 10. HLM science results for students of teachers prior to AMP! and during AMP!**

| | **Pass** | **Pass advanced** |
|---|---|---|
| | **Basic model B (p-value)** | **Basic model B (p-value)** |
| Fit statistics | 15,168.5 | 16,160.6 |
| Intercept | 0.7299 (.0535) | –1.9938 **(.0004)** |
| Comparison | 0.3438 **(<.0001)** | –0.0079 (0.9344) |

**Bold** highlight = p-values < .05.

For the cohort of teachers who were in the AMP! program in 2014/15, the 2013/14 students of AMP! science teachers were compared to the 2014/15 science students of AMP! teachers to the 2015/16 students of AMP! science teachers. Since the STAAR test varies year to year, these results should be viewed cautiously especially in comparing the scores. Table 11 shows the students had a higher average score after their teacher participated in AMP! (3,892.11 compared to 3,616.51 in 2014/2015 and 3,747.52 in 2013/2014). Additionally, there was a higher pass rate (80 percent) for teachers a year after participating in AMP! compared to 64.4 percent in 2013/2014 and 57.1 percent in 2014/2015.

**Table 11. Comparison of students in 2013/14, 2014/15 and 2015/16 for AMP! science teachers in 2014/15**

| | Prior to AMP! 2013/2014 | AMP! 2014/2015 | After AMP! 2015/2016 |
|---|---|---|---|
| **Sample** | **343** | **310** | **325** |
| **Outcomes** | | | |
| Average score | 3,747.52 | 3,616.51 | 3,892.11 |
| Number (percent) passed | 221 (64.4) | 177 (57.1) | 260 (80.0) |
| Number (percent) passed advanced | 47 (13.7) | 18 (5.81) | 38 (11.7) |

The HLM results without covariates are shown in Table 12. Since the STAAR assessment does vary year to year, only the pass rate and the pass advanced rate were used as dependent variables. Without covariates, there is evidence that there is a significant difference between pass rates with an overall improvement. However, the pass rates show that there was a decline from 2013/2014 to 2014/2015 and an improvement from 2014/2015 to 2015/2016. This results in an overall trend toward improvement; however, due to the drop in the pass rate during the treatment year, the improvement should be viewed cautiously.

**Table 12. HLM science results for students of teachers prior to AMP!, during AMP!, and the year after AMP!**

| | Pass | Pass Advanced |
|---|---|---|
| | **Basic model B (p-value)** | **Basic model B (p-value)** |
| Fit statistics | 4,308.52 | 5,124.2 |
| Intercept | 0.4229 (0.2187) | –2.0448 **(0.0222)** |
| Comparison | 0.3399 **(<.0001)** | –0.1428 (0.2601) |

**Bold** highlight = p-values < .05.

Overall, the results were mixed. There was evidence that the treatment group (students of teachers in AMP!) in 2015/16 is statistically significantly better than students of the same teacher in 2014/15 on pass rates. Additionally, the students of science teachers in AMP! had improved pass rates during the treatment when comparing to the 2014/15 AMP! cohort.

## Question 2: Did AMP! impact student achievement on the STAAR exams of specific demographic subgroups of students?

To examine whether AMP! had an impact on student achievement on the STAAR exam results for specific demographic subgroups of students, the results were compared to the other students at the same school. For each subject area (math and science), the demographic subgroups were examined separately. HLM analysis was used for raw test scores and logistic HLM was used for

pass and pass advanced results. The models included the outcome variable, the demographic variables, and the interaction between student outcomes. The interaction results show the student outcomes which were different for that demographic subgroup compared to other students at the same school. Table 13 displays the mean or overall pass rates for the groups and the comparisons that were statistically significant. For example, the students who do not have services for special education STAAR posted science test scores of 3,903.3 if they did not have an AMP! teacher and science test scores of 3,866.7 if they had an AMP! teacher. However, students who receive services for special education STAAR had science test scores of 3,223.0 if they had an AMP! teacher and 2,852.8 if they did not have an AMP! teacher. This suggests that the students receiving special education services are more likely to score higher on their science STAAR test if they have an AMP! teacher compared to those without an AMP! teacher. Figure 1 shows this relationship graphically for this example of special education scores in science.

