



RESEARCH REPORT

ALSDE/A+ College Ready LTF Teacher Implementation Evaluation Study

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ABSTRACT

Three years ago ALSDE/A+ College Ready shifted to building a pipeline of students better prepared for AP and college through the development and implementation of a teacher training program aligned with Alabama's state standards for grades 6-10 in math science and English. The program combines the NMSI Laying the Foundation (LTF) curricula with additional activities created by expert teachers in Alabama to better equip teachers with the content knowledge and instructional know-how to set high classroom expectations and increase student performance. In partnership with the ALSDE, the current study measured the impact and success of the professional development program (the LTF infused curricula and teaching strategies) on student academic success in a matched set of treatment and control schools. The implementation study included teacher surveys, logs and observations to gain insight into teacher use and perceptions of the LTF lessons as well as teacher feedback on program efficacy. Student level ACT/Aspire data for the 2015-1016 academic year for each comparison and treatment school served as the primary outcome variable to measure change in student achievement.

INTRODUCTION

In 2015-2016 a new cohort of teachers (Cohort VIII) joined 118 Alabama high schools in the ALSDE/A+ College Ready Program (using the Laying the Foundation lessons). The Laying the Foundation (LTF) initiative is a professional development program grounded in comprehensive teacher training and student support to boost enrollment and success in Advanced Placement (AP®) courses (and the rigorous courses that lead up to AP). Research has shown that passing AP exams can positively influence college matriculation and graduation as well as serve as indicators of the quality of a college applicant's high school program (Geiser & Santelices, 2004; Dougherty, Mellor, & Jian, 2006). In addition, students with AP course credit earned higher first semester college GPAs than their counterparts with similar high school academic features, but no AP credit (Scott, Tolson, & Lee, 2010).

The goals of the initiative are to improve the quality of instruction, increase the number of AP course offerings as well as the number of students prepared for, enrolled in and passing AP courses. The program provides training in highly effective teaching strategies that promote critical thinking and deep content understanding to help support these goals. Our study focused on the high schools (and feeder middle schools) that comprise Cohort VIII of the LTF initiative and included teachers in mathematics, English language arts (ELA) and science.

In conjunction with support offered in math and English, the A+ College Ready initiative has focused on the importance of rigorous science instruction for all students and all grade levels to provide a comprehensive approach to increase student achievement in all schools. The necessity for an increased focus on math and science specifically is based on years of research that shows fewer students are entering math and science related career fields (National Science Board, 2010). Performance in math and science of U.S. elementary and secondary students is also below

that of their peers in many other nations (Chen and Soldner, 2013; Fleischman et al. 2010). Indeed, it is estimated that in 2016, only around 41% of U.S. high school graduates were ready for college-level math, and only 36% ready for college-level science (ACT, Inc. 2016). Additionally, national scores on math and science assessments like the ACT have been relatively stagnant the past few years and Alabama has lagged behind national achievement on these measures. In 2016, 100% of graduating students in Alabama took the ACT, 23% met the benchmark for college readiness in math, and 24% met the benchmark in science (ACT, Inc. 2016). The ALSDE/A+ College Ready Program aims to help provide better preparation for Alabama's students in these subjects via targeted professional development to help improve college and career readiness.

Historically, professional development initiatives have had mixed results when considering student achievement outcomes as indicators of success. Possible reasons for this include poor implementation of professional development programs, as well as lack of adherence to characteristics of professional development programs shown to have positive effects. These characteristics include a focus on content knowledge and skills of the teachers, ongoing and collaborative nature, as well as an emphasis on teacher practices (see Garet, Porter, Desimone, Birman, Herman & Yoon, 1999; Hiebert, 1999). Most commonly reported in the literature are PD programs which are short, "one-shot" workshops. For example, Birman et al., (2007) reported that few teachers receive intensive, sustained, and content-focused professional development in mathematics. Their data indicated that while teachers report taking part in professional development activities focused on teaching—very few took part in these activities for an extended period; teachers averaged 8.3 hours of professional development on how to teach mathematics and 5.2 hours of more in-depth study.

LTF program

The LTF program aims to train teachers to facilitate students' progression through the academic pipeline toward advanced coursework (AP courses). Developed by experienced teachers and content experts, the program provides comprehensive, hands-on training led by a national corps of expert classroom teachers, Trainers guide teachers through content-rich instruction that moves beyond what to teach to how to deepen student understanding of key concepts. The program also offers classroom-ready materials and resources which are aligned with state standards and encourage higher-order thinking. LTF training emphasizes research-based instructional strategies including: inquiry-based learning, instructional scaffolding (techniques and guidance for delivering differentiated instruction), and vertical alignment (education about the knowledge and skills that students need to master at each grade level) all designed to help increase academic rigor and build college and career readiness.

While teachers have provided positive feedback on the NMSI Laying the Foundation (LTF) training in Alabama, many have reported difficulty incorporating the teaching methods into the classroom. To address this, acclaimed teachers and expert content directors from the state worked to create an LTF lesson-based scope and sequence which was then used to create a more

more comprehensive set of curricula. These curricula are rigorous, aligned with Alabama’s College and Career Ready Standards, and designed to prepare students for the work and thinking required in AP courses.

The LTF professional development program is comprised of a summer institute that focuses on content and pedagogy, with follow-up course-specific training throughout the year. Details of the implementation study associated measures were introduced to teachers at the LTF summer institute after which teachers were asked to sign letters of agreement (LOAs) indicating their agreement to both participate in the study and to implement the LTF curriculum to 80% fidelity. Through implementing rigorous College and Career Ready Standards (CCRS)-aligned courses which heavily utilize the LTF-infused curricula, the schools in Cohort VIII agreed to help move thousands of students closer to college and career readiness. Participation in the study required implementing the LTF curricula in any of the following courses: Algebra I (8th or 9th grade), Algebra II (10th grade), English (8th grade), English (10th grade), physical science and completing a set of study measures.

Goals of the ALSDE/A+ College Ready Program

Schools invited to join Cohort VIII agreed to embrace an ambitious plan to train teachers, implement rigorous CCRS-aligned courses, establish vertical team meetings, change policies and procedures and share data to better prepare students and teachers for success in a college readiness and the AP program.

Specific goals of the ALSDE/A+ College Ready Program (using the LTF lessons) are to provide teaching training and support in the following areas:

- Identify and ameliorate gaps in teacher content knowledge
- Train teachers on pedagogical models that are student-centered
- Train teachers in use of “minds-on” and “hands-on” activities
- Train teachers in how to create and conduct collaborative learning environments
- Train teachers how to combine higher expectations with fair grading
- Instruct teachers in the use of the A+ College Ready curricula
- Instruct teachers in effective questioning techniques
- Online and face to face communications with teachers by content managers in each discipline

Evidence of the following metrics will provide one measure of successful implementation.

- Collaborative work among students
- Productive struggle by students
- Investigative or problem-based approach to learning
- Students discussion beyond basic recall of facts
- Productive noise levels

- Student generated ideas, questions, and respectful comments
- Technology tools used to communicate and solve problems
- Student engagement through on-task behaviors
- Timely implementation of scope and sequence

In partnership with the ALSDE, the current study measured the impact of the LTF lessons and strategies on student academic success. This report focuses on math, science and ELA teacher participation and student outcomes during the 2015-16 academic year.

METHODOLOGY

Participants

Participants were teachers from schools (and feeder schools) in Cohort VIII who attended training during the summer 2015. Participating teachers agreed to place an intensive focus on implementation of the NMSI LTF-infused courses in 7-10th grade to help prepare more students for success in AP courses in the final years of high school. The sample of schools was further divided into “Program Schools”—those currently offering AP and, “Pipeline Schools” which were schools scheduled to begin AP course offerings the following academic year. Initial teacher recruitment yielded 123 eligible teachers (see Table 1).

Table 1: Initial teacher recruitment

	Grade	Teachers in Cohort	Final Sample (by sub-group)	Final Sample (by subject area)
Physical Science	8	22	18	19
English	8	33	24	56
English	10	35	32	
Math (Algebra I)*	8	42	30	49
Math (Algebra II)	10	25	19	
Total		157	122	123

* Includes 9 teachers who are teaching 9th Grade Algebra I

Demographic data for participating teachers are shown in Table 2.

Table 2: Teacher demographics

	Math	ELA	Science
Males	5	4	3
Females	31	31	10
Average age (SD)	40.2 (9.23)	39.81 (9.88)	37.76
Average years teaching (SD)	13.97 (7.73)	11.88 (6.56)	9.85 (5.15)
First year of LTF participation	30	22	10

Study Design

This study utilized a comparative interrupted time series (CITS) design. The performance of students in the classrooms of the teachers who received the training and implemented the curriculum in the 2015-2016 academic year (treatment group) were compared to the performance of students from a comparable group of teachers who did not receive the training (control group). The CITS design allows for valid causal inferences of treatment effects by controlling for baseline and slope differences across the treatment and control groups. The comparison group comprised a matched sample created by comparing school-level data from non-participating schools to schools in Cohort VIII. Matching was done at the school mean level and no individual students were identifiable. The following data were used to create a matched comparison set of schools.

- Percent free or reduced lunch
- Percent African-American or Hispanic
- Percent Special Education/Learning Disabled
- Percent English Language Learners
- Average ACT/Aspire scores
- Prior exposure to LTF training (these schools will not be included in the comparison sample)

The study focused on the following research questions to explore implementation as well as compare the academic growth of students in the treatment schools to the control schools.

- i. Is there a significant difference in the scores on ACT-based assessments in the treatment vs. control groups?
- ii. To what extent is the LTF program implemented with fidelity in the treatment classrooms?
- iii. What are the facilitators and barriers to implementation?
- iv. Are variations in program implementation systematically associated with differences in program outcomes?

Data Sources

Student Outcome Data

De-identified student level ACT/Aspire data for the 2015-1016 academic year for each comparison and treatment school served as the primary outcome variable for the study. These data included all Grade 8 and Grade 10 Math and English scores, as well as all Grade 7 Science scores from the comparison and treatment high schools and their feeder middle schools. Table 3 below indicates outcome measure data used to evaluate the success of the LTF-training and use of the curriculum. ACT/ASPIRE data from the most recent prior year were used as a covariate in the analysis.

Table 3: Study Outcome data by subject area and grade

Grade level	8 th Grade Science	8 th Grade Math	8 th Grade English	10 th Grade Math	10 th Grade English
Baseline	ACT 7 th Grade	ACT 7 th	ACT 7 th	8th Grade ACT	8th Grade ACT
	Aspire Science	Grade Aspire	Grade Aspire	Explore**	Explore
Growth Measure	ACT 8 th Grade	ACT 8 th	ACT 8 th	ACT Early	ACT Early
	Aspire Science	Grade Aspire	Grade Aspire	College Aspire	College Aspire
		Math	Reading	Math	Reading

** data from 2013-2014 school year

Data sources included measures of teacher implementation practices: implementation logs, surveys and observations as well as student achievement data. We studied program implementation to identify facilitators and barriers as well as exploring variations between teachers.

Teacher Surveys

Teacher surveys contained items focused on the following constructs:

- Teacher background information/demographics
- Beliefs in teaching specific subject area
- Purpose of the LTF initiative
- Perceptions of LTF utility
- Impact of LTF on students

Three versions for the teacher surveys were created (one for each study subject area) with sections customized by subject area where necessary. Items relating to teacher perspectives on the purpose of the LTF initiative in the math survey, for example, were aligned to the Common Core State Standards of Mathematical Practice, while the science survey took examples from the Next Generation Science Standards framework as well as relevant Common Core standards (e.g., problem solving and perseverance). One of the teacher surveys constructs focused on teacher self-perceptions. In science, we incorporated existing items used in prior research which looked at 1) teachers confidence in doing tasks such as generating a research question, or developing theories; 2) teachers feelings about belonging to a community of scientists and self-identifying as a scientist. Comparable items were created for both math and science teachers, although for both disciplines there were fewer items than for science teachers.

Teacher Logs

Intervention fidelity indexes the extent to which the program model is faithfully reproduced in program schools. To help evaluate the fidelity of implementation of the LTF initiative and examine factors related with success, we created online teacher logs to be completed at the end

of each nine-week LTF module (i.e., four times per year). Constructs explored within the teacher log included:

- Proportion of class time spent on various LTF-related activities
- Ways in which teachers introduced the LTF lessons
- Particular skills emphasized during instruction
- Assessment strategies
- Teacher perceptions on student learning
- Feedback on positive and negative aspects of the LTF lessons

As with the other measures, there were common items across subject areas as well as subject area-specific items. Thus, the teacher logs and specific items included within reflected important skills and strategies within each subject-area domain

Observation Protocol

One common observation protocol was developed to use across all subject areas. Observations were conducted to obtain more detailed information on curriculum implementation as well as insight into any potential barriers to implementation. Thus, the observations performed a formative, rather than evaluative function. Behaviors recorded in the observation included:

- Ways in which the teacher introduced the lesson
- Strategies and activities observed during a 50-minute observation period
- Types of materials observed
- Types of assessment strategy observed
- Percentage of class time spent on different activities
- Methods for differentiating students

Student Survey

We used an existing ten-item student survey focused on science self-perceptions which has been used in previous research (Aschbacher, Ing, & Tsai, 2014). Math and English versions were created with similar/parallel items where appropriate. Student surveys were administered twice during the school year in paper-and-pencil format with packets mailed to participating teachers and collected by AP coordinators. Results of the student surveys are described in separate reports by subject area (see for example Phelan, Ing, and Nylund-Gibson, 2016).

RESULTS

Student Outcomes

Student level ACT/Aspire data for the 2015-1016 academic year served as the primary outcome variable for the study. Data were analyzed to determine if there was a significant difference in scores on ACT-based assessments in the treatment and control groups. These data included all 8th

and 10th grade math and reading scores, as well as all 8th grade science scores from the comparison and treatment high schools and their feeder middle schools. Multiple regression analyses was used to estimate treatment effects on ACT/ASPIRE scores while holding constant prior achievement using ACT/Aspire data from the prior year (in the case of eight grade students) or from earlier testing (eight grade scores for the tenth grade sample).

Initial analyses included schools with at least one participating teacher and all student data from those schools were analyzed—regardless of whether the student was actually a student of the LTF-trained teacher. This method likely dilutes any observed effect of the treatment as not all students were in LTF-based classes. Despite this limitation, positive effects of the LTF training were identified in some subject-grade combinations; students in schools with LTF-trained teachers scored higher in both math and reading in grade 8. No significant difference between the experimental and control conditions were found for reading or math in grade 10 or physical science in grade 8.

Subsequently, we obtained access to teacher-level data and were able to conduct follow-up analyses on the sample of students directly instructed by the LTF-trained teacher. This allowed us to isolate just those teachers and students involved in the A+ College Ready program, rather than include students in the treatment condition who were not instructed by teachers receiving the training. In this set of analyses, the findings for all subject areas/grade levels were positive, with one exception—there were no significant differences between treatment and control students in 8th grade physical science.

Significant effects were, however, found for math and reading in both grades 8 and 10. As Table 4 indicates, for 8th grade math, treatment students scored on average 3.217 points higher on the ACT/Aspire exam than control students while holding constant prior math achievement (Cohen's D effect size of .47). Likewise, for 8th grade reading scores (see Table 5), the students of LTF-trained teachers scored an average of 1.00 point higher on the ACT/Aspire test, while controlling for prior reading achievement (Cohen's D effect size of .15). Grade 10 analyses showed similar results, though the effects are slightly smaller (see Tables 6 & 7). For 10th grade math scores, the experimental group gained an average of .84 points on the ACT/Aspire test (Cohen's D effect size of .11). Similarly, students of LTF-trained teachers scored an average .794 points higher on the ACT/Aspire reading test than the control students, holding constant prior reading achievement (Cohen's D effect size of .11). Taken together, these results provide evidence that students of LTF-trained teachers outperformed students with comparable academic achievement of teachers not receiving the LTF training across grade level and subject area.

As expected, the effects were significantly larger for the restricted sample of students taught by the LTF-trained teachers than for the whole school population of students from the schools in which the LTF-trained teachers worked. Effect size doubled with the restricted sample in 8th grade reading (from .08 to .15) and tripled in 8th grade math (from .14 to .47). For 10th grade students, restricting the sample to those students actually on the classroom rosters of LTF-trained

teachers, rather than using all students in the schools in which the LTF-trained teachers taught uncovered significant effects otherwise not evident. In the sample of students taught by LTF-trained teachers, the effect of training for 10th grade math was significant (effect size .11) as was the effect for 10th grade reading (effect size .11), whereas these effects were non-significant using the whole school populations.

Table 4: 8th Grade Math

	Coef.	S.E.	P <
Treatment	3.217	.236	.000
G7 Math	.782	.016	.000

Note: $R^2 = .550$

Table 5: 8th Grade Reading

	Coef.	S.E.	P <
Treatment	1.00	.175	.000
G7 Reading	.746	.014	.000

Note: $R^2 = .489$

Table 6: 10th Grade Math

	Coef.	S.E.	P <
Treatment	.840	.263	.001
G8 Math	1.725	.035	.000

Note: $R^2 = .476$

Table 7: DV 10th Grade Reading

	Coef.	S.E.	P <
Treatment	.794	.192	.000
G8 Reading	1.292	.025	.000

Note: $R^2 = .454$

Participation Rates

The recruited sample comprised 78.3% of the eligible teachers who participated in the summer training. Teachers from 16 middle schools and 29 high schools (including some junior high schools) participated in the study. Table 8 includes the actual participation rates (as well as teacher measure completion) for teachers for the study subject areas.

Table 8: Teacher study measure participation

	Math (N)	ELA (N)	Science (N)
Total sample	49	56	19
At least one measure	45	42	15
At least one teacher measure	44	39	14
Total observations*	56	41	12
Teacher Survey 1	36	35	13
Teacher Log 1	30	30	8
Teacher Log 2	29	28	9
Teacher Log 3	25	22	4
Teacher Log 4	16	17	5
Teacher Survey 2	22	22	6
Student surveys	29	36	9
Completed all measures (7)	6 (11.5%)	8 (14%)	0
Completed 0 measures	5 (11.5%)	14 (25%)	5 (26.3%)
Average number of measures (for final sample)	4.3	4.72	3.8

*In some cases the same teacher was observed at two time points

Some teachers completed only the student survey measures and thus had no data to include in the analysis, although they had a minimal level of participation. Considering submission of at least one teacher measure as the lowest (relevant) level of participation, the final sample included 97 teachers (78.9% of the original sample). Teacher compliance in measure completion varied across subject areas; ELA teachers had the highest participation rates with an average measure completion (considering at least one teacher measure) of 4.65 (10th grade ELA) and 4.79 (8th grade ELA). The lowest participation rate was in physical science with an average measure

completion of 3.8. A comparison of average measure completion by subject area and grade is shown in Figure 1.