Other results in Table 13 indicate the interaction between demographic subgroups and AMP! was statistically significant in several areas. Therefore, for students with AMP! teachers in mathematics, all demographic subgroups presented in the table appear to benefit more, while in science, some demographic subgroups seem to benefit more. Those students who appear to benefit from both AMP! mathematics and science teachers are White, Asian, students who receive special education services, and students who receive gifted/talented services.

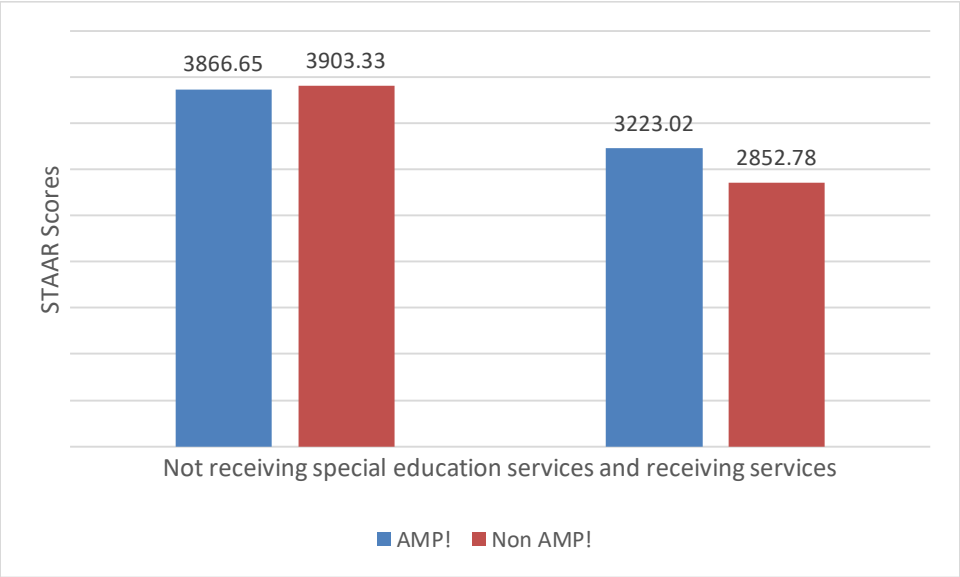
**Table 13. Comparison of the impact of AMP! on different subgroups: statistically significant subgroup differences (p<.05)**

| | Mean or overall rate | | | |
|---|---|---|---|---|
| | **AMP! students not in demographic subgroup** | **Non-AMP! students not in demographic subgroup** | **AMP! students in demographic subgroup** | **Non-AMP! students in demographic subgroup** |
| **Math** | | | | |
| African American (pass rate)[1] | 70.9% (n = 1,561) | 57.5% (n = 11,227) | 55.4% (n = 578) | 42.3% (n = 6,356) |
| White (STAAR scores)[1] | 1,950.0 (n = 1,394) | 1,643.4 (n = 12,912) | 2,562.2 (n = 751) | 1915.2 (n = 4,833) |
| White (pass rate)[1] | 61.3% (n = 1,394) | 47.8% (n = 12,912) | 76.8% (n = 751) | 64.8% (n = 4,833) |
| Asian (STAAR scores)[1] | 2,014.0 (n = 1971) | 1,694.1 (n = 16,689) | 3,955.3 (n = 167) | 2232.9 (n = 749) |
| Hispanic (pass rate)[1] | 72.9% (n = 1,123) | 53.9% (n = 9569) | 60.2% (n = 1,033) | 53.9% (n = 9,020) |
| Economic disadvantaged (STAAR scores)[1] | 2863.0 (n = 881) | 1,983.2 (n = 5,094) | 1,680.2 (n = 1,060) | 1,605.7 (n = 11,374) |
| Economic disadvantaged (pass rate)[1] | 84.6% (n = 881) | 67.4% (n = 5,094) | 55.5% (n = 1,060) | 48.1% (n = 11,374) |
| Special education (STAAR scores)[1] | 2,195.9 (n = 2,116) | 1,730.9 (n = 17,524) | 1,774.4 (n = 174) | 1576.4 (n = 1,876) |
| Special education (pass rate)[1] | 69.7% (n=1982) | 56.9% (n=16844) | 34.5% (n=174) | 25.7% (n=1745) |