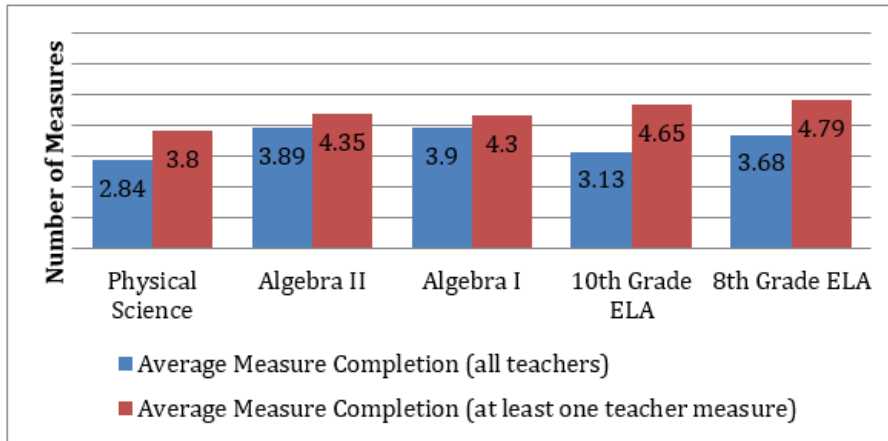


Figure 1: Average measure completion

Based on the number of measures submitted, teachers were divided into two groups—high and low implementation. High implementers were those teachers who submitted four or more of the required teacher measures and the low implementers those who submitted three or fewer. Teachers who only submitted the student survey ($N = 5$) were not included. Three quarters of the ELA teachers were in the high implementation group (76.9%), with the greatest number of teachers submitting four or more measures in 8th grade ELA (84.2% of the 8th grade sample). Just over half of the science teachers were in the high implementation group (see Table 9).

Table 9: Implementation groups (by grade and subject area)

Subject area (grade)	High Implementers		Low implementers	
	N	%	N	%
Science (8th grade)	8	53.33%	7	46.66%
Algebra I (8 th or 9 th)	18	64.3%	10	35.7%
Algebra II (10 th)	10	62.5%	6	37.5%
Math total	28	63.63%	16	36.36%
ELA (8 th grade)	16	84.2%	3	15.8%
ELA (10 th grade)	14	70%	6	30%
ELA Total	30	76.9%	9	23.1%

Implementation data (surveys, logs and observations) were analyzed by subject area and complete results from all administered measures are included in Appendix A.

Teacher survey comparisons

Comparisons of teacher responses (by subject area) on some of the key survey constructs are shown in Table 10. In cases where pre and post data were available, the post-survey data are included in Table 10.

Table 10: Comparisons of teacher groups by subject area

	Max Possible	Math	Science	ELA
Recruited vs. final sample size		49 vs. 44	19 vs. 14	56 vs. 39
% High implementation		63.63	53.33	76.9
Average measure completion	7	4.31	3.8	4.71
Years teaching experience, M (SD)		13.97 (7.73)	9.85 (5.15)	11.88 (6.56)
Self-perception score, M (SD)	6	3.5 (1.54)		3.17 (1.15)
	16		13.12 (3.18)	
LTF effectiveness Score, M (SD)	13	7.0 (4.63)	8.33 (4.46)	10.22 (4.11)
LTF usefulness score, M (SD)	8	3.39 (2.59)	5.33 (3.33)	6.22 (2.5)
Differentiating instruction (% agreement)				
- ELL		.00	.33	.23
- SWD		.07	.33	.18
- Struggling Students		.11	.33	.16
- Advanced Students		.83	.50	.21
Flexibility (% agreement)		.38	.67	.68
Student Engagement (% agreement)				
- More		.67	.67	.65
- Same		.33	.33	.35
- Lower		0	0	0
Expectations for LTF students				
- Higher		.83	.83	.91
- Same		.17	.17	0
- Lower		0	0	0

Summary of Results by Subject Area

Student Achievement

Comparisons between the treatment and control schools for all subject areas/grade levels, yielded positive findings with one exception; there were no significant increases seen for 8th grade physical science. Effect size doubled with the restricted sample (looking at only students of LTF-teachers) in 8th grade reading (from .08 to .15) and tripled in 8th grade math (from .14 to .47). Effects for 10th grade math were significant (effect size .11) and also for 10th grade reading (effect size .11) for the restricted sample only

Teacher Compliance

Teacher compliance in measure completion varied across subject areas; ELA teachers had the highest participation rates with an average measure completion (considering at least one teacher measure) of 4.65 (10th grade ELA) and 4.79 (8th grade ELA). The lowest participation rate was in physical science with an average measure completion of 3.8. High implementers were those teachers who submitted four or more of the required teacher measures. Just over three quarters of the ELA teachers were in the high implementation group (76.9%), with the greatest number of teachers submitting four or more measures in 8th grade ELA (80%). Just over half of the science teachers were in the high implementation group.

Teacher Measures

We explored changes in teacher responses to the surveys from pre to post. This allowed us to consider changes in teacher opinions following implementation after which they have more information on which to base their responses. The below summarizes key findings from the surveys, logs and observations.

Science

Completion: Only six of the 14 science teachers submitted both a pre and a post survey (this was the smallest sample in our study). Logs and observations were available for a larger sample (see Table 8 above).

Teacher beliefs and attitudes: Teacher self-perceptions and self-identification related to science increased pre to post, whereas overall confidence doing science decreased slightly.

Classroom teaching practices: Teachers indicated greater agreement in efficacy of “constructivist” teaching methods (both pre and post) compared to more traditional (direct transmission methods). Teachers’ overall agreement increased from 80% to 100% for the statement “students should be allowed to think of solutions to problems before the teacher shows they how they are solved”. The latter increase may reflect this teacher seeing the value of allowing students to persevere on their own before being told the answer. There was also a decrease in the number of teachers who thought “building instruction around problems with clear, correct answers and ideas that were easy to grasp” was an effective strategy (100% at pre and 70% at post). This indicates that at least some teachers are seeing the value of the “productive struggle” during instruction (one indicator of successful implementation).

LTF Lessons (Effectiveness): Overall composite scores (maximum of 12) increased slightly from pre ($M = 7.33$, $SD = 4.92$) to post ($M = 8.33$, $SD = 4.46$).

LTF Lesson (Helpful): Teachers tended to find LTF less helpful for formative assessment-related activities and providing students with detailed feedback about their work. Teachers’ average overall composite score decreased slightly from pre ($M = 6.16$, $SD = 2.99$) to post ($M = 5.33$, $SD = 3.33$).

Students: Teachers tended to find the LTF lessons more effective for high-ability math students. Teachers had the highest average level of agreement on the effectiveness of the LTF lessons in differentiating instruction for students with advanced math abilities ($M = .5$). This decreased from .67 at the pre time point. Ratings for students struggling with math also decreased from the pre time point ($M = .5$) to the post time point ($M = .33$). Most found the lessons flexible enough to be used with all students. At the post time period, two thirds of teachers reported their LTF students to be more engaged than other (non-LTF) students. At the pre time period 100% of teachers reported expectations of higher achievement than other (non-LTF students). At the post time period, this decreased to 83%. Over half of the teachers (57.7%) reported their students to have responded with excitement to the lessons with just over 15% reporting student frustration. Responses tended to depend on the particular module teachers had completed—one teacher reported student frustration for module 1, apathy for module 2 and frustration for module 3. Additional comments indicated some students struggled with the material and got confused easily. One teacher indicated that his/her students liked the challenge but were concerned about their grades possibly going down.

Teaching Focus: Teachers reported spending an average of 40.22% of their time teaching concepts which should have been prior knowledge and a little less (38.49%) re-teaching/reviewing prior knowledge concepts. Teachers felt overall that the suggested time given to teach the LTF lessons was appropriate (69%).

Grading: Four teachers reported issues with grading citing time to grade as an issue ($N = 2$), soft-landing grading ($N = 1$), and the amount of grading ($N = 1$).

Planning: Respondents were asked to rate the importance of certain information about their students as they planned and implemented the modules. The most important consideration when planning and implementing the modules was differentiating activities and instruction for different students. The least important information was the students' prior Aspire scores.

Student Mastery: Most teachers (64%) reported that between 50 and 75% of their students had a strong grasp of course content by the end of the modules. This finding (common across all subject areas) suggests that teachers and students may need additional support to increase the effectiveness of the LTF lessons.

Math

Teaching Beliefs: Teachers had a higher level of agreement that how much students learn depends on their background knowledge which is why teaching facts is so necessary from the pre survey to the post survey. This change may relate to the fact that in the logs, teachers reported spending an average of 35.12% of their time teaching concepts which should have been prior knowledge and a little less (33.33%) re-teaching/reviewing prior knowledge concepts. This may

have become more evident after teaching the LTF curriculum and may have led to an increase in belief that teaching facts is important.

Self-perceptions: On average, teacher self-perception increased from the pre-survey to the post-survey.

LTF Lessons (Effectiveness): Overall composite scores (maximum of 13) decreased slightly from pre to post. Lowest ratings were for using formative assessment strategies to identify student strengths and weaknesses and to help inform instruction.

LTF Lessons (Helpful): Teacher ratings of how helpful the LTF lessons were in achieving certain goals either remained the same or decreased from pre to post. Teachers' average overall composite score decreased from pre to post. .

Students: Teachers had the highest average level of agreement on the effectiveness of the LTF lessons in differentiating instruction for students with advanced math abilities, and this increased from pre to post. Ratings for students struggling with math decreased from the pre to the post time point. No teachers at the post time point felt that the LTF lessons helped them differentiate instruction for ELL students, and very few for students with disabilities (SWD). Teachers tended to find students in their LTF classes more engaged than in other classes, and this remained relatively constant between the pre and post time period. Expectations of achievement were also high with over 75% of teacher expecting higher levels of achievement from their LTF students. Almost two-thirds of teachers found the LTF lessons to be flexible to fit the needs of all students. Students were reported to have responded to the LTF lessons with piqued interest 41.2% of the time, with frustration 26.5% of the time, with excitement 17.6% of the time and with apathy 7% of the time.

Teaching Focus: Teachers reported spending an average of 35.12% of their time teaching concepts which should have been prior knowledge and a little less (33.33%) re-teaching/reviewing prior knowledge concepts. Teachers felt overall that the suggested time given to teach the LTF lessons was appropriate (60% of responses). On average students worked in small groups for just over half of class time, and worked in pairs or independently between 10-13% of the time. For some teachers, however, these behaviors were seen 80% of the time. Less variability was seen in the proportion of time spent with the teacher lecturing to the whole class an average of 2.9% of the time and only around 11% of the time (on average) was spent on assessment-related activities

Grading: Teachers reported issues with grading citing difficulty dealing with varied ability levels, soft-landing grading, availability of assessment items/need to create own assessment items, uncertainty about how to implement the grading scale, time needed for grading, problems stemming from students' lack of foundational skills, explaining grades in the pre-AP context. Appendix E includes comments from the math teachers relating to grading issues.

Planning: The most important consideration when planning and implementing the modules was knowledge of differing ability levels of students.

Student Mastery: Half of the teachers reported that between 50 and 75% of their students had a strong grasp of course content by the end of the modules. Almost 30% felt students had less than a 50% grasp of the content taught in the module.

ELA

Measure completion: Pre and post survey data were available for 23 teachers.

Teaching Beliefs: Agreement of constructivist teaching beliefs remained relatively constant pre to post on all belief statements.

Self-Perceptions: On average, teacher self-perception increased from the pre-survey to the post survey.

LTF Lessons (Effectiveness): Overall composite scores (maximum of 13) were almost identical pre to post (10 vs. 10.21).

LTF Lessons (Helpful): At the pre time point, only 26% of teachers agreed that the LTF lessons helped learn new ways to include formative assessment in teaching, and 48% found them helpful in terms of learning information about student strengths and weaknesses. Agreement on both of these goals increased from pre to post, but they remained with the lowest level of teacher agreement on the post survey. Teachers were most in agreement with the LTF lessons helping prepare students for rigorous content (91% at the post time point) and increasing the rigor of writing assignments (also 91%).

Students: At the post time period, the largest percentage of teachers agreed that the LTF lessons were effective at differentiating instruction for ELL students—but this was still only 23%. Ratings for students struggling with reading/writing also increased from the pre time point to the post time point (from 9% to 16%). Levels of agreement about differentiating instruction were, however, low for the ELA teachers (compared with the math and science teachers). Teachers tended to find students in their LTF classes more engaged than in other classes, and this remained relatively constant between the pre and post time period. Expectations of achievement were also high with over 100% of teachers who responded to the item (91% of the sample) expecting higher levels of achievement from their LTF students. Fewer teachers (65.2% at the post time period) found the LTF lessons to be flexible to fit the needs of all students. One teacher commented, “there is not enough time to help students whose reading and writing are not on grade level.”

Teaching Focus: Across all time periods, the most frequently observed behavior was questioning for understanding which occurred in all time periods between 42-88% of the time.

In 30 of the classrooms, observed teachers were leading student discussions an average of 45.33% of the time. The next most common activity observed was teacher lecturing (with no student discussion) 38.89% followed by students working independently which was observed in 24 classrooms an average of 22.92% of the time.

DISCUSSION & CONCLUSIONS

The study described here sought to measure implementation of a professional development initiative grounded in comprehensive teacher training and student support as well as estimate the effect of such a program on student academic success. Primarily, we were interested in the discernable impact of the teacher professional development on students' ACT/ASPIRE scores using the prior years' score as a baseline and comparing between treatment schools and a matched sample of control schools. Multiple regression was used to estimate treatment effects on student outcomes with ACT/ASPIRE data from the most recent prior year available used as a covariate in the analysis. The findings for all subject areas/grade levels were positive, with significant increases (treatment relative to control) seen in all cases for math and reading. Significant effects were in the small to moderate range. No significant effects were seen for 8th grade physical science.

Data collected in the teacher measures allowed us to gain deeper insight into how exactly the LTF program was implemented as well as gather information on potential challenges to implementation. Participation rates varied across subject areas and only 14% of teachers completed all of the required study measures (with the highest participation seen in ELA). We were, however, able to gather valuable information on program implementation, classroom practices and teacher attitudes and beliefs. These data may help inform changes in the teacher training as well as adding additional teacher supports (for example in areas relating to grading and assessment). Additional multilevel analyses are currently underway to further explore the differences in student outcome for high and low implementing teachers. These additional analyses will help provide more information on the extent to which the professional development (A+ College Ready/LTF program) was implemented as intended, and help us draw inappropriate inferences about how well it is working and under which circumstances.

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Implementation Results: Math

Completion of Study Measures

Figure 2 shows the study completion rates for the math teachers in the sample. Figure 3 shows the frequency of overall number of measures completed. One teacher completed all seven measures and the average number of measures completed was 4.24. Twenty-six teachers were observed.

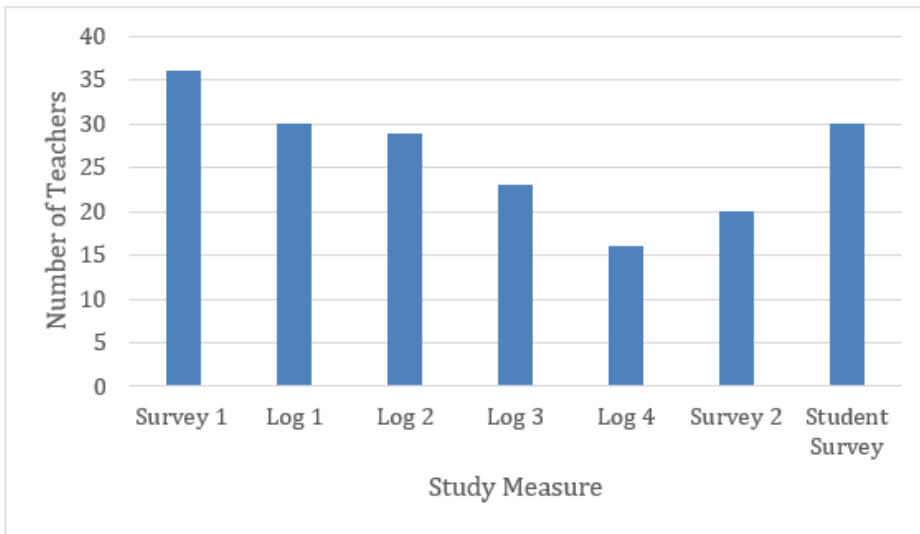


Figure 2: Study measure completion rates

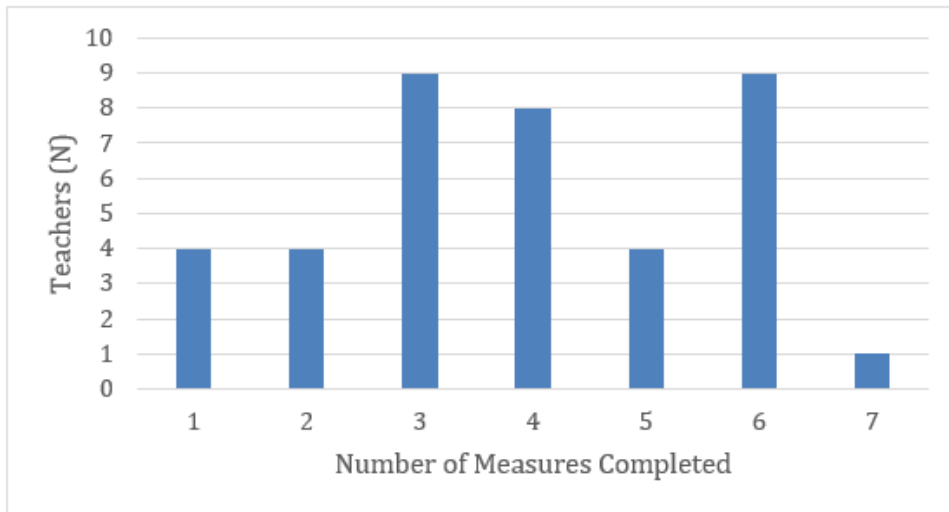


Figure 3: Frequency of measure completion

Teacher Survey

The teacher survey was designed to align with and expand upon information collected in the online teacher logs. As such, the survey emphasized purpose and implementation of the LTF lessons as well as teacher perceptions of their use and impact on students, and math skills in general. Teachers received the survey as a pre and post measure and teacher background items were included on the pre-survey only.

Teacher Survey 1 (fall 2015)

Teacher Survey 1 was deployed to teachers during the fall, 2015 term. Thirty-six teachers responded.

Teacher background information/demographics

Respondents were 31 female and five male teachers with an average age of 40.2 ($SD = 9.23$) years. Three teachers reported having 1-2 years' math teaching experience and the rest three or more years. Twenty-six teachers held a single subject (math) credential, seven a multiple subject credential, six a clear credential, and one an emergency credential.

Teachers in the sample taught multiple grade levels (from 7th to 11th). Teachers in the study, however, were those teaching Algebra I or II using the A+ College Ready Program. Just over half of the study sample (58.3%) taught Algebra I and this group was further divided into 8th grade ($N = 14$) and 9th grade ($N = 7$). The remaining 15 teachers taught 10th grade, Algebra II.

Thirty teachers reported to be in their first year of the LTF program and six indicated this was not their first year. Ten teachers described their participation as voluntary, and twenty-six as mandated by their school. Teacher experience both overall and within the current school is shown in Table 11.

Table 11: Teaching experience (N = 36)

	M	SD
Years as a teacher	13.97	7.73
Years teaching in current school	9.29	7.03
Years teaching in current district	10.33	7.81

Teachers were asked about their participation in professional development training as well as relevant college coursework. Response frequencies are shown in Table 12. The majority of teachers reported participation in the listed PD activities with an average number of 3.36. Only one teacher reported not having attended any general PD trainings in the past three years.

Table 12: Recent Professional Development (N = 36)

PD Focus	Response Count
Math content	28
Math pedagogy/instruction	23
Math curriculum	29
Integrating information technology into math	21
Improving students' critical thinking or problem solving skills	20

Classroom teaching practices, beliefs and attitudes

Teachers come into the classroom with certain beliefs about teaching and learning and items related to these beliefs were included in the survey measure. Teacher responses regarding their agreement on ways to strengthen students' understanding of science were divided into two categories—constructivist items and items focused on more direct transmission (more traditional teaching techniques). Items were drawn from our prior work as well as the Teaching and Learning International Survey (TALIS). The TALIS includes items on teachers' pedagogical beliefs, attitudes and teaching practices, including student assessment practices, and we included items from these areas in our teacher survey.

Items shown in Figure 4 reflect an index of constructivist teaching beliefs which asked teachers about the ways they believe students learn best as well as how teachers can help facilitate this learning. Teachers indicated (on a four-point scale) how strongly they agreed with the statements shown in Figure 4. These statements reflect teaching strategies present in the ALSDE/A+ College Ready Program Logic model and which are the basis of the teacher training and support. Therefore, a high level of agreement of the effectiveness of these strategies indicates a high level of agreement with the intent of the College Ready Program.

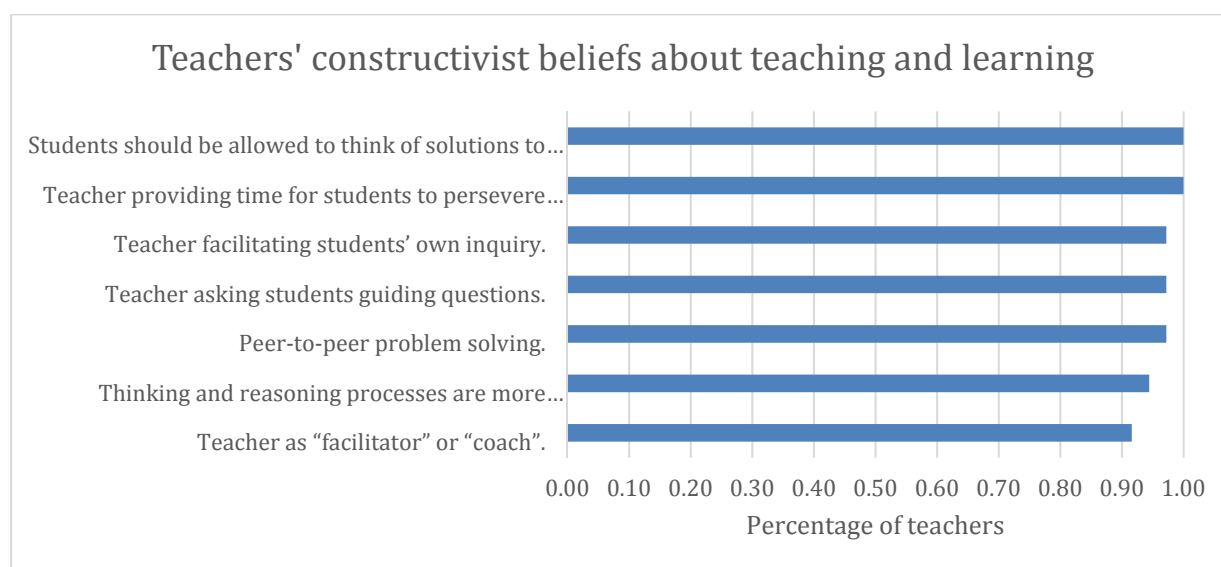


Figure 4: Percentage of teachers who "agree" or "agree somewhat" with the statements

Items in Figure 5 reflect an index of teacher beliefs and strategies focused on direct transmission of information. This view implies that the teachers’ role is to communicate knowledge in a clear and structured way and can be considered a more “traditional” model of teaching. By contrast, the constructivist view focuses on students as more active participants in the process of learning (OECD, 2009). We would expect that teachers with higher levels of agreement of the statements in Figure 5 to be less in agreement with the intent of the College Ready Program.

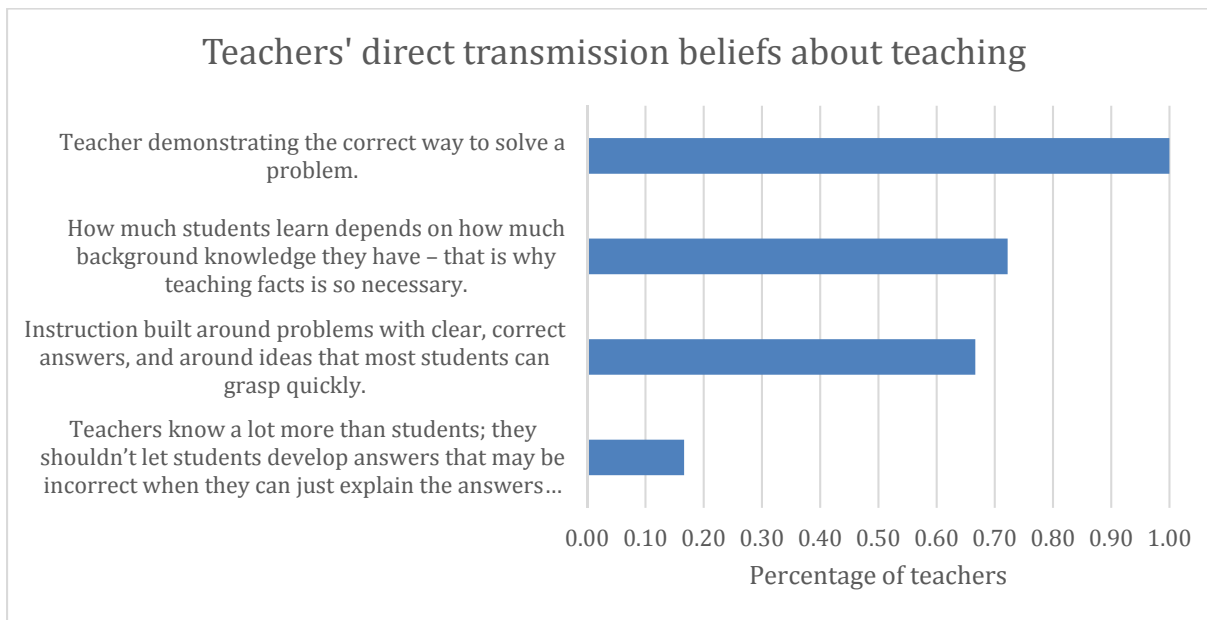


Figure 5: Percentage of teachers who “agree” or “agree somewhat” with the statements

Overall agreement with the statements in Figure 5 was lower than for those in Figure 4, with only 17% of teachers agreeing that teachers should not let students develop their own thinking, but should explain answers to them. All teachers, however, did think that demonstrating the correct way to solve a problem was an effective way to help strengthen students’ math understanding. Not clear from this item is when this demonstrating would occur—if it came at the beginning of instruction it would be more aligned to a teacher-centered model of instruction, but if it followed a productive struggle, or period of student problem-solving, it could be considered more of a constructivist strategy.

Self-perceptions

Table 13 presents responses to the items focused on teacher’s feelings about belonging to a community of mathematicians. The item ratings were combined to yield a dichotomous score. We used ‘agree’ (1) and all others (0) and created a composite score for each.

Table 13: Descriptives for self-perception items

	Self-Perception Statement	M	SD
1	I have a strong sense of belonging to the community of mathematicians	.44	.50
2	I have come to think of myself as a ‘mathematician’.	.33	.48
3	I feel like I belong in the field of mathematics.	.64	.49
4	I have a good understanding of the mathematical concepts I need to teach in math.	.92	.28
5	I think like a mathematician.	.53	.51
6	My students put in the effort it takes to learn math	.11	.32

Teachers’ lowest average agreement was related to the level of effort their students put in to learn math ($M = .11$, $SD = .32$). Almost all teachers agreed that they had a good understanding of the mathematical concepts needed to teach math, and almost two-thirds felt they belonged in the field of mathematics.

College Ready/LTF Initiative

Teachers reported on their agreement with the impact of the LTF lessons for particular pedagogy-based statements (Table 14). We used ‘agree’ (1) and all others (0) and a created a composite score for each. In this case, the composite score represented a high level of agreement on important elements of the LTF initiative.

Table 14: Extent teachers found LTF effective

	M	SD
Pedagogy statements		
improving students' ability to think mathematically.	.75	.44
providing a curricular resource for teachers in addressing the Common Core Math Standards.	.64	.49
encouraging teachers to adjust their pedagogy in math instruction from a focus on process to a focus on building conceptual understanding.	.81	.40
making instruction more engaging for students.	.56	.50
using formative assessment strategies to identify student strengths and weaknesses and to help inform instruction.	.28	.45
helping students make sense of problems and persevere in solving them.	.72	.45
helping students reason abstractly and quantitatively.	.67	.48
helping students construct viable arguments and critique the reasoning of others.	.58	.50
helping students model with mathematics.	.56	.50
helping students use appropriate tools/resources strategically.	.53	.51
helping students communicate precisely.	.50	.51
helping students look for and make use of patterns or structure.	.83	.38
helping students look for and express regularity in repeated reasoning	.75	.44

Teachers had a 75% or greater average agreement that the LTF lessons were effective in improving student’s ability to think mathematically ($M = .75, SD = .44$), encouraging teachers to adjust pedagogy to focus more on building conceptual understanding ($M = .81, SD = .40$), and helping students look for and make use of patterns ($M = .83, SD = .38$). The lowest level of agreement was seen for using formative assessment strategies to identify strengths and weaknesses and to help inform instruction ($M = .28, SD = .45$). Statements in Table 14 reflect the intent of the A+ College Ready initiative in areas such as using student-focused teaching strategies, questioning techniques and building conceptual understanding. Thus, high levels of teacher agreement regarding the effectiveness of the initiative on these areas indicates teachers see the LTF initiative as achieving its mission. The average composite score was 8.12 ($SD = 3.94$).

Table 15 presents data on the extent to which teachers found the LTF lessons helpful in achieving goals relating to teaching and learning math. We used ‘agree’ (1) and all others (0) and created a composite score.

Table 15: Extent teachers found LTF helpful

	M	SD
Find effective strategies for teaching my subject content.	0.61	0.49
Learn new ways to include formative assessment in my classes.	0.22	0.42
Learn detailed information about my students’ strengths and weaknesses.	0.31	0.47
Provide students with more detailed feedback about their work.	0.33	0.48
Implement the Common Core Math Standards.	0.64	0.49
Create an environment that promotes mathematical discourse.	0.56	0.5
Better engage students.	0.53	0.51
Prepare students for more rigorous course content (e.g., AP or pre-AP).	0.86	0.35

Note: Means represent percentages

Teachers expressed consistent views related to assessing students and learning more about student strengths and weaknesses as in other survey items. They tended to have lower levels of agreement that the LTF lessons helped achieve assessment-related goals—compared to other goals included in this item. For example, 86% of teachers agreed that the LTF lessons helped prepare students for more rigorous course content, while only 22% felt the LTF lessons would help find new ways to include formative assessment in the class. Table 16 presents teacher responses when asked the LTF lessons helped them differentiate instruction for different groups of students. Teachers had the highest level of agreement on the effectiveness of the LTF lessons in differentiating instruction for students with advanced math abilities ($M = .75, SD = .44$), and the lowest level of agreement for SWD ($M = .06, SD = .23$) and ELL students ($M = .06, SD = .23$).

Table 16: Perceptions about using LTF lessons to differentiate instruction

Group	M	SD
ELL students	.06	.23
Special education students/SWD	.06	.23
Students who struggle with math	.14	.35
Students with advanced math abilities	.75	.44

Fifty percent of teachers ($N = 18$) indicated that the LTF lessons were flexible enough to fit the needs of all students and the other half indicated the lessons were not flexible to fit all student needs. When comparing LTF instruction to typical instruction, 75% of teachers indicated students were more engaged and 22% indicated students had the same level of engagement as non-LTF classes. Finally, over 83% of teachers reported expectations that the LTF-taught students would show higher achievement than the non-LTF students. Four teachers (11%) expected the same level of achievement and two teachers did not respond.

Teacher Survey 2 (spring 2016)

Twenty-two teachers completed the second survey in June 2016. Of these 22 teachers, 18 also completed Survey 1 and four only completed Survey 2. We compared teachers who completed both surveys ($N = 18$) and those who only completed Survey 1 ($N = 18$). Independent samples t-tests indicated no significant differences on demographic variables such as age and years of teaching. There were also no significant differences in self-perception, or composite score of perceived effectiveness of the LTF lessons between the two groups (see Table 17).

Table 17: Comparison of teacher groups (pre only vs. pre and post survey)

	Pre and Post Survey	N	M	SD
Age	Pre only	18	40.06	9.54
	Pre and post	18	40.33	9.19
Time as teacher	Pre only	18	14.44	8.50
	Pre and post	18	13.50	7.10
Time as teacher in current school	Pre only	18	9.81	7.86
	Pre and post	18	8.78	6.28
Time as teacher in current district	Pre only	18	10.83	9.01
	Pre and post	18	9.83	6.62
Self-Perception Score	Pre only	18	3.17	1.76
	Pre and post	18	2.78	1.90
Effectiveness Score	Pre only	18	8.89	4.20
	Pre and post	18	8.67	4.46

In order to more closely examine change over time, the following analyses present matched data for those teachers submitting both a pre and a post survey ($N = 18$). Items on the second teacher survey were the same as for Survey 1 (albeit without the teacher background/demographic information).

Items shown in Figure 6 reflect the index of constructivist teaching beliefs (described above) Figure 6 compares teacher responses from pre-post for the seven constructivist items.

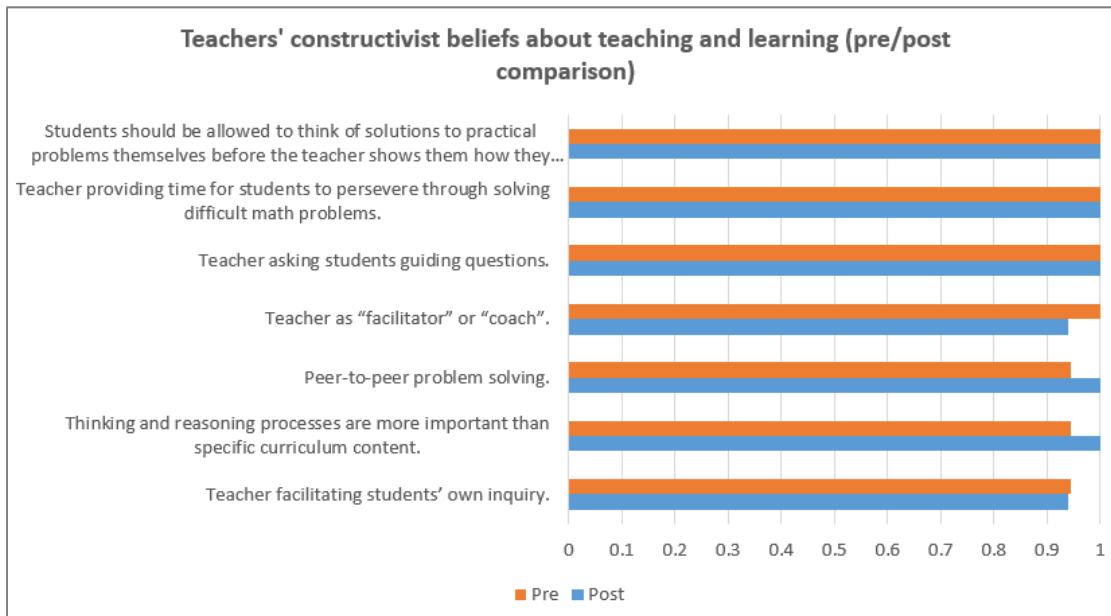


Figure 6: Percentage of teachers who "agree" or "agree somewhat" with the statements (pre/post comparison)

Items shown in Figure 7 reflect the index of direct transmission beliefs (described above) and data presented compares teacher responses from pre-post for the four relevant items.

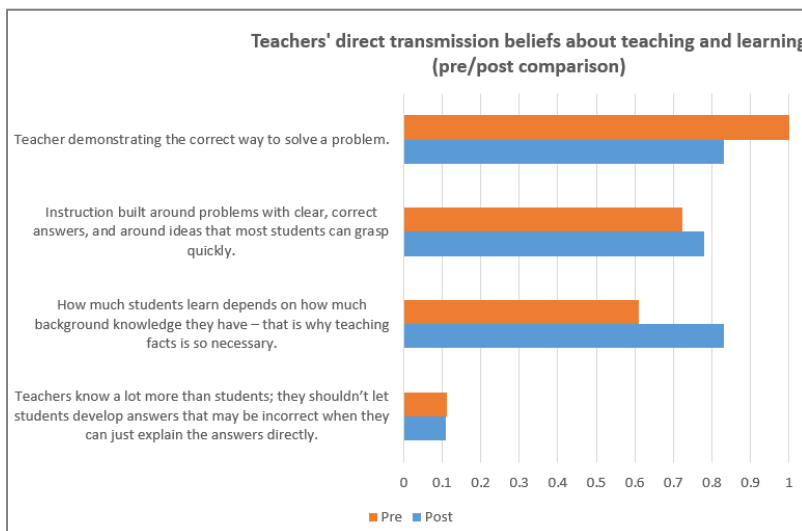


Figure 7: Percentage of teachers who "agree" or "agree somewhat" with the statements (pre/post comparison)

Agreement was mostly consistent on the constructivist items between the pre and the post time period (Figure 6). Looking at the direct-transmission beliefs (Figure 7) teachers had a higher level of agreement that how much students learn depends on their background knowledge which is why teaching facts is so necessary from the pre survey ($M = .61, SD = .51$) to the post survey ($M = .83, SD = .38$). This change may relate to the fact that in the logs, teachers reported spending an average of 35.12% of their time teaching concepts which should have been prior knowledge ($SD = 20.48$) and a little less (33.33%) re-teaching/reviewing prior knowledge concepts ($SD = 17.73$). This may have become more evident after teaching the LTF curriculum and may have led to an increase in belief that teaching facts is important.

Self-perceptions

Table 18 presents the comparison of teacher self-perceptions about belonging to a community of mathematicians (pre to post).

Table 18: Descriptives for self-perception items (pre/post)

Self-Perception Statement		Pre		Post	
		M	SD	M	SD
1	I have a strong sense of belonging to the community of mathematicians	.39	.50	.56	.51
2	I have come to think of myself as a ‘mathematician’.	.33	.49	.44	.51
3	I feel like I belong in the field of mathematics.	.61	.50	.83	.38
4	I have a good understanding of the mathematical concepts I need to teach in math.	.83	.38	1.00	.00
5	I think like a mathematician.	.44	.51	.56	.51
6	My students put in the effort it takes to learn math	.17	.38	.11	.32

Note: Means represent percentages

There were increases in overall agreement with five of the math self-perception items between the pre and the post surveys. There was a decrease in agreement that students put in the effort to learn math. Looking at an overall average rating and composite score for each teacher we can further explore individual change in this construct. Teachers indicated their agreement with six statements and so a score of six indicates 100% agreement with all statements—and in this case—a high level of math self-perception. On average, teacher self-perception increased from the pre-survey ($M = 2.78, SD = 1.90$) to the post-survey ($M = 3.5, SD = 1.54$). This difference approached, but was not, statistically significant, $t(17) = -1.794, p > .05$.