| | | | | |
|---|---|---|---|---|
| Special education (pass advanced rate)[1] | 21.5% (n=1982) | 8.2% (n=16844) | 16.1% (n=174) | 11.0% (n=1745) |
| Gifted / talented (STAAR scores)[1] | 2,012.3 (n = 1908) | 1,693.3 (n = 17,011) | 3,312.7 (n = 248) | 1965.7 (n = 1,578) |
| **Science** | | | | |
| White (STAAR scores)[1] | 3,713.2 (n = 1,770) | 3,716.9 (n = 4997) | 3,929.5 (n = 1,359) | 3,872.2 (n = 4,156) |
| White (pass rate)[1] | 62.2% (n = 1,770) | 65.6% (n = 4,997) | 75.4% (n = 1,359) | 73.0% (n = 4,156) |
| White (pass adv. Rate)[1] | 16.0% (n = 1,770) | 18.7% (n = 4,997) | 7.5% (n = 1,376) | 8.7% (n = 4,156) |
| American Indian (pass rate) | 66.6% (n = 2,660) | 67.5% (n = 7,390) | 63.8% (n = 271) | 71.0% (n = 1,396) |
| American Indian (pass adv. Rate) | 14.5% (n = 2,660) | 15.9% (n = 7,390) | 8.1% (n = 271) | 15.4% (n = 1,396) |
| Asian (STAAR scores)[1] | 64.3% (n = 2,733) | 67.2% (n = 8,335) | 92.4% (n = 249) | 86.1% (n = 531) |
| Asian (pass adv. Rate) | 12.4% (n = 2,733) | 14.1% (n = 8,335) | 36.1% (n = 249) | 50.0% (n = 531) |
| Economically disadvantaged (pass rate)[1] | 79.1% (n = 1,270) | 82.7% (n = 3,125) | 59.1% (n = 1,508) | 63.8% (n =5,923) |
| LEP (STAAR scores)[1] | 3,897.2 (n = 2,941) | 3,889.0 (n = 8,138) | 3,426.8 (n = 536) | 3,395.7 (n = 1,803) |
| Special education (STAAR scores)[1] | 3,866.7 (n = 3,255) | 3,903.3 (n = 8,987) | 3,223.0 (n = 231) | 2,852.8 (n = 986) |
| Gifted / Talented (STAAR scores) | 3,770.3 (n = 3,096) | 3,718.5 (n = 8,930) | 4,250.0 (n = 390) | 4,489.6 (n = 1,045) |
| Gifted / Talented (pass rate) | 65.9% (n = 3,096) | 66.3% (n = 8,930) | 95.6% (n = 390) | 98.8% (n = 1,045) |

[1]AMP! students performed better in these demographic subgroups.

**Figure 1. Relationship between AMP! teachers and students who receive special education services on science STAAR results**




## Question 3: Did the AMP! teacher's subject area impact student achievement on math or science differently?

The final research question is to examine the impact of student achievement on math and science based on the AMP! teachers' subject area. Students with AMP! teachers either had an AMP! science teacher, an AMP! mathematics teacher, or an AMP! mathematics and science teacher. Table 14 shows the students STAAR outcomes for each subject. The results were mixed. Generally, there were not many results that were statistically significant. To test if the improved results were due to different populations of students, the demographic information about the students were included in the model. Therefore, for these analyses, the full HLM model for each subject area (math and science STAAR results) was conducted, with the demographic information for all students included in the model. To determine the difference between the teachers, covariates for science teachers and mathematics teachers were included in the model. The results show students with an AMP! science teacher or an AMP! mathematics teacher differ from students with AMP! mathematics and science teachers even when the different demographics are included. Table 14 shows the average STAAR score and pass rate for each subject area by AMP! teacher. It is noted in the table that five conditions were significantly different.

**Table 14. Comparison of test subject results for all students of AMP! teachers**

| | Math | | | Science | | |
|---|---|---|---|---|---|---|
| | **Score** | **Passed** | **Passed adv.** | **Score** | **Passed** | **Passed adv.** |
| **Science teachers** | 1,920.9 (n = 2,112) | 68.8%[1] | 14.8% | 3,846.0[2] (n = 2,371) | 71.2% | 15.7% |
| **Math teachers** | 2,117.1 (n = 1,108) | 70.1% | 18.8% | 3,826.2[3] (n = 1,122) | 71.0%[4] | 12.3%[5] |
| **Math and science teachers** | 2,209.2 (n = 1,048) | 63.4%[1] | 23.6% | 3,777.3[2,3] (n = 1,115) | 65.0%[4] | 15.5%[5] |

The number indicates the results were statistically significantly different from each other with a p-value < .05.