College Ready/LTF Initiative

Table 19 presents the comparison of teacher agreement with the impact of the LTF lessons for particular pedagogy-based statements.

Table 19: Extent teachers ($N = 18$) found LTF effective (pre post comparison)

Pedagogy statements	Pre		Post	
	M	SD	M	SD
improving students' ability to think mathematically.	.67	.49	.61	.50
providing a curricular resource for teachers in addressing the Common Core Math Standards.	.67	.49	.56	.51
encouraging teachers to adjust their pedagogy in math instruction from a focus on process to a focus on building conceptual understanding.	.83	.38	.50	.51
making instruction more engaging for students.	.56	.51	.50	.51
using formative assessment strategies to identify student strengths and weaknesses and to help inform instruction.	.28	.46	.39	.50
helping students make sense of problems and persevere in solving them.	.67	.49	.56	.51
helping students reason abstractly and quantitatively.	.72	.46	.53	.51
helping students construct viable arguments and critique the reasoning of others.	.61	.50	.56	.51
helping students model with mathematics.	.56	.51	.67	.49
helping students use appropriate tools/resources strategically.	.44	.51	.44	.51
helping students communicate precisely.	.44	.51	.56	.51
helping students look for and make use of patterns or structure.	.83	.38	.61	.50
helping students look for and express regularity in repeated reasoning	.72	.46	.56	.51

Note: Means represent percentages

For three of the statements in Table 19 (bolded), average teacher rating of LTF effectiveness increased from pre to post—although by ~10% in each case. From pre to post, overall teacher rating of LTF effectiveness for all non-bolded statements either decreased or stayed the same. Overall composite scores (maximum of 13) decreased slightly from pre ($M = 8.67$, $SD = 4.46$) to post ($M = 7.0$, $SD = 4.63$). A score of 13 indicates 100% agreement in the effectiveness of the LTF lessons on the statements in Table 19.

Table 20 presents data on the extent to which teachers found the LTF lessons helpful in achieving goals relating to teaching and learning science.

Table 20: Extent teachers found LTF helpful (pre post comparison)

Goals	Pre		Post	
	M	SD	M	SD
find effective strategies for teaching my subject content.	.67	.49	.47	.51
learn new ways to include formative assessment in my classes.	.28	.46	.24	.44
learn detailed information about my students' strengths and weaknesses.	.39	.50	.33	.49
provide students with more detailed feedback about their work.	.39	.50	.22	.43
implement the Common Core Math Standards.	.67	.49	.50	.51
create an environment that promotes mathematical discourse.	.50	.51	.39	.50
better engage students.	.50	.51	.50	.51
prepare students for more rigorous course content (e.g., AP or pre-AP).	.89	.32	.78	.43

Note: Means represent percentages

Teacher ratings of how helpful the LTF lessons were in achieving certain goals either remained the same or decreased from pre to post. Teachers' average overall composite score decreased from pre ($M = 4.28$, $SD = 2.44$) to post ($M = 3.39$, $SD = 2.59$), although the difference was not significant. Only one teacher at the pre and post time points agreed with all statements.

Table 21 presents teacher responses when asked if the LTF lessons helped them differentiate instruction for different groups of students. Teachers had the highest average level of agreement on the effectiveness of the LTF lessons in differentiating instruction for students with advanced math abilities, and this increased from pre ($M = .78$, $SD = .43$) to post ($M = .83$, $SD = .38$).

Ratings for students struggling with math decreased from the pre time point ($M = .17$, $SD = .38$) to the post time point ($M = .11$, $SD = .32$). No teachers at the post time point felt that the LTF lessons helped them differentiate instruction for ELL students, and very few SWD ($M = .07$).

Table 21: Perceptions about using LTF lessons to differentiate instruction (pre post comparison)

Group	Pre		Post	
	M	SD	M	SD
ELL students.	.06	.24	.00	.00
Special education students/SWD.	.06	.24	.07	.26
Students who struggle with math.	.17	.38	.11	.32
Students with advanced math abilities.	.78	.43	.83	.38

Note: Means represent percentages

Table 22 presents pre and post frequencies of response survey items on flexibility of the LTF lessons, student engagement, and student achievement.

Table 22: Evaluation of the impact and effect of LTF lessons

		Pre	Post
Flexible for all students	Yes	9	6
	No	8	10
Student Engagement with LTF	More	13	12
	Same	5	6
Expectations of achievement (LTF)	Higher	14	15
	Same	4	3

Teachers tended to find students in their LTF classes more engaged than in other classes, and this remained relatively constant between the pre and post time period. Expectations of achievement were also high with over 75% of teacher expecting higher levels of achievement from their LTF students. Fewer teachers (62.5% at the post time period) found the LTF lessons to be flexible to fit the needs of all students.

Teacher Log Measures

As previously indicated, participants were asked to complete logs after each LTF module, with a goal of four logs per teacher (after each nine-week module). Forty-two unique teachers responded to at least one teacher log. Of the teachers who did complete logs, nine completed four logs, 11 completed three, twelve completed two, and ten teachers completed only one. Logs were deployed each ten weeks and subsequent reminders sent in the following months to encourage participation.

Analyses of the LTF Teacher Logs

Experience implementing LTF

Three respondents indicated they were in their second year implementing the LTF program and all others ($N = 39$) were in their first year. Sixteen teachers taught Algebra II and the remaining teachers taught Algebra I at 8th grade ($N = 15$) or 9th grade ($N = 10$).

Preparation Time

There was considerable variability in time taken to prepare to teach the LTF lessons. Just over half of the teachers reported to take between one and two hours, 31% took under an hour and 13% over two hours. A small number of teachers (~4%) indicated that the preparation time depended on the lesson.

Teaching the A+ College Ready Curriculum

Teachers were asked how closely they followed the A+ College Ready scope and sequence when teaching each module. Teachers were divided between following it very closely and doing all lessons as described (56%) and using the A+ College Ready scope and sequence as a guideline to compliment an existing course (41%). Only 3% of the time did teachers indicate they did not use it at all.

Teachers reported spending an average of 35.12% of their time teaching concepts which should have been prior knowledge ($SD = 20.48$) and a little less (33.33%) re-teaching/reviewing prior knowledge concepts ($SD = 17.73$). Teachers felt overall that the suggested time given to teach the LTF lessons was appropriate (60% of responses).

When asked to what extent the school administration has given teachers freedom to teach the A+ curriculum, 97% of teachers reported a great deal of freedom, and the rest reported having some freedom. Twenty-five percent of teachers reported issues with grading citing difficulty dealing with varied ability levels, soft-landing grading, availability of assessment items/need to create own assessment items, uncertainty about how to implement the grading scale, time needed for grading, problems stemming from students' lack of foundational skills, explaining grades in the pre-AP context..

Respondents were asked to rate the importance of certain information about their students as they planned and implemented the modules. The most important consideration when planning and implementing the modules was knowledge of differing ability levels of students ($M = 2.63$, $SD = .44$). The least important information was the students' prior Aspire scores ($M = 1.69$, $SD = .55$) (see Table 23).

Table 23: Importance of features as used for planning and implementing LTF

Features	M	SD
Knowledge of differing ability levels of my students	2.63	.44
Students' prior year Aspire scores	1.69	.55
Organizing instructional groups to support learning	2.34	.61
Differentiating activities and instruction for different students	2.35	.53

Note: 3 = Very important, 2 = somewhat important, 1 = not important

Teachers' log responses showed some variability in the proportion of time reportedly spent on the major components of the LTF lessons and activities included in the lesson plans (see Table 24). In general, teachers spent an average of about 25% of their time engaging students in small-group collaborative work, followed by explicit strategy instruction, which comprised around 20% of the time spent on each module. Student presentations, think/pair/share, and whole class discussions were the least common activities, although there was considerable variation across teachers. Teachers reported the amount of time for each activity (and were instructed to make sure the percentages totaled 100%). One teacher did not do this and those data were excluded.

Table 24: Average Proportion of Time Spent on the Different LTF Classroom activities

	N	M	SD	Min	Max
Lecture on subject matter content	39	17.80	9.26	0	40
Mini-lesson	37	12.73	8.02	0	40
Explicit strategy instruction	40	19.79	7.59	10	37.50
Whole-class discussion	39	14.42	5.39	10	30
Small-group work	40	25.56	12.13	10	63.33
Think/pair/share	35	9.90	6.58	0	20
Students working independently	41	13.82	7.81	0	50
Student presentations	32	7.68	5.22	0	20

Note: The means represent the average proportion of time spent by each teacher across the study rather than per log. Proportions on each log were measured in 10% increments for a total of 100% time per log.

Respondents were asked which pedagogical techniques they typically used to introduce a lesson. The most common introduction to a lesson was analyzing a problem/table/graph ($M = 2.64$), followed by physically modeling a problem ($M = 2.47$). The least common technique was reviewing success criteria and/or rubrics. During instruction, teachers placed the most emphasis on explaining reasoning (showing written work/explaining answers) ($M = 2.72$, $SD = .37$), and the least on independent reading—which we might expect in a math class (see Table 25). We expected to see different patterns of instructional emphasis across the different subject areas.

Table 25: Emphasis of instruction

Technique	M	SD
Independent reading/research	1.90	.58
Making predictions/previewing	2.27	.38
Summarizing important points	2.55	.45
Note-taking/annotation	2.29	.55
Identifying/defining vocabulary	2.37	.53
Analyzing problem structure	2.63	.46
Interpreting information from visual texts or tables/graphs	2.66	.38
Explaining reasoning (showing written work/explaining answer)	2.72	.37
Justifying an answer	2.54	.56

Note: 3 = great deal of emphasis, 2 = some emphasis, 1 = no emphasis

Teachers' typical practice for grouping students was relatively evenly divided between letting students choose their own groups (41.2%) and assigning students to heterogeneous math ability groups (47.06%). Only 11.76% of the time were students assigned to homogeneous math ability groups.

Assessment

Turning to the assessment component of the LTF lessons, the most frequent technique was listening as students discussed assignments and classwork with their peers—57.8% of teachers did this daily, 25.5% 2-3 times a week, 9.8 % once a week and 3.9% 2-3 times a month. A

similar activity (circulating and reviewing student work) was the next most frequent daily activity (54.9%), followed by asking students to provide feedback to each other (35.3%). Graded assignments were used less frequently—most common frequencies for these were 2-3 times a week (52%) or once a week (36.3%) (see Table 26).

Table 26: Types of strategies used to assess students during instruction

Strategy	Daily	2-3 times a week	Once a week	2-3 times a month	Once a month	> once a month	Never
Graded a tangible assignment	.029	.52	.363	.069	.02	0	0
Listened as students discussed assignments and classwork with their peers	.578	.255	.098	.039	.02	0	.01
Asked students to provide feedback to one another	.353	.294	.176	.069	.039	.02	.049
Circulated and reviewed student notes and work	.549	.196	.137	.039	.01	.029	.029

Respondents had four choices to describe (in general) their students’ emotional reaction to the new LTF lessons. Students were reported to have responded to the LTF lessons with piqued interest 41.2% of the time, with frustration 26.5% of the time, with excitement 17.6% of the time and with apathy 7% of the time. Half of the teachers reported that between 50 and 75% of their students had a strong grasp of course content by the end of the modules. Almost 30% felt students had less than a 50% grasp of the content taught in the module. This suggests that teachers and students may need additional support to increase the effectiveness of the LTF lessons. Eleven teachers indicated specific lessons they found particularly effective, and four teachers identified lessons they found ineffective with their students.

Teacher Observations

Fifty-six math teacher observations were carried out between October 2015 and April 2016. Of the 56 observations, 25 were either teachers not using the LTF lesson on the date of the observation, or not in the final study sample. The remaining 31 observations included 22 teachers and for nine teachers there was a second observation. The below analyses included data from all 31 observations, during which 24 different LTF math lessons were observed.

Lesson Activities

Teachers typically introduced the lessons by either connecting the topic to students’ existing knowledge (48.4%) or providing an overview of the topic (35.5%). Two teachers modeled a problem, and six teachers analyzed a problem/table/graph to introduce the lesson. No teachers reviewed the success criteria for the lesson. Teacher behaviors were observed for five-minute intervals followed by five minutes of recording. This yielded responses for five separate time intervals. During the first interval, teachers were visibly using the LTF lesson, using guided problem solving/scaffolding over 75% of the time, along with explicit strategy instruction (70%).

Across all time periods, when teachers used procedural feedback it was more often used along with correction vs. no correction (80% vs. 20% of instances).

There was very little evidence of teachers dealing with behavior/classroom management issues. The highest incidence was during the last observation interval and this occurred in 19% of the observations. There was almost no evidence of teachers teaching a mini-lesson, lecturing on subject-matter content, specifically referencing quiz/test results, or using manipulatives. Formative assessment practices were observed for 29% of teachers in the first interval, but little evidence was seen after that. During every interval between 77 and 90% of teachers were observed using the LTF lessons and on average ~13 teachers used technology. The largest number of different behaviors observed across all teachers was during the 15-20 minute period ($N = 145$) and the most consistent behaviors were the LTF module visible and in use and teachers using guided problem solving/scaffolding in their math instruction (see Table 27).

Table 27: Activities observed within lesson

Activity	Interval (5 min)				
	5-10	15-20	25-30	35-40	45-50
A Lecture on subject matter content	2	1	1	0	1
B Teacher teaches a mini-lesson.	2	0	1	0	1
C Explicit strategy instruction	22	16	15	11	10
D Teacher uses guided problem solving/scaffolding	24	29	28	26	21
E Teacher provides procedural feedback	2	2	8	5	1
F Teacher provides procedural feedback plus correction	13	21	15	13	8
G Teacher questions for understanding	15	24	22	24	17
H Teacher specifically references test/quiz results	2	2	0	0	0
I Teacher differentiates activities and instruction for different students	0	0	0	0	0
J Teacher uses assessment in instruction (Formative Assessment)	9	5	1	0	2
K Teacher is managing/dealing with classroom behavior issues	2	3	1	2	6
L Teacher uses manipulatives	1	1	1	1	2
M Teacher uses technology	9	14	15	14	11
N The LTF module is visible and in use	24	27	27	28	27
Total	127	145	135	124	107

Note: Data indicate the number of times the behavior was observed in each period for all teachers.

Most teachers and students were observed using LTF content handouts. In only ~10% of classrooms was an LTF activity observed. Manipulative use was not frequently observed, nor were graphic organizers, or evidence of LTF lessons displayed.

Teachers were observed implementing formative assessment activities with no evidence of summative activities. There were 23 observed uses of formative assessment practices (across all Depth of Knowledge levels) and 13 of them were labeled as DOK 1-related activities

There was considerable variability in the proportion of class time spent on various activities. On average students worked in small groups for just over half of class time, and worked in pairs or independently between 10-13% of the time. For some teachers, however, these behaviors were seen 80% of the time. Less variability was seen in the proportion of time spent with the teacher lecturing to the whole class ($M = 2.9\%$, $SD = 6.43\%$), and only around 11% of the time (on average) was spent on assessment-related activities (see Table 28). These findings are in keeping with other parts of the observation in which assessment-related activities were not commonly observed.

Table 28: Percent of class time spent on different activities

	Min	Max	M	SD
Students working independently	0	80	10.65	17.88
Small groups (3+ students)	0	100	53.55	37.82
Students working in pairs	0	80	12.58	25.82
Whole group/teacher lectures (no discussion)	0	30	2.90	6.43
Whole group/teacher lectures (leads student discussion)	0	80	33.55	21.69
Whole group/teacher gives feedback to students	0	90	26.45	23.03
Assessment activities	0	100	10.97	19.89
Peer evaluation	0	90	6.77	17.39

Just over 80% of teachers used the LTF lessons as written with the remaining group integrating them with other curricula materials. Just over half (58.5%) of teachers spent the suggested amount of time on the lesson and observers noted that in 90% of the cases, there seemed to be enough time allotted for the observed lesson.

Ways in which teachers assigned students to groups varied across the sample; most common were heterogeneous groups assigned by the teacher (61.3%). In 23% of the cases, students chose their own groups and in 10% of the observations there was no group work and in ~7% of the cases no grouping practices were evident. Students were observed to either be engaged (in 54.8% of classrooms) or a mixture of somewhat engaged and/or a little distracted (42%). On average, ~76% ($SD = 12.85$) of students were actively engaged during ~77% ($SD = 18.69$) of the lesson.

General impressions of the teachers and lessons observed are shown in Appendix B. While some teachers were observed to be enthusiastically implementing the LTF lessons, others were struggling somewhat with either the content or the teaching strategies. In addition, some teachers

were observed to be having difficulty adopting LTF-related pedagogical techniques vs. their usual way of teaching.

Implementation Findings: Science

Study Sample

Nineteen science teachers volunteered to participate in the study. Of these, four did not complete any of the teacher measures.

Completion of Study Measures

Figure 8 shows the study completion rates for science teachers in the sample. Figure 9 shows the overall number of measures completed. Teachers completed an average of 2.8 measures and ten teachers were observed.

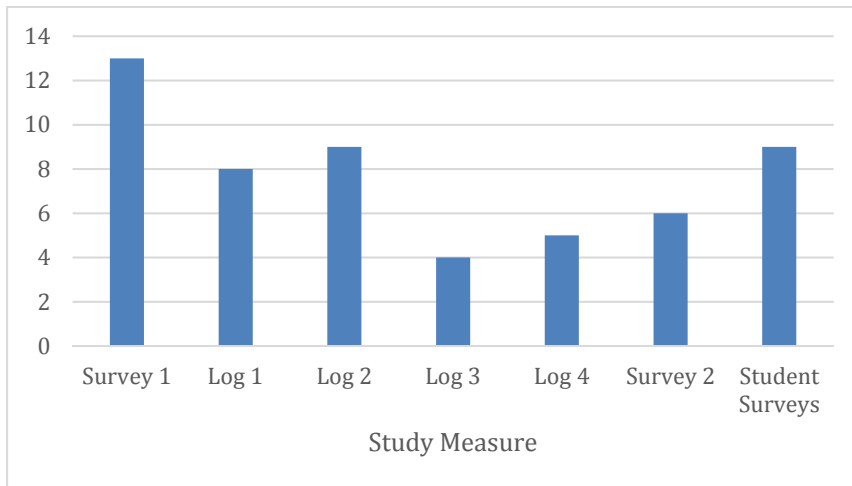


Figure 8: Study measure completion rates (science)

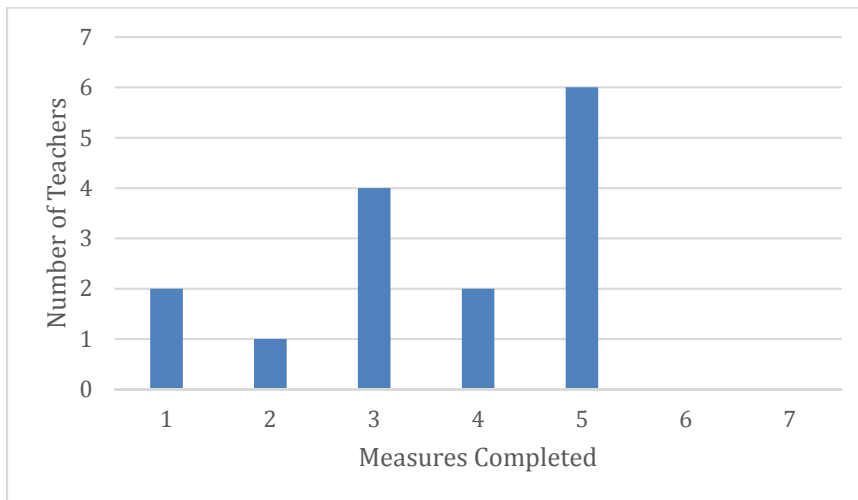


Figure 9: Measures completed by teacher

Teacher Surveys

Teacher Survey 1 (fall 2015)

Teacher Survey 1 was deployed to teachers during the fall, 2015 term. Eleven teachers responded in Sept-October 2015, and three additional teachers in January/February, 2016.

Teacher background information/demographics

Respondents were three male and ten female teachers with an average age of 37.76 years. Two teachers reported having 1-2 years of science teaching experience and the rest three or more years. Eight teachers held a single subject (science) credential, five a multiple subject credential, and two a clear credential. All teachers taught 8th grade physical science. Additional grade levels taught were 7, 9, 10 and 11, and additional subjects, life science ($N = 6$) and chemistry ($N = 1$). Ten teachers reported to be in their first year of the LTF program and three indicated this was not their first year. Eleven teachers described their participation as voluntary, two as mandated by their school. Teachers were asked about their participation in professional development training as well as relevant college coursework. Response frequencies are shown in Table 29. The majority of teachers reported participation in the listed PD activities.

Table 29: Teacher PD focus

General professional development trainings (past three years)	Response Count
Science content	11
Science pedagogy/instruction	9
Science curriculum	11
Integrating information technology into science	10
Improving students' critical thinking or problem solving skills	10

Teaching experience is shown in Table 30.

Table 30: Teaching experience ($N = 13$)

	M	SD
Years as a teacher	9.85	5.15
Years teaching in current school	6.38	4.84
Years teaching in current district	7.31	5.81

Classroom teaching practices, beliefs and attitudes

Items shown in Figure 10 reflect an index of constructivist teaching beliefs (described above).

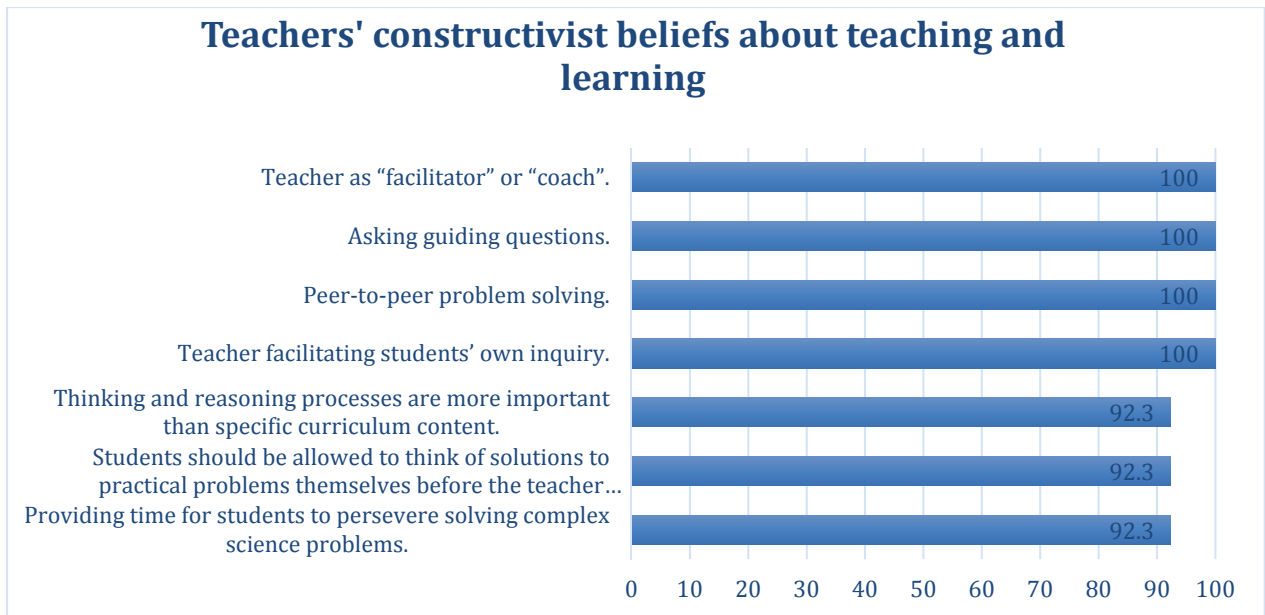


Figure 10: Percentage of science teacher agreement (constructivist items)

Items in Figure 11 reflect an index of teacher beliefs and strategies focused on direct transmission of information.

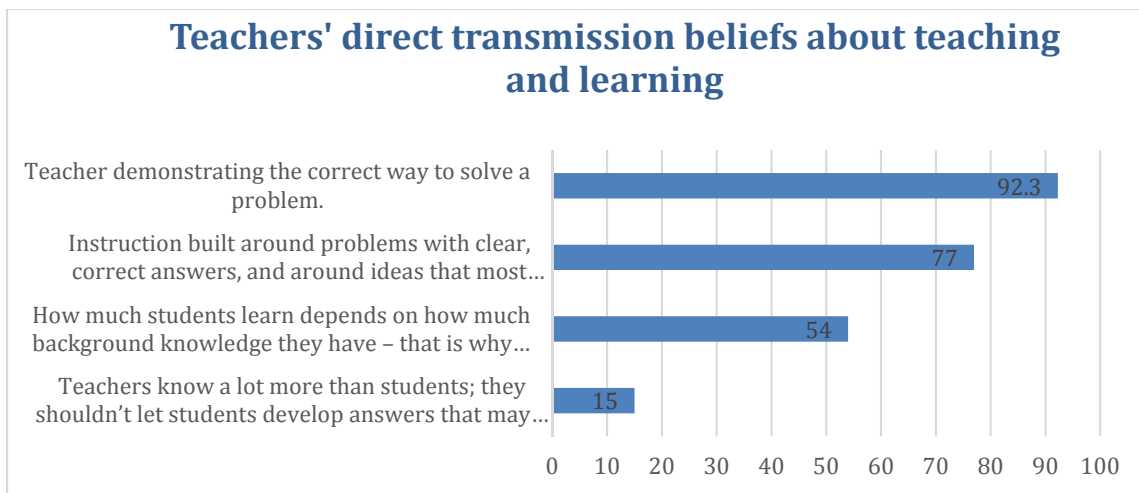


Figure 11: Percentage of science teacher agreement (direct transmission items)

Overall agreement with the statements in Figure 11 was lower than for those in Figure 10, with only 15% of teachers agreeing that teachers should not let students develop their own thinking, but should explain answers to them. A large percentage of teachers (92.3%) did think that demonstrating the correct way to solve a problem was an effective way to help strengthen students' science understanding.

Self-perceptions

Table 31 presents responses to the items focused on teacher's feelings about belonging to a community of scientists. All sixteen items were summed, with higher values on the composite

indicating more positive science self-perceptions. The average composite self-perception score was 8.5 ($SD = 5.4$).

Table 31: Descriptives for self-perception items (science teachers)

	Self-Perception Statement	M	SD
1	I have a strong sense of belonging to the community of scientists	0.31	0.48
2	I derive great personal satisfaction from working on a team that is doing important research.	0.31	0.48
3	I have come to think of myself as a ‘scientist’.	0.38	0.51
4	I feel like I belong in the field of science.	0.62	0.51
5	The daily work of a scientist is appealing to me.	0.54	0.52
6	I think like a scientist.	0.69	0.48
7	I have a good understanding of the science concepts I need to teach in science.	0.77	0.44
8	I learn new ideas in science quickly.	0.69	0.48
9	Other science teachers like my ideas in science.	0.54	0.52
10	Other science teachers think I’m good at science.	0.58	0.51
11	I am good at advising students on how to become a scientist or engineer.	0.38	0.51
12	Advising students about possible science-related careers is an important part of my job.	0.54	0.52
13	My students are usually pretty interested in learning science.	0.62	0.51
14	My students put in the effort it takes to learn science.	0.62	0.51
15	My students have what it takes to become scientists or engineers.	0.46	0.52
16	If I were not a teacher, I could imagine myself being a scientist or engineer.	0.46	0.52

Note: Means represent percentages

Agreement with the first three statements in Table 31 was low, with average agreement of 31% to the idea of belonging to a community of scientists and deriving pleasure from working with a team on important research. The relevance of the latter statement to teachers may play a role in the lower agreement.

Responses to the question “assess your confidence in your ability to do the following tasks” are shown in Table 32. The average confidence score was 3.70 ($SD = 2.18$).

Table 32: Descriptives for confidence in performing science-related tasks

Tasks	M	SD
Use technical science skills (use tools, instruments and/or techniques).	0.69	0.48
Generate a research question to answer.	0.62	0.51
Figure out which data/observations to collect and how to collect them.	0.62	0.51
Create explanations for the results of the study.	0.69	0.48
Use scientific literature and/or reports to guide research.	0.62	0.51
Develop theories (integrate/coordinate results from multiple studies).	0.46	0.52

Note: Means represent percentages

Responses to the question “how much is the person in the description like you?” are shown in Table 33. The average self-identification score was 4.62 ($SD = 1.98$).

Table 33: Teacher ratings of self-identification as a scientist

Descriptions	M	SD
A person who thinks it is valuable to conduct research that builds the world’s scientific knowledge.	0.69	0.48
A person who feels discovering something new in the sciences is thrilling.	0.69	0.48
A person who thinks discussing new theories and ideas between scientists is important.	0.69	0.48
A person who thinks that scientific research can solve many of today’s world challenges.	0.85	0.38
A person who thinks it is important to understand the causes for phenomena.	0.85	0.38
A person who thinks scientific exploration will result in a greater appreciation of the world around us.	0.85	0.38

Note: Means represent percentages

College Ready/LTF Initiative

Teachers reported on their agreement with the impact of the LTF lessons for particular pedagogy-based statements.

Table 34: Extent science teachers found LTF effective

Pedagogy statements	M	SD
improving students’ ability to think scientifically.	.85	.38
providing a curricular resource for teachers in addressing the Next Generation Science Standards.	.85	.38
encouraging teachers to adjust their pedagogy in science instruction from a focus on process to a focus on building conceptual understanding.	.85	.38
making instruction more engaging for students.	.85	.38
using formative assessment strategies to identify student strengths and weaknesses and to help inform instruction.	.69	.48
helping students make sense of problems and persevere in solving them.	.77	.44
helping students develop and use models.	.85	.38
helping students analyze and interpret data to determine similarities and differences in findings.	.85	.38
helping students in constructing explanations and designing solutions.	.85	.38
helping students gather, read, and synthesize information from multiple appropriate sources.	.85	.38

helping students follow precisely a multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks.	.77	.44
helping students reason abstractly and quantitatively.	.85	.38

Note: Means represent percentages

Statements in Table 34 reflect the intent of the College Ready initiative in areas such as using student-focused teaching strategies, questioning techniques and building conceptual understanding. For nine of the statements in Table 34, 85% of teachers reported to find the LTF lessons effective in helping students think and learn as well as supporting teachers. The average effectiveness score was 9.85 ($SD = 4.0$).

Table 35 presents data on the extent to which teachers found the LTF lessons helpful in achieving goals relating to teaching and learning science.

Table 35: Extent science teachers found LTF helpful

Goals	M	SD
find effective strategies for teaching my subject content.	.85	.38
learn new ways to include formative assessment in my classes.	.92	.28
learn detailed information about my students' strengths and weaknesses.	.69	.48
provide students with more detailed feedback about their work.	.77	.44
implement the Next Generation Science Standards.	.92	.28
create an environment that promotes scientific discourse.	.85	.38
better engage students.	.85	.38
prepare students for more rigorous course content (e.g., AP or pre-AP).	.92	.28

Note: Means represent percentages

As with other survey items there was very little variation in response with most teachers agreeing that the LTF lessons helped them achieve the stated goals. The least agreement from teachers related to the LTF lessons helping learn detailed information about students' strengths and weaknesses. Table 36 presents teacher responses when asked if the LTF lessons helped them differentiate instruction for different groups of students. Teachers had the highest level of agreement on the effectiveness of the LTF lessons in differentiating instruction for students with advanced math abilities ($M = .69$), and the lowest level of agreement for SWD ($M = .38$) and ELL students ($M = .31$).

Table 36: Perceptions about using LTF lessons to differentiate instruction (science)

Group	M	SD
ELL students	.31	.48
Special education students/SWD	.38	.51
Students who struggle with math	.54	.52
Students with advanced math abilities	.69	.48

Eleven teachers indicated that the LTF lessons were flexible enough to fit the needs to all students. When comparing LTF instruction to typical instruction, ten teachers indicated students were more engaged and three indicated students had the same level of engagement as other (non-LTF) classes. All teachers indicated they expected their LTF students to have higher achievement than those not exposed to LTF.

Teacher Survey 2 (fall 2015)

Six teachers completed the second survey in June 2016. All six also completed Survey 1. We compared teachers who completed both surveys ($N = 6$) and those who only completed Survey 1 ($N = 7$). Independent samples t-tests indicated no significant differences on demographic variables such as age and years of teaching. There were also no significant differences in self-perception, confidence, or self-identification score between the two groups.

The following analyses present matched data for those teachers submitting both a pre and a post survey. Figure 12 compares teacher responses from pre-post for the seven constructivist items.

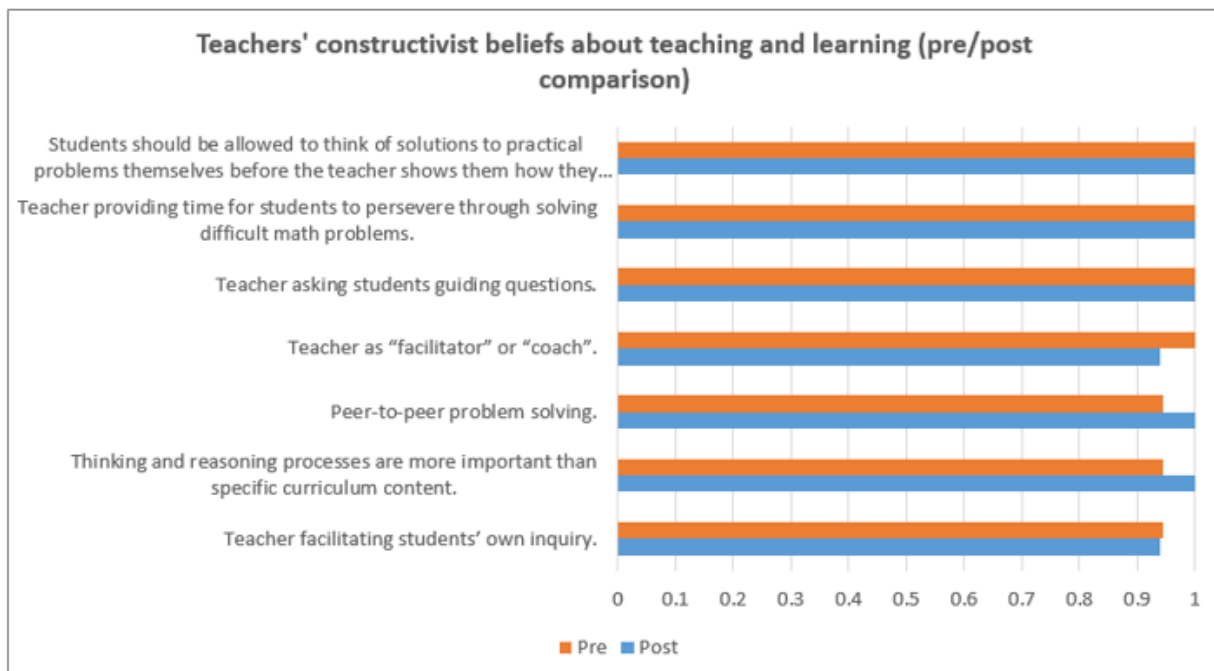


Figure 12: Percentage of science teacher agreement (constructivist items) pre to post

Figure 12 highlights changes in the beliefs of the teachers from before they began using the LTF lessons to after implementation. The data indicate teachers' agreement with the following beliefs decreased from 100% to 80% – F1 (teacher facilitating students' inquiry), B1 (peer-to-peer problem solving) and A1 (teacher as facilitator or coach).

Teachers indicated the same level of agreement with – D1 (teachers providing time for students to persevere through solving problems, C1 (teachers asking guiding questions) and I1(thinking and reasoning are more important than specific content).

Teachers’ overall agreement increased from 80% to 100% on K1 (students should be allowed to think of solutions to problems before the teacher shows they how they are solved). The latter increase may reflect this teacher seeing the value of allowing students to persevere on their own before being told the answer. This shift was also seen for the items in Figure 13 which reflect the index of direct transmission beliefs (described above) and data presented compares teacher responses from pre-post for the four relevant items.

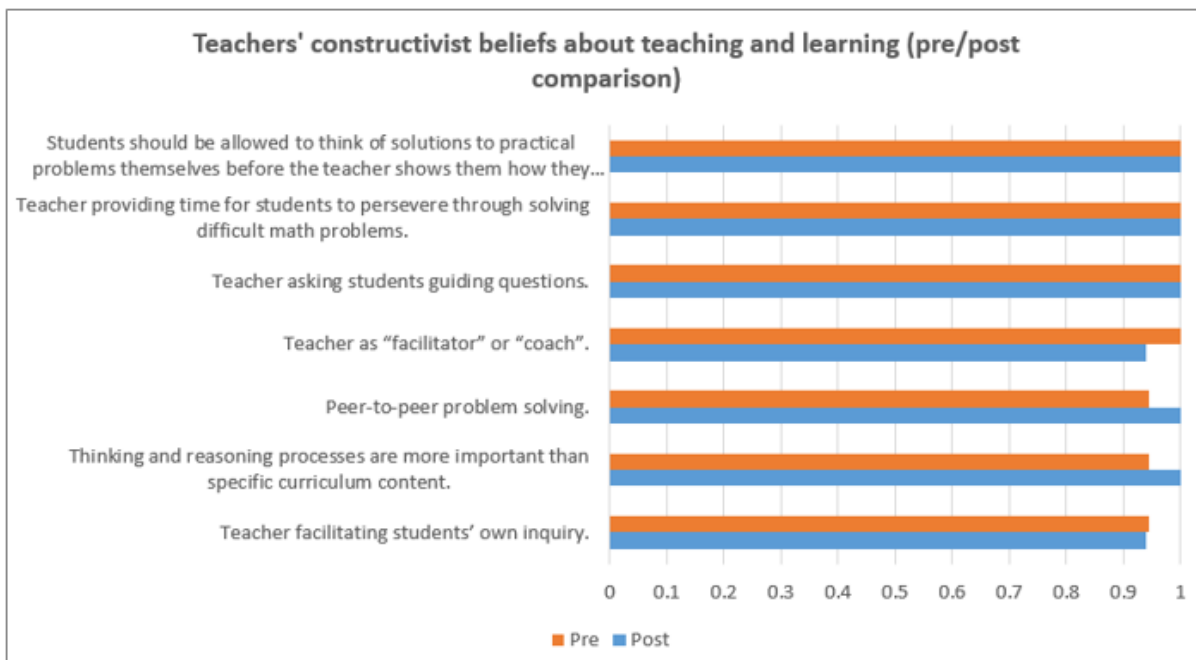


Figure 13: Percentage of science teacher agreement (direct transmission items) pre to post

All teachers indicated that demonstrating the correct way to solve a problem was an effective way to strengthen students’ science understanding (E2) and there was no change pre to post. There was a decrease, however, in the number of teachers who thought building instruction around problems with clear, correct answers and ideas that were easy to grasp was an effective strategy (100% at pre and 70% at post). This indicates that at least some teachers are seeing the value of the “productive struggle” during instruction. Both other items (H2: How much students learn depends on their background knowledge so teaching facts is important, and J2: teachers know more and shouldn’t let students develop incorrect answers but should explain answers directly) remained the same from pre to post.

Self-perceptions

The following tables compare the responses for the teacher self-perceptions and attitudes towards science items between the pre and post time periods. Table 37 presents responses to the items focused on teacher's feelings about belonging to a community of scientists.

Table 37: Descriptives for science self-perception items (pre to post)

Self-Perception Statement	Pre		Post	
	M	SD	M	SD
I have a strong sense of belonging to the community of scientists.	0.67	0.52	0.83	0.41
I derive great personal satisfaction from working on a team that is doing important research.	0.50	0.55	1.00	0.00
I have come to think of myself as a 'scientist'.	0.50	0.55	0.67	0.52
I feel like I belong in the field of science.	1.00	0.00	1.00	0.00
The daily work of a scientist is appealing to me.	0.83	0.41	1.00	0.00
I think like a scientist.	1.00	0.00	1.00	0.00
I have a good understanding of the science concepts I need to teach in science.	1.00	0.00	1.00	0.00
I learn new ideas in science quickly.	0.83	0.41	1.00	0.00
Other science teachers like my ideas in science.	0.67	0.52	0.67	0.52
Other science teachers think I'm good at science.	0.60	0.55	0.83	0.41
I am good at advising students on how to become a scientist or engineer.	0.50	0.55	0.67	0.52
Advising students about possible science-related careers is an important part of my job.	0.67	0.52	0.67	0.52
My students are usually pretty interested in learning science.	0.50	0.55	0.83	0.41
My students put in the effort it takes to learn science.	0.83	0.41	0.83	0.41
My students have what it takes to become scientists or engineers.	0.33	0.52	0.67	0.52
If I were not a teacher, I could imagine myself being a scientist or engineer.	0.67	0.52	0.67	0.52

Note: Means represent percentages

There were increases in overall agreement with nine of the science self-perception items between the pre and the post surveys (bold statements in Table 37). For items where there was not an increase, the average agreement remained the same. In three cases, there was 100% agreement at the pre and post time points. Looking at an overall average rating and composite score for each teacher, we can further explore individual change in this construct. Teachers indicated their agreement with sixteen statements and so a score of 16 indicates 100% agreement with all statements (a high level of science self-perception). On average, teacher self-perception increased from 11.00 on the pre-survey ($SD = 3.89$) to an average of 13.12 ($SD = 3.18$) on the post-survey.

Table 38 presents responses to the items focused on teachers' confidence in performing science-related tasks.

Table 38: Descriptives for confidence in performing science-related tasks (pre to post)

Tasks	Pre		Post	
	M	SD	M	SD
Use technical science skills (use tools, instruments and/or techniques).	0.83	0.41	0.67	0.52
Generate a research question to answer.	1.00	0.00	0.50	0.55
Figure out which data/observations to collect and how to collect them.	0.67	0.52	0.83	0.41
Create explanations for the results of the study.	0.83	0.41	0.83	0.41
Use scientific literature and/or reports to guide research.	0.67	0.52	0.67	0.52
Develop theories (integrate and coordinate results from multiple studies).	0.50	0.55	0.67	0.52

Note: Means represent percentages

There was an overall increase in average confidence ratings for the two bold items in Table 38. Teachers reported a decrease in confidence in using technical science skills as well as generating a research question to answer. There were six confidence-related items so a maximum score of six indicates high levels of confidence across all tasks. Some teachers increased ($N = 3$), some decreased ($N = 1$) and some remained the same ($N = 2$). Overall confidence decreased slightly from pre ($M = 4.5$, $SD = 1.76$) to post ($M = 4.17$, $SD = 2.4$).

Teachers' ratings of self-identification as a scientist are shown in Table 39.

Table 39: Teacher ratings of self-identification as a scientist

Descriptions	Pre		Post	
	M	SD	M	SD
A person who thinks it is valuable to conduct research that builds the world's scientific knowledge.	0.83	0.41	0.67	0.52
A person who feels discovering something new in the sciences is thrilling.	0.67	0.52	1.00	0.00
A person who thinks discussing new theories and ideas between scientists is important.	0.67	0.52	0.83	0.41
A person who thinks that scientific research can solve many of today's world challenges.	0.83	0.41	1.00	0.00
A person who thinks it is important to understand the causes for phenomena.	0.83	0.41	1.00	0.00
A person who thinks scientific exploration will result in a greater appreciation of the world around us.	0.67	0.52	0.67	0.52

Note: Means represent percentages

Teachers' average ratings increased from pre to post on the bold statements in Table 39. There was a decrease in self-identification with the statement "A person who thinks it is valuable to

conduct research that builds the world’s scientific knowledge”, and the average rating for the remaining statement was stable from pre to post. A score of six indicated a high level of self-identification as a scientist. At the pre time point, four teachers indicated this level of self-identification vs. two at the post time point. On average, however, across the construct, teacher overall self-identification increased from pre ($M = 4.5, SD = 2.5$) to post ($M = 5.2, SD = .75$).

LTF Initiative

Table 40 presents science teacher agreement on the effectiveness of the LTF lessons.

Table 40: Extent science teachers found LTF effective (pre to post)

Pedagogy statement	Pre		Post	
	M	SD	M	SD
improving students’ ability to think scientifically.	0.67	0.52	0.83	0.41
providing a curricular resource for teachers in addressing the Next Generation Science Standards.	0.67	0.52	0.50	0.55
encouraging teachers to adjust their pedagogy in science instruction from a focus on process to a focus on building conceptual understanding.	0.67	0.52	0.83	0.41
making instruction more engaging for students.	0.67	0.52	0.83	0.41
using formative assessment strategies to identify student strengths and weaknesses and to help inform instruction.	0.33	0.52	0.50	0.55
helping students make sense of problems and persevere in solving them.	0.50	0.55	0.67	0.52
helping students develop and use models.	0.67	0.52	0.83	0.41
helping students analyze and interpret data to determine similarities and differences in findings.	0.67	0.52	0.67	0.52
helping students in constructing explanations and designing solutions.	0.67	0.52	0.83	0.41
helping students gather, read, and synthesize information from multiple appropriate sources.	0.67	0.52	0.50	0.55
helping students follow precisely a multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks.	0.50	0.55	0.50	0.55
helping students reason abstractly and quantitatively.	0.67	0.52	0.83	0.41

Note: Means represent percentages

For eight of the statements in Table 40, average teacher rating of LTF effectiveness increased (from pre to post)—although in all cases by only one teacher. From pre to post, overall teacher rating of LTF effectiveness decreased in relation to addressing the NGSS and helping students gather, read, and synthesize information from multiple appropriate sources—again by ~17%. Overall composite scores (maximum of 12) increased slightly from pre ($M = 7.33, SD = 4.92$) to post ($M = 8.33, SD = 4.46$). A score of 12 indicates 100% agreement in the effectiveness of the LTF lessons on the statements in Table 40.

Table 41 presents data on the extent to which teachers found the LTF lessons helpful in achieving goals relating to teaching and learning science.

Table 41: Extent science teachers found LTF helpful (pre to post)

Goals	Pre		Post	
	M	SD	M	SD
Find effective strategies for teaching my subject content.	0.83	0.41	0.83	0.41
Learn new ways to include formative assessment in my classes.	0.83	0.41	0.67	0.52
Learn detailed information about my students' strengths and weaknesses.	0.67	0.52	0.67	0.52
Provide students with more detailed feedback about their work.	0.67	0.52	0.50	0.55
Implement the Next Generation Science Standards.	0.83	0.41	0.67	0.52
Create an environment that promotes scientific discourse.	0.67	0.52	0.67	0.52
Better engage students.	0.67	0.52	0.67	0.52
Prepare students for more rigorous course content (e.g., AP or pre-AP).	1.00	0.00	0.67	0.52

Note: Means represent percentages

Teacher ratings of how helpful the LTF lessons were in achieving certain goals either remained the same or decreased from pre to post. At the post time point, there was a decrease in agreement that the LTF lessons helped find new ways to include formative assessment in the class, as well as providing students with feedback on their work, implementing the NGSS, and preparing students for rigorous coursework. Teachers' average overall composite score decreased slightly from pre ($M = 6.16$, $SD = 2.99$) to post ($M = 5.33$, $SD = 3.33$). At the pre time point, four teachers indicated 100% agreement that the LTF lessons helped achieve the listed goals. At the post time point, three teachers had 100% agreement

Table 42 presents teacher responses when asked if the LTF lessons helped them differentiate instruction for different groups of students. Teachers had the highest average level of agreement on the effectiveness of the LTF lessons in differentiating instruction for students with advanced math abilities ($M = .5$). This decreased from .67 at the pre time point. Ratings for students struggling with math also decreased from the pre time point ($M = .5$) to the post time point ($M = .33$).

Table 42: Science teacher perceptions about using LTF lessons to differentiate instruction (pre and post)

Group	Pre		Post	
	M	SD	M	SD
ELL students.	0.33	0.52	0.33	0.52
special education students/SWD.	0.33	0.52	0.33	0.52
students who struggle with math.	0.50	0.55	0.33	0.52
students with advanced math abilities.	0.67	0.52	0.50	0.55

Note: Means represent percentages

On the pre-survey five teachers indicated that the LTF lessons were flexible enough to fit needs of all students and one disagreed. On the post-survey, four agreed, one disagreed and one commented: "Some of the lessons are, but some of the lessons require a background in math that is not taught unless you have been honors since sixth grade."

Teacher responses about student engagement from pre to post remained the same for four teachers, increased from the same level of engagement to more engagement for one teacher, with the opposite pattern for the remaining teacher. At the post time period, two thirds of teachers reported their LTF students to be more engaged than other (non-LTF) students. At the pre time period 100% of teachers reported expectations of higher achievement than other (non-LTF students). At the post time period, this decreased to 83%.

Teacher Log Measures

Fourteen unique teachers responded to at least one teacher log. Of the teachers who did complete logs, four completed three logs, four completed two, and six teachers completed only one.

Analyses of the LTF Science Teacher Logs

Experience implementing LTF

All respondents ($N = 14$) indicated they were in their first year implementing the LTF program and all were teaching 8th grade physical science.

Preparation Time

There was considerable variability in time taken to prepare to teach the LTF lessons. Just under half of the teachers reported to take less than one hour, and just over 25% took between 1-2 hours and over two hours respectively.

Teaching the A+ College Ready Curriculum

Teachers were asked how closely they followed the A+ College Ready scope and sequence when teaching each module. Over three-quarters of teachers followed the scope and sequence very closely and taught lessons as described, the remaining 23% used the scope and sequence as a guideline to complement their existing course.

Teachers reported spending an average of 40.22% of their time teaching concepts which should have been prior knowledge and a little less (38.49%) re-teaching/reviewing prior knowledge concepts. Teachers felt overall that the suggested time given to teach the LTF lessons was appropriate (69% of responses). When asked to what extent the school administration has given teachers freedom to teach the A+ College Ready curriculum, 86% of teachers reported a great deal of freedom, and the rest reported having some freedom. Four teachers reported issues with grading citing time to grade as an issue ($N = 2$), soft-landing grading ($N = 1$), and the amount of grading ($N = 1$).

Respondents were asked to rate the importance of certain information about their students as they planned and implemented the modules. The most important consideration when planning and implementing the modules was differentiating activities and instruction for different students ($M = 2.64$, $SD = .42$). The least important information was the students' prior Aspire scores ($M = 2.05$, $SD = 0.56$).

Teachers' log responses showed some variability in the proportion of time reportedly spent on the major components of the LTF lessons and activities included in the lesson plans (see Table 43). In general, teachers spent an average of about 22% of their time engaging students in small-group collaborative work, followed by explicit strategy instruction, which comprised around 16% of the time spent on each module. Student presentations and think/pair/share were the least common activities, although there was considerable variation across teachers. Teachers were asked to report the amount of time for each activity and to make sure the percentages totaled 100%. Some teachers, however, did not follow this guidance and as a result, the average sum of activity percentages was 150%. We included those teachers who reported percentages adding up to 100% ($N = 10$).

Table 43: Average proportion of time spent on the different LTF classroom activities (science)

	M	SD	Min	Max
Lecture on subject matter content	13	9.49	0	30
Mini-lesson	12	7.89	0	20
Explicit strategy instruction	16	5.16	10	20
Whole-class discussion	12	7.89	0	30
Small-group work	22	16.87	0	50
Think/pair/share	3	4.83	0	10
Students working independently	15	15.09	0	50
Student presentations	7	6.75	0	20

Note: The means represent the average proportion of time spent by each teacher across the study rather than per log. Proportions on each log were measured in 10% increments for a total of 100% time per log.

Respondents were asked which pedagogical techniques they typically used to introduce a lesson. The most common introduction to a lesson was analyzing a problem/table/graph, followed by connecting the topic to students' existing knowledge and an overview of readings. The least common techniques were reviewing success criteria and/or rubrics and overview/review of the topic

During instruction, teachers placed equal emphasis on interpreting information from visual texts or tables/graphs and explaining reasoning ($M = 2.83$, $SD = 0.36$). Note taking and annotation, identifying/defining vocabulary and analyzing text structure were emphasized the least (see Table 44). We will likely see different patterns of instructional emphasis across the different subject areas.

Table 44: Emphasis of science instruction

Technique	M	SD	Min	Max
Independent reading/research	2.55	0.48	2	3
Making predictions/previewing	2.58	0.47	2	3
Summarizing important points	2.55	0.42	2	3
Note-taking/annotation	2.26	0.48	1.5	3
Identifying/defining vocabulary	2.25	0.51	1.5	3
Analyzing text structure	2.25	0.59	1	3
Interpreting information from visual texts or tables/graphs	2.83	0.36	2	3
Explaining reasoning (showing written work/explaining answer)	2.83	0.36	2	3

Note: 3 = great deal of emphasis, 1 = no emphasis

There was a relatively even distribution of how teachers formed collaborative groups in the classroom: 37.5% let students choose their own groups, 31.3% teachers assigned students to heterogeneous science ability group, and 31.3% assigned students to homogeneous science ability groups.

Assessment

Turning to the assessment component of the LTF lessons, the most frequent technique was listening as students discussed assignments and classwork with their peers—42.3 % of teachers did this daily, 26.9% 2-3 times a week, 19.2 % once a week and 11.5% 2-3 times a month. A similar activity (circulating and reviewing student work) was the next most frequent daily activity (30.8%), followed by asking students to provide feedback to each other (19.2%). Graded assignments were used less frequently—most common frequencies for these were 2-3 times a week (53.8%) or once a week (38.5%) (see Table 45).

Table 45: Types of strategies used to assess students during science instruction

Strategy	Daily	2-3 times a week	Once a week	2-3 times a month	Once a month	> once a month	Never
Graded a tangible assignment	.038	.538	.385		0	0	.038
Listened as students discussed assignments and classwork with their peers	.423	.269	.192	.115	0	0	0
Asked students to provide feedback to one another	.192	.308	.192	.231	.038	.038	0
Circulated and reviewed student notes and work	.308	.346	.269	.077	0	0	0

Respondents were given four choices to describe (in general) their students’ emotional reaction to the new LTF lessons. Over half of the teachers (57.7%) reported their students to have responded with excitement to the lessons with just over 15% reporting student frustration. Responses tended to depend on the particular module teachers had completed—one teacher

reported student frustration for module 1, apathy for module 2 and frustration for module 3. Additional comments indicated some students struggled with the material and got confused easily. One teacher indicated that his/her students liked the challenge but were concerned about their grades possibly going down. Eleven teachers indicated lessons they found particularly effective, and four teachers identified lessons they found ineffective with their students. Four teachers identified gaps in the LTF curriculum and seven identified concepts where they needed additional teaching resources. Most teachers (64%) reported that between 50 and 75% of their students had a strong grasp of course content by the end of the modules. This suggests that teachers and students may need additional support to increase the effectiveness of the LTF lessons.

Teacher Observations

Eleven science teacher observations were carried out between August 2015 and January 2016. Three of the observed teachers did not complete any of the other teacher measures.

Lessons Observed

Lessons observed were "Electron Configuration" and Chemical Bonding 3.1 ($N = 6$), Bug Races, States of Matter and Kinetic Energy, Chemical Bonding, Penny Test Lab, Gas Laws ($N = 1$ for the all others).

Lesson Activities

Teachers typically introduced the lessons by either providing an overview of the topic (54%) or connecting the topic to students' existing knowledge (54%). No teachers reviewed the success criteria for the lesson, or modeled a problem. One teacher worked through a problem from the LTF lesson.

Teacher behaviors were observed for five minutes and then behaviors observed recorded for five minutes. This yielded five separate intervals. During the first interval, over half (54.5%) of teachers gave a lecture on the subject matter content, and the majority (72%) used technology as well as the LTF lesson. Also during the first interval 27% of teachers were dealing with behavior/classroom management issues, but during the middle three intervals no teachers were addressing these issues. There was almost no evidence of teachers teaching a mini-lesson, or specifically referencing quiz/test results. Formative assessment practices were observed for 91% of teachers during the fourth interval, and this coincided with teachers (82%) using questioning techniques with their students. During every interval (except the first) all teachers were observed using the LTF lessons and in intervals 1-4 around two-thirds of teachers were using technology. The largest number of different behaviors observed across all teachers was during the 35-40 minute period ($N = 64$) and the most consistent behaviors were the LTF module visible and in use, technology use and formative assessment practices (see Table 46).

Table 46: Activities observed within science lessons

Activity	Interval (5 min)				
	5-10	15-20	25-30	35-40	45-50
Lecture on subject matter content	6	3	1	1	3
Teacher teaches a mini-lesson.	1	0	0	0	0
Explicit strategy instruction	1	5	2	3	1
Teacher uses guided problem solving/scaffolding	3	6	3	5	2
Teacher provides procedural feedback	0	2	4	6	3
Teacher provides procedural feedback plus correction	0	2	4	4	5
Teacher questions for understanding	2	6	7	9	5
Teacher specifically references test/quiz results	0	1	1	0	1
Teacher differentiates activities and instruction for different students	1	4	4	5	5
Teacher uses assessment in instruction (FA)	2	6	6	10	9
Teacher is managing/dealing with classroom behavior issues	3	0	0	0	2
Teacher uses manipulatives	1	2	3	3	3
Teacher uses technology	8	7	7	7	5
The LTF module is visible and in use	8	11	11	11	11
Total	36	55	53	64	55

Note: Data indicate the number of times the behavior was observed in each period for all teachers.

Most teachers and students were observed using LTF content handouts and in 90% of the classrooms, students were using an LTF activity or lab. Manipulative use was not frequently observed, nor was use of graphic organizers.

Teachers were observed implementing formative assessment activities at a much higher frequency than summative activities. There were 28 observed uses of formative assessment practices (across all DOK levels) and only six summative assessment activities. The most commonly observed formative assessment activity was associated with DOK 2.

There was considerable variability in the proportion of class time spent on various activities. On average students worked in pairs for close to 25% of class time, with small group work and independent work comprising just over 20% each—but for some teachers these behaviors were seen between 70-90% of the time. Less variability was seen in the proportion of time spent with the teacher lecturing to the whole class ($M = 14.55$, $SD = 13.68$) and only around 10% of the time (on average) was spent on assessment-related activities (see Table 47). Given that on previous parts of the observation, assessment-related activities were reported, the observers may only have considered summative or more traditional types of assessment activity for this component.

Table 47: Percent of class time spent on different activities (science)

	Min	Max	M	SD
Students working independently	0	90.00	22.73	29.01
Small groups (3+ students)	0	90.00	21.82	37.63
Students working in pairs	0	70.00	24.55	25.83
Whole group/teacher lectures (no discussion)	0	30.00	14.55	13.68
Whole group/teacher lectures (leads student discussion)	0	30.00	11.82	10.79
Whole group/teacher gives feedback to students	0	10.00	3.64	5.05
Assessment activities	0	10.00	.91	3.02
Peer evaluation	0	.00	.00	0

Sixty-three percent of teachers used the LTF lessons as written with the remaining group integrating them with other curricula materials. Just over half (54.5%) of teachers spent the suggested amount of time on the lesson and observers noted that in 82% of the cases, there seemed to be enough time allotted for the observed lesson. Ways in which teachers assigned students to groups varied across the sample. Most common were heterogeneous groups assigned by the teacher or no evident grouping practices (each 27.3%), followed by homogeneous groups and student-selected groups (both used by 18.2%), with one teacher not assigning any group work. Students were observed to either engaged (in 64% of classrooms) or a mixture of engaged and frustrated (36%). On average, 78% of students were actively engaged during the lesson ($SD = 18.34$) and were engaged for an average of 83% of the lesson ($SD = 13.48$). Some teachers were observed to be enthusiastically implementing the LTF lessons while others were struggling a little with either the content or the teaching strategies. Some teachers were observed to be having difficulty adopting LTF-related pedagogical techniques vs. their usual way of teaching. General impressions of the teachers and lessons observed are shown in Appendix C.

Implementation Results: ELA

Study Sample

Fifty-six ELA teachers volunteered to participate in the study. Of these, fourteen did not complete any of the measures, and three only completed the student survey.

Completion of Study Measures

Figure 14 shows the study completion rates for the ELA teachers in the sample. Figure 15 shows the frequency of overall number of measures completed. Seven teacher completed all seven measures and the average number of measures completed was 4.72.

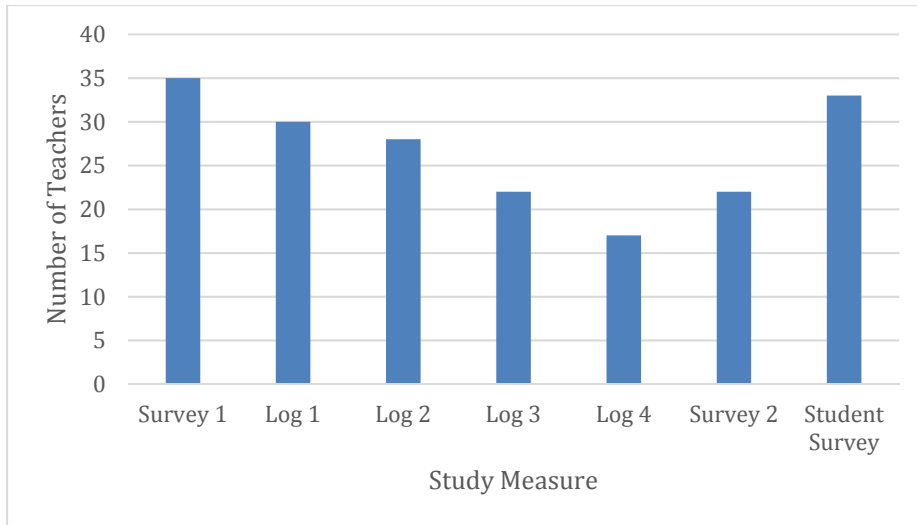


Figure 14: Study measure completion rates (ELA)

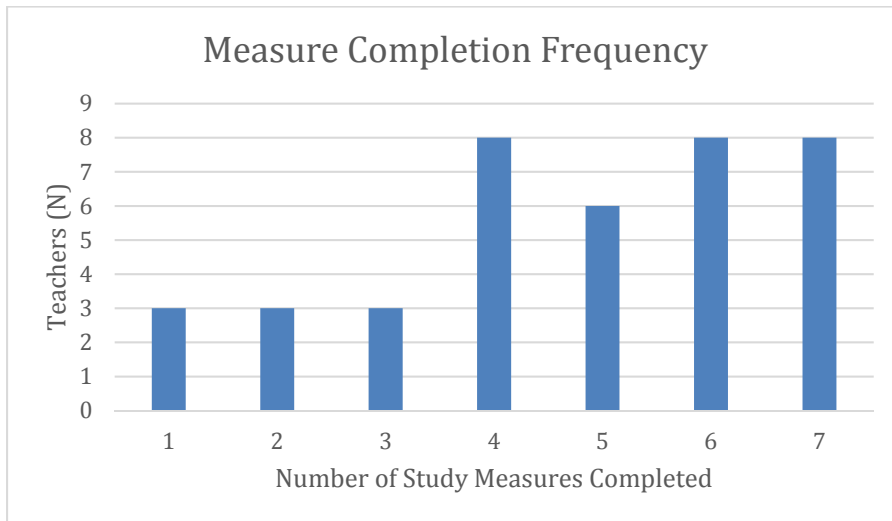


Figure 15: Frequency of measure completion (ELA)

Teacher Survey

Teacher Survey 1 (fall 2015)

Thirty-five teachers responded to the first teacher survey.

Teacher background information/demographics

Respondents were 31 female and four male teachers with an average age of 39.81 ($SD = 9.88$) years. Eight teachers reported having 1-2 years' ELA teaching experience and the rest ($N = 27$) three or more years. Twenty-two teachers held a single subject (ELA) credential, nine a multiple subject credential, and one a single subject credential (not in ELA).

Teachers in the sample taught multiple grade levels (from 7th to 11th). Teachers in the study, however, were those teaching ELA in grades 8 or 10 using the A+ College Ready Program. Just under half of the study sample (48.6%) taught 8th grade ELA with 51.4% teaching 10th grade.

Twenty-two teachers reported to be in their first year of the LTF program and 13 indicated this was not their first year. Fourteen teachers described their participation as voluntary, and nineteen as mandated by their school. Teacher experience both overall and within the current school is shown in Table 48.

Table 48: ELA Teacher experience (N = 35)

	M	SD
Years as a teacher	11.88	6.56
Years teaching in current school	8.09	6.48
Years teaching in current district	8.74	6.59

Teachers were asked about their participation in professional development training as well as relevant college coursework. Response frequencies are shown in Table 49. The majority of teachers reported participation in the listed PD activities with an average number of 2.51. Two teachers reported not having attended any general PD trainings in the past three years.

Table 49: ELA Teacher professional development (N = 35)

PD Focus	Response Count
ELA content	23
ELA pedagogy/instruction	22
ELA curriculum	24
Improving students' writing skills	15
None	2
Other	2

Classroom teaching practices, beliefs and attitudes

Statements shown in Table 50 reflect an index of constructivist teaching beliefs which asked teachers about the ways they believe students learn best as well as how teachers can help facilitate this learning.

Table 50: Descriptives for beliefs about teaching (ELA)

Teacher belief statement	M	SD
Teacher as facilitator or coach	3.86	.36
Students discussing reading and writing with their peers	3.91	.28
Teachers asking students guiding questions	3.91	.28
Students providing feedback to one another	3.89	.32
Giving students time to self-correct	3.86	.36

Teaching reading and writing skills in other content areas	3.91	.28
Teacher facilitating students' own inquiry	3.91	.28

Overall agreement with the statements in Table 50 was high. In all cases, at least 85% of teachers agreed with the statements as effective ways to strengthen students' ELA content understanding.

Self-perceptions

Table 51 presents responses to the items focused on teacher's feelings about belonging to a community of literacy experts.

Table 51: Descriptives for ELA self-perception items

	Self-Perception Statement	M	SD
1	I have a strong sense of belonging to the community of ELA experts	.40	.50
2	I have come to think of myself as a 'literacy expert'	.23	.43
3	I have a good understanding of the reading and writing skills I need to teach my course.	.60	.50
4	Writing assignments can help my students develop a deeper understanding of important concepts.	.89	.32
5	Reading and writing processes are more important than specific curriculum content	.57	.50
6	Science and social studies teachers do not have much time to teach reading and writing	.00	.00

Note: Means represent percentages

The greatest level of agreement was seen for statement 4: Writing assignments can help my students develop a deeper understanding of important concepts, with 89% of teachers in agreement. Only 23% of teachers agreed that they saw themselves as literacy experts, and no teachers agreed with statement 6.

College Ready/LTF Initiative

Teachers reported on their agreement with the impact of the LTF lessons for particular pedagogy-based statements (Table 52).

Table 52: Extent ELA teachers found LTF effective

Pedagogy statements	M	SD
improving students' literacy skills	.77	.43
providing a curricular resource for teachers in addressing the Common Core ELA Standards.	.86	.36
encouraging teachers in other subject areas to teach literacy skills	.51	.51
making instruction more engaging for students.	.63	.49
using formative assessment strategies to identify student strengths and weaknesses and to help inform instruction.	.54	.51
helping students make sense of problems and persevere in solving them.	.71	.46
helping students read and understand more complex texts	.80	.41
helping students construct viable arguments and critique the reasoning of others.	.74	.44
helping students use and understand academic vocabulary	.80	.41
helping students read and carefully grasp information and arguments, ideas, and details based on evidence in text.	.86	.36
helping students communicate precisely.	.83	.38
helping students develop strong general knowledge and vocabulary	.71	.46
Improving students' skills in effective argumentative and informative writing	.89	.32

Note: Means represent percentages

For all but two of the statements in Table 52 there was above 70% agreement that these aspects of the LTF program were effective in helping students think and learn as well as supporting teachers. The lowest level of agreement was seen for encouraging teachers in other subject areas to teach literacy skills ($M = .51$, $SD = .51$) and using formative assessment strategies to identify strengths and weaknesses and to help inform instruction ($M = .54$, $SD = .51$).

Table 53 presents data on the extent to which teachers found the LTF lessons helpful in achieving goals relating to teaching and learning ELA content and concepts.

Table 53: Extent ELA teachers found LTF helpful

	M	SD
find effective strategies for teaching my subject content.	.80	.41
learn new ways to include formative assessment in my classes.	.34	.48
learn detailed information about my students' strengths and weaknesses.	.51	.51
provide students with more detailed feedback about their work.	.57	.50
implement the Common Core Math Standards.	.71	.46
create an environment that promotes mathematical discourse.	.74	.44
better engage students.	.60	.50
prepare students for more rigorous course content (e.g., AP or pre-AP).	.83	.38

Note: Means represent percentages

Teachers expressed consistent views related to assessing students and learning more about student strengths and weaknesses as in other survey items. They tended to have lower levels of agreement that the LTF lessons helped achieve these goals, than with other outcomes. For example, 80% of teachers agreed that the LTF lessons helped prepare students for more rigorous course content, while only 34% felt the LTF lessons would help find new ways to include formative assessment in the class.

Table 54 presents teacher responses when asked the LTF lessons helped them differentiate instruction for different groups of students. Teachers had the highest level of agreement on the effectiveness of the LTF lessons in differentiating instruction for students SWD (but only 17% of teachers agreed strongly). For all other groups, only 11% of teachers agreed that the LTF lessons were helpful in differentiating instruction.

Table 54: Perceptions about using LTF lessons to differentiate instruction (ELA)

Group	M	SD
ELL students	.11	.32
Special education students/SWD	.17	.38
Students who struggle with math	.11	.32
Students with advanced math abilities	.11	.32

Over 74% ($N = 26$) of teachers indicated that the LTF lessons were flexible enough to fit the needs to all students and the others indicated the lessons were not flexible to fit all student needs. When comparing LTF instruction to typical instruction, 57% of teachers indicated students were more engaged and 31% indicated students had the same level of engagement as non LTF classes. Three teachers reported students were less engaged. Finally, over 85% of teachers reported expectations that the LTF-taught students would show higher achievement than the non-LTF

students. Four teachers (11%) expected the same level of achievement and one teacher did not respond.

Teacher Survey 2 (spring 2016)

Twenty-three teachers completed the second survey in June 2016. All 23 teachers also completed Survey 1. The following analyses present matched data for those teachers submitting both a pre and a post survey (N =23).

Items shown in Table 55 reflect the index of constructivist teaching beliefs (described above) and compare teacher responses from pre-post for the seven constructivist items.

Table 55: Descriptives for ELA teacher beliefs about teaching

Teacher belief statement	Pre		Post	
	M	SD	M	SD
Teacher as facilitator or coach	3.91	.29	3.83	.39
Students discussing reading and writing with their peers	3.96	.21	3.83	.39
Teachers asking students guiding questions	3.96	.21	3.87	.46
Students providing feedback to one another	3.91	.29	3.70	.47
Giving students time to self-correct	3.87	.34	3.87	.34
Teaching reading and writing skills in other content areas	3.96	.21	3.96	.21
Teacher facilitating students' own inquiry	3.96	.21	3.91	.29

Teacher agreement remained relatively constant pre to post on all belief statements presented in Table 55.

Self-perceptions

As discussed above, one of the teacher survey constructs focused on teacher self-perceptions about belonging to a community of literacy educators.

Table 56: Descriptives for ELA self-perception items (pre to post)

Self-Perception Statement	Pre		Post	
	M	SD	M	SD
1 I have a strong sense of belonging to the community of ELA experts	.43	.51	.52	.51
2 I have come to think of myself as a 'literacy expert'	.22	.42	.30	.47
3 I have a good understanding of the reading and writing skills I need to teach my course.	.52	.51	.83	.39
4 Writing assignments can help my students develop a deeper understanding of important concepts.	.91	.29	.91	.29
5 Reading and writing processes are more important than specific curriculum content	.57	.51	.57	.51
6 Science and social studies teachers do not have much time to teach reading and writing	.00	.00	.04	.21

Note: Means represent percentages

There were increases in overall agreement with four of the ELA self-perception items between the pre and the post surveys (the others remained constant). Looking at an overall average rating and composite score for each teacher, we can further explore individual change in this construct. Teachers indicated their agreement with six statements and six indicates 100% agreement with all statements (a high level of ELA self-perception). Greatest agreement was for the statement: “Writing assignments can help my students develop a deeper understanding of important concepts.” On average, teacher self-perception increased from the pre-survey ($M = 2.65$, $SD = 1.27$) to the post survey ($M = 3.17$, $SD = 1.15$).

College Ready/LTF Initiative

Teachers reported on their agreement with the impact of the LTF lessons for particular pedagogy-based statements.

Table 57: Extent ELA teachers found LTF effective (pre to post)

Pedagogy statements (13)	Pre		Post	
	M	SD	M	SD
improving students' literacy skills	.83	.39	.87	.34
providing a curricular resource for teachers in addressing the Common Core ELA Standards.	.91	.29	.91	.29
encouraging teachers in other subject areas to teach literacy skills	.48	.51	.61	.50
making instruction more engaging for students.	.65	.49	.70	.47
using formative assessment strategies to identify student strengths and weaknesses and to help inform instruction.	.52	.51	.65	.49
helping students make sense of problems and persevere in solving them.	.70	.47	.74	.45
helping students read and understand more complex texts	.83	.39	.87	.34
helping students construct viable arguments and critique the reasoning of others.	.78	.42	.78	.42
helping students use and understand academic vocabulary	.83	.39	.87	.34
helping students read and carefully grasp information and arguments, ideas, and details based on evidence in text.	.91	.29	.83	.39
helping students communicate precisely.	.87	.34	.78	.42
helping students develop strong general knowledge and vocabulary	.74	.45	.78	.42
Improving students' skills in effective argumentative and informative writing	.96	.21	.83	.39

Note: Means represent percentages

Teachers either remained the same pre to post or increased in their ratings of LTF effectiveness (Table 57). This was not true, however, for the two statements related to grasping information and arguments based on text evidence and argumentative writing (these both decreased slightly). Overall composite scores (maximum of 13) were almost identical pre to post (10 vs. 10.21).

Table 58 presents data on the extent to which teachers found the LTF lessons helpful in achieving goals relating to teaching and learning language arts.

Table 58: Extent ELA teachers found LTF helpful

Goals (8)	Pre		Post	
	M	SD	M	SD
find effective strategies for teaching my subject content.	.87	.34	.83	.39
learn new ways to include formative assessment in my classes.	.26	.45	.65	.49
learn detailed information about my students' strengths and weaknesses.	.48	.51	.57	.51
provide students with more detailed feedback about their writing	.61	.50	.70	.47
implement the Common Core ELA Standards.	.78	.42	.86	.35
increase the rigor of writing assignments.	.87	.34	.91	.29
better engage students.	.61	.50	.83	.39
prepare students for more rigorous course content (e.g., AP or pre-AP).	.96	.21	.91	.29

Note: Means represent percentages

Teacher ratings of how helpful the LTF lessons were in achieving certain goals either remained the same or decreased from pre to post. Teachers' average overall composite score increased from pre ($M = 5.43$, $SD = 2.29$) to post ($M = 6.22$, $SD = 2.49$), although the increase was not statistically significant. At the pre time point, only 26% of teachers agreed that the LTF lessons helped learn new ways to include formative assessment in teaching, and 48% found them helpful in terms of learning information about student strengths and weaknesses. Agreement on both of these goals increased from pre to post, but they remained with the lowest level of teacher agreement on the post survey (see Table 58). Teachers were most in agreement with the LTF lessons helping prepare students for rigorous content (91% at the post time point) and increasing the rigor of writing assignments (also 91%).

Table 59 presents teacher responses when asked if the LTF lessons helped them differentiate instruction for different groups of students. At the post time period, the largest percentage of teachers agreed that the LTF lessons were effective at differentiating instruction for ELL students ($M = .23$). Ratings for students struggling with reading/writing also increased from the pre time point to the post time point ($M = .09$ vs. $M = .16$). Levels of agreement about differentiating instruction were, however, overall low for the ELA teachers (compared with the math and science teachers).

Table 59: ELA teacher perceptions about using LTF lessons to differentiate instruction (pre to post)

Group	Pre		Post	
	M	SD	M	SD
ELL students.	.09	.29	.23	.43
Special education students/SWD.	.13	.34	.18	.39
Students who struggle with reading/writing	.09	.29	.16	.37
Students with advanced abilities.	.09	.29	.21	.42

Note: Means represent percentages

Table 60 presents pre and post frequencies of response survey items on flexibility of the LTF lessons, student engagement, and student achievement.

Table 60: Evaluation of the impact and effect of LTF lessons (ELA)

		Pre	Post
Flexible for all students	Yes	17	15
	No	5	6
Student Engagement with LTF	More	14	15
	Same	7	8
	Less	2	0
Expectations of achievement (LTF)	Higher	19	21
	Same	3	0

Teachers tended to find students in their LTF classes more engaged than in other classes, and this remained relatively constant between the pre and post time period. Expectations of achievement were also high with over 100% of teachers who responded to the item (91% of the sample) expecting higher levels of achievement from their LTF students. Fewer teachers (65.2% at the post time period) found the LTF lessons to be flexible to fit the needs of all students. One teacher commented “there is not enough time to help students whose reading and writing are not on grade level.”

Teacher Observations

Forty ELA teacher observations were carried out between October 2015 and May 2016. Of the 40 observations, six were teachers who on that particular day were not using the LTF lesson. The remaining 34 observations included 20 teachers, with two observations for 14 teachers.

Lesson Activities

Teachers typically introduced the lessons by either connecting the topic to students’ existing knowledge (70%) or providing an overview of the topic (80%) and 20% of the time, teachers also included a discussion of the success criteria for the lesson. Teacher behaviors were observed for five minutes and then behaviors observed recorded for five minutes. This yielded responses for five separate intervals. During the first interval, teachers were questioning the class for understanding (82% of observations), using formative assessment practices (59%), using scaffolding techniques (56%) and using technology (59%). The LTF module was only visible or in use in 26% of the observations.

Across all time periods, the most frequently observed behavior was questioning for understanding which occurred in all time periods between 42-88% of the time. There was some evidence of teachers dealing with behavior/classroom management issues—but this decreased across the class period from 26% of the time during the first interval to only 3% in the final interval. The least frequently observed behaviors were: Lecture on subject matter content and differentiating activities and instruction for different students ($M = 5.3\%$ of observations in both cases), as well as referencing quiz/test results which only happened an average of 4% of the time. During every interval between although the observer indicated the LTF lesson was being used (in a later item) it was not explicitly observed (in terms of the module/materials).

The largest number of different behaviors observed across all teachers was during the first 5-minute interval ($N = 168$) (see Table 61).

Table 61: Activities observed within lesson (ELA)

		Interval (5 min)					
Activity		5-10	15-20	25-30	35-40	45-50	Sum
A	Lecture on subject matter content	3	3	2	1	0	9
B	Teacher teaches a mini-lesson.	14	6	6	3	1	30
C	Explicit strategy instruction	15	20	19	17	5	76
D	Teacher uses guided problem solving/scaffolding	19	23	27	27	14	110
E	Teacher provides procedural feedback	11	7	9	9	3	39
F	Teacher provides procedural feedback plus correction	14	14	10	14	4	56
G	Teacher questions for understanding	28	30	27	30	14	129
H	Teacher specifically references test/quiz results	2	2	2	1	0	7
I	Teacher differentiates activities and instruction for different students	3	2	1	2	1	9
J	Teacher uses assessment in instruction (Formative Assessment)	20	18	24	26	12	100
K	Teacher is managing/dealing with classroom behavior issues	9	7	7	4	1	28
L	Teacher uses manipulatives	1	3	5	4	1	14
M	Teacher uses technology	20	18	17	17	8	80
N	The LTF module is visible and in use	9	6	4	4	3	26
Total		168	159	160	159	67	

Note: Data indicate the number of times the behavior was observed in each period for all teachers.

Most teachers and students were observed using LTF content handouts (85% of the time) and LTF activities (91% for teachers and 94% for students). Graphic organizers were observed in use by students (56%) and teachers (29%) and evidence of the LTF lessons were displayed for both teachers (50%) and students (29%) Manipulative use was not frequently observed. Teachers were observed implementing formative assessment activities (a total of 95 instances mostly at DOK levels 1-3) with fewer instances (12) of summative assessment activities.

There was considerable variability in the proportion of class time spent on various activities. In 30 of the classrooms, observed teachers were leading student discussions an average of 45.33% of the time ($SD = 22.55$). The next most common activity observed was teacher lecturing (with no student discussion) ($M = 38.89$, $SD = 25.22$), followed by students working independently which was observed in 24 classrooms an average of 22.92% ($SD = 21.16$). There were few instances of peer evaluation (seen in only three classrooms) and teacher providing feedback to students was also only seen in seven classrooms (and at the most 10% of the time). Assessment activities were only observed in 13 classrooms. This does not align to data in other parts of the observation in which formative assessment activities were reported quite frequently. It might be that the observers were counting more “traditional” instances of assessment activity (giving a test or a quiz) and not less formal assessment and data collection activities (see Table 62).

Table 62: Percent of ELA class time spent on different activities

	N	Min	Max	M	SD
Students working independently	24	10	90	22.92	21.16
Small groups (3+ students)	16	10	90	35.63	24.76
Students working in pairs	7	10	60	34.29	16.18
Whole group/teacher lectures (no discussion)	9	10	80	38.89	25.22
Whole group/teacher lectures (leads student discussion)	30	10	80	45.33	22.55
Whole group/teacher gives feedback to students	7	10	10	10.00	.00
Assessment activities	13	10	90	24.62	27.87
Peer evaluation	3	10	10	10.00	.00

Almost two-thirds of teachers used the LTF lessons as written with the remaining group integrating them with other curricula materials. Ninety-one percent of teachers spent the suggested amount of time on the lesson and the observer noted that in 88% of the cases, there seemed to be enough time allotted for the observed lesson. Ways in which teachers assigned students to groups varied across the sample. In 12% of classroom, teachers assigned students to heterogeneous ability groups. In 32% of the cases there was no group work, and in 53% of cases the grouping practices (if any) were not evident.

Students were observed to either engaged (in 56% of classrooms), disinterested (6%) or a mixture of somewhat engaged and/or a little distracted (38%). On average, however, the observer indicated around 88% of students were engaged in the lesson about 86% of the time.

General impressions of the teachers and lessons observed are shown in Appendix D.

Appendix B

General impressions of the observed math lessons/teachers
Teacher had much better classroom management this time. Students were working on an LTF lesson and were much more engaged this time.
The review activity could have been completed in a shorter amount of time and with more rigorous questions. Perhaps the teacher underestimates the ability of the majority of the students.
Teacher is using the curriculum along with other resources. She said her benchmark test scores have improved and she is excited to get ASPIRE results. There were great discussions between the students and with the teacher.
Teacher had good classroom discipline and questioning skills. She seemed to have a good rapport with her students.
It seemed as if the teacher pulled this lesson out since I was there, but was not really prepared to use it.
Large class. Good classroom management.
Teacher seems to really like the materials. Teacher has a good rapport with students.
Good conversations between students and between teacher and students. Students appeared comfortable working together and asking questions.
Teacher did a good job connecting this lesson to others completed. She acted excited about the lesson and the calculator skills that would be taught within the lesson.
This lesson should have been a review for the students. However, the students were struggling some because the teacher did not use all of the lessons throughout the year that build to this lesson.
The teacher has a good relationship with the students. They weren't afraid to answer and ask questions. The teacher was strong in content and used good vocabulary. However, the teacher is only using 30-40% of the lessons in the scope & sequence.
I wish there had been more discussion among students while they were working instead of waiting until the graphs and tables were complete.
The teacher did a good job of guiding the students through the lesson. Perhaps the lesson could have moved a little faster for some students if they were allowed to work in groups more.
The teacher did not implement the curriculum the first semester, but is trying hard to implement this semester.
Excellent class. Teacher did great job of facilitating the discussion. She had great questioning skills. I was amazed by some of the comments made by the students.
I am not sure how much the teacher is using the curriculum.
Teacher said he was only implementing the curriculum to about 30% fidelity.
This class contains all 10th graders. The teacher switched the order of the units and started with unit 2. This class just started in January.
Great lesson. Students started it yesterday by working independently on the assignment. Today, they wrapped up the lesson with a group activity. Excellent job of using correct vocabulary and integrated content not in the lesson.
Teacher uses some LTF lessons, but is not following the curriculum. Students do a lot of work out of a workbook.
The teacher is fully implementing the curriculum. She is supplementing where necessary when students do not have the required prior knowledge. The students are very quiet and not very open to discussing answers openly in class.
Teacher changed the order. She is doing some pre teaching before using the lessons. She is trying to use the curriculum.
Students worked diligently on lesson and seemed to grasp the concept
Good lesson. Students seemed to understand well and seemed comfortable with the LTF lessons.
The teacher said that she is not implementing the curriculum fully. She is using the lessons that she was trained in this summer. She is not using all of the others because she is not confident in her knowledge and ability to present the lessons.

Teacher is following curriculum while adding in other material. The teacher flipped the order of part of the A+ curriculum. Students were talkative at the end of the class.

Teacher was very prepared and knowledgeable. She was also very comfortable integrating the use of graphing calculators in the lesson.

Appendix C

General impressions of the observed science lessons/teachers
General impressions of the lesson
Questioning skills are developing
They Loved the Bug Races, and had inventive names for their Bugs. Lots of student work on display in hallways from all disciplines
Teacher struggling to integrate AMSTI activities with LTF lessons/labs. Long time AMSTI user, and had issues going to DOK 3 and 4 questions.
This teacher struggles with Chemistry content, and some basic pedagogy, such as transitions. She has problems "letting go".
Use of models or manipulatives would have helped this class.
She is getting better! Better than the first partial class observation!
This teacher is struggling to give up old habits.
The enthusiasm of this teacher really helps his students!!!
It is obvious that the students are engaged in LTF activities regularly by observing their "Interactive Notebooks"
Excellent. Class was very heterogeneous in ability, but remained engaged until the last 2-3 minutes.
A sense of community and risk-free environment in class. Students are not afraid to share answers or ask questions.

Appendix D

General impressions of the observed ELA lessons/teachers
This teacher is young and inexperienced. She is doing a good job implementing LTF lessons and is seeing some success. She needs to work on classroom management skills; this group is quite talkative and easily distracted from the tasks at hand.
A well-executed LTF lesson; productive class discussion with students. One practice that I found was different: the teacher posted the objective/target on the board in student-friendly language; after explaining/discussing the objective, she had students recite aloud the objective.
This lesson is an introduction to Shakespeare. The teacher did a pre- activity and a little discussion prior to video. After video, students did a 3-2-1 exit slip and then discussed their responses. The "lecture" time that is allotted for in the chart is the video time, where students were watching, listening, and jotting notes.
The teacher allowed students ample time for essay writing and revision; she conducted some teacher/student writing conferences during the class period. She also traveled around the classroom to help individual students with specific questions they had about the assignment.
Unfortunately, the teacher spent most of the class period reading portions of the story aloud to students, even though the story was printed in their textbooks that are available to take home. Time was not used as effectively as it could/should have been; however, the teacher did get into the LTF graphic organizer and students were eventually actively engaged.
The teacher understands fully how to execute and LTF lesson.
This teacher is trying hard to follow the curriculum to 100% fidelity! There is plenty of evidence of LTF lessons present in the classroom. Diligent work going on by both teachers and students.
The "lecture" portion of class was actually the teacher reading aloud three of the chunks of text to the class. This teacher understands how to execute and LTF lesson and her students are generally engaged in the work.
After talking with the teacher about the use of this lesson last year in the pilot and this year with her upper classmen and AP students, it is evident that she has executed the lesson more successfully than I observed today. Unfortunately, the technology in her classroom was not working properly, which frustrated her and distracted the students. The video finally uploaded and played, but the music was unable to be heard, which affected the lesson as a whole. There was a general lack of focus and excessive talking during the video, which I believe would not have been the case had the music been present. The discussion after students annotated the text did yield some insightful comments from some students; however, I believe it would have been a more substantial learning experience if the lesson and all components has worked as intended.
This teacher has a firm grasp on delivering LTF lessons. She made a small adaptation with this lesson at the direction of her students. The change seems to be working with this group.
This teacher has a large class, but is doing a good job of managing students while integrating LTF lessons.
The teacher is doing a great job of teaching with LTF strategies; students are clearly conditioned for working in this type of environment and are eager to participate. This is a large class and keeping them all on task is a bit of a challenge.
Teacher is growing in ability to execute LTF. Class is accustomed to this style of lesson/class.
Teacher is behind in pacing guide; students were working, but rather robotically; I felt like this may have been a review lesson, although the teacher did not indicate this to me. Teacher did an okay job executing lesson. This is a small and quiet class. With practice, I believe the teacher will become better at teaching LTF and engaging her students.
The teacher has an excellent rapport with students and a good understanding of how to execute an LTF lesson. Her students responded well to the activities today and class was productive. With time, this teacher will become a master at utilizing LTF in the classroom.
This was a well-executed LTF lesson. The class was small - only about 14 students - so engagement was easily seen; students seemed to really enjoy the conversation sparked by this text.
Teacher has progressed in executing LTF lessons. There is certainly potential here.

This teacher will be better able to implement this particular activity once his students understand the process. Time management for this lesson is key.
Students were engaged with a three-part summative assessment of Huck Finn. Teacher did not receive my email notification of my visit when it was originally sent; once she did receive it, it was too late to change the lesson plan. This teacher is doing a fine job of implementing LTF in her classroom, and her students seemed well-prepared for this assessment.
Excellent execution of a multiple choice review activity.
This teacher executes LTF lessons well; she guides students through discussions and scaffolds where needed. Although she is behind in pacing, she is still doing an excellent job implementing the curriculum.
Teacher is implementing fully and effectively.
First Socratic Seminar for both teacher and her students. Students did well and most were prepared. Teacher allowed students to drive the discussion.
The teacher read over the vocabulary for the students, explaining context but not engaging them in the discussion. Students worked for the remainder of the period on a review quiz of their reading assignment from Ender's Game. This is not an LTF lesson, and students worked independently. This class is in the 3rd 9 Week Module and will likely not touch the 4th 9 Week Module at all. Pacing for the first year was slow.
This class was distracted today; there were several interruptions and there was a faculty/student basketball game scheduled soon after their class period. The teacher understands how to implement LTF, although this particular lesson was less effective than it could have been without all the distractions of the day.
This teacher is obviously working hard to make LTF work in her classroom. Most students are receptive to the lesson.
Teacher understands how to execute LTF lessons; students are clearly accustomed to this style of teaching.
Teacher is using a different and less complex text for this nine-weeks' major work. She did adapt the LTF lesson to use with this text and did a pretty thorough job with it. Students are participating, but the level of engagement is lacking due to no group work and a lesser text, which doesn't lend itself to deep discussion/connection to theme.
The teacher has excellent skill at delivering LTF lesson, particularly in giving "wait time" for students to discuss and find answers on their own. The class was small as many had to leave for a track meet; students clearly understand that the expectation in this classroom is learning and collaboration.
This classroom is a well-oiled machine. All students know expectations and rise to meet them. The LTF strategies are essentially seamlessly embedded in the workings of this classroom. Excellent job by both teachers and students.
Technology is used often in this class. Teacher incorporates LTF with technology whenever she can. Students were using Chrome Books to do their Allusion research/Google Docs for recording information. Teacher aided individuals as they had questions.
This teacher tried to use Google docs for annotation so that students could see all comments during annotation. This was a new endeavor for both teacher and students, and I applaud her efforts to try something new; with practice, this method could work. Teacher is only in her second year of teaching, so grouping techniques will improve with experience. Overall, teacher and students were engaged with this lesson in an appropriate and relatively successful way. Classroom management is a strength for this teacher, which will aid her in implementation of LTF.
Teacher is going out on maternity leave soon! She has a small class of 12 students who are obviously comfortable with the format of LTF lessons. This is a bright group of young people. The teacher executed this lesson perfectly.
Teacher did an excellent job of executing this LTF lesson.

Appendix E

Due to varied ability levels in each class, I sometimes must count the work as a "participation" grade only
Finding assessment questions that meet the same rigor
Grading takes a lot of time that I don't have during a 53 minute planning period with 85+ students
However, trying to get students/parents to understand that a B in Pre-AP is good has been a nightmare.
I am not using the "square root method" or any scaling procedures. I don't feel comfortable with boosting their grades "just because."
I am still figuring out how to adjust for this more difficult curriculum where grades are concerned. It's really difficult to quantify what the students have actually learned - they can talk through the concepts lots better than they can get correct answers down on paper.
I am unsure of the appropriate grading scale for each lesson.
I am unsure of the appropriate weights of each question or how it should be graded due to the rigor of the assignment.
I don't have a problem with grading lessons, but preparing tests beyond checkpoints to assess student learning.
I had to give way too many "soft landings". The grades were not indicative of the students' ability level.
I have a hard time making assessments in a timely manner and deciding how to grade them.
I have been teaching on the block schedule for 9 years and I have not been able to adjust to a planning period of 50 minutes.
I have had to do test corrections during the conic sections portion.
I have implemented the AP grading scale but using this makes me afraid since other math teachers do not use it.
I was until our One day training and a lot of my question were answered that day.
In the beginning I did, but I learned how to grade effectively and save time.
Increased rigor at the Algebra2/Trig level without the same level of rigor in previous courses is not easy on the students and their grades are suffering. There are only so many "soft landings" that can be used.
It has been very difficult to create assessments beyond the checkpoints provided which match the level of difficulty of the material in the lessons.
It is difficult to assign points to concepts
It is increasingly difficult to find a way to have enough time to work through the needed content and also to find a way to assess students in a formative way. Students are struggling so much that they are unable to complete one problem in less that 20 minutes because the foundation skills are lacking.
It takes a long time to grade these lessons
Need more test banks to choose from. Need expansive bank to pick & choose from.
Not having enough questions for assessments without making up my own or spending time searching for questions.
The assignments take a really long time to grade accurately. If I don't grade them carefully, The kids don't put any effort into them.
The more LTF lessons we use, the more soft landings we must provide.
These activities take a great deal of time and the way our grading system is set up at our school (10% HW; 35 % quizzes; 55 % tests) it is hard to justify counting work as just homework. Yet, resources provided for testing situations (checkpoints) are not always adequate. I usually use these as formative assessments.
They take a long time to grade and the assessment resources are not useful for me.
Trying to decide what is an acceptable answer and the time it takes to grade.
We are expected to get the grades into the system within 24 hours of a test and 48 hours of assignments. The activities that are being done with the LTF take a great deal of time to grade and the assessments take a very long time as well. Also, finding time to create all new assessments that match the curriculum while spending even more time preparing for each new lesson activity is unrealistic when trying to add to it calling parents, detention, grading, and administrative meetings.