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RESEARCH IN MATHEMATICS EDUCATION

STEM Academy for Teachers and Leaders: 2019-20 Coaching and PLC Evaluation

Technical Report 20-14

STEM Academy for Teachers and Leaders: 2019-20 Coaching and PLC Evaluation

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Executive Summary

In an effort to increase student interest and achievement in STEM, Dallas Independent School District (ISD) leadership partnered with the Texas Instrument Foundation, Southern Methodist University (SMU), and the O'Donnell Foundation to develop and implement the *STEM Academy for Science Teachers and Leaders.* As part of the Academy, teachers and leaders engage in two primary components including: (a) intensive summer professional development, and (b) coaching with an SMU coach during the school year. Teachers participated in the STEM Academy for up to three years. This report focuses on the coaching component of the STEM Academy during the 2019-20 school year. The purpose of this report is to describe: (a) changes to the coaching model from previous years of implementation, (b) participating teachers and their school characteristics, (c) the fidelity of coaching implementation during the third year of implementation, and (d) teachers' perception of the coaching based on responses to the coaching evaluation survey.

The Coaching Model. The structure of the STEM Academy coaching includes a one-on-one pre-conference, observation, and post-conference, which is defined as the full cycle of coaching. Teachers also participated in a school leader or coach-led professional learning community (PLC) meeting during each cycle. During the third year, 21 teachers engaged in up to seven coaching cycles and PLC meetings with an instructional coach from SMU. Coaching included an emphasis on: (a) active learning, (b) scientific process standards, (c) deepened content knowledge, and (d) differentiation.

Participating Teachers and their Schools. Twenty-one teachers participated in at least one STEM Academy coaching cycle during the third year (2019-20). The majority of teachers identified as Black (54%) and female (73%). These teachers taught in 11 Dallas ISD middle schools. The schools in which the teachers taught tended to include more Black and Hispanic students, more economically disadvantaged students, and students identified as English learners.

Fidelity of Implementation. On average teachers completed five of the seven targeted coaching cycles. Coaches completed fewer coaching cycles than planned due to the closure of school due to COVID-19. During the 2019-20 school year, SMU instructional coaches engaged in 303 coaching sessions (i.e., pre-conferences, observations, or post-conferences), resulting in a total of 98 complete coaching cycles across the school year. On average, the pre-conference occurred in 15 minutes, the observation occurred in 47 minutes, and the post-conference occurred in 18 minutes. Furthermore, SMU coaches engaged in 57 PLC meetings that multiple teachers attended across the school year for an average of 30 minutes.

Teachers' Perceptions of Coaching. Overall, between 86% to 100% of teachers agreed or strongly agreed that coaching was a valuable professional learning development experience and supported their understanding and utilization of active learning strategies. For the pre-conference sessions, depending on cohort and time of survey, 83% to 100% of teachers agreed or strongly agreed the sessions helped with their implementation of active learning strategies. Similarly, for the post-conference session, 83% to 100% agreed or strongly agreed that the post-conference sessions were reflective, confidential, and encouraged the use of active learning strategies.

Furthermore, 83% to 100% of teachers agreed or strongly agreed that coaching supported their confidence in implementing active learning strategies in their classroom after the coaching cycle.

Teachers responses to the survey indicated opportunities for improvement. With regards to the content knowledge, teachers declined in their agreement towards the academy deepening their understanding of content knowledge. In the fall 2019 survey administration, 88% to 100% of teachers across cohorts agreed or strongly agreed that the coaching deepened their understanding of content knowledge. After the spring 2020 survey, only 84% to 92% of teachers agreed or strongly agreed.

These results support three key recommendations. First, the complete coaching cycles (i.e., pre-conference, observation, post-conference) were perceived favorably by teachers. Those interested in implementing programs similar to the STEM Academy should consider implementing coaching with a similar structure. The model was implemented with strong fidelity and was perceived as an overall valuable experience by teachers. Second, more emphasis is needed with content knowledge. This is evidenced by the decrease across time in teachers' perceptions that coaching improved their content knowledge. Lastly, coaching should increase the amount of differentiation strategies teachers can use in their classrooms. This is evidenced by a decrease in the percentages of cohort 1 teachers who agreed that the STEM Academy provided the tools to support differentiation.

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STEM Academy for Teachers and Leaders: 2018-19 Coaching and PLC Evaluation

Background Information

During the first decade of the 21st century the number of science, technology, engineering and math (STEM) related jobs grew at three times the rate of non-STEM jobs (Smithsonian, 2018). Additionally, fields in STEM represent a majority of the highest starting paid fields in the United States (National Association of Colleges and Employers, 2018). Both the American and global economies are requiring more individuals with STEM related degrees to fill professional positions in an increasingly high-tech job market (DeJarnette, 2012), and although the United States has experienced growth in this field, it has not seen the same growth in qualified STEM workers as its global competitors in Europe and Asia (National Science Board, 2010).

Some students, particularly female students, students of color, and students from low socio-economic backgrounds are hesitant to consider STEM careers (Tytler & Osborne, 2012; Mikaye et al., 2010). Dallas Independent School System (ISD) was concerned with similar trends reflected within their school system, especially considering the large metropolitan area of Dallas where many STEM careers exist (Dallas ISD, 2019; Perry, Reeder, Brattain, Hatfield, & Ketterlin-Geller, 2017). In 2013, Texas House Bill 5 (HB 5) required that Grade 8 students select an endorsement area, including STEM, Business and Industry, Public Services, Arts & Humanities, or Multidisciplinary Studies. During the 2014-2015 school year, just 16.9% of Dallas Independent School District (ISD) students selected the STEM pathway, despite the fact that a wide range of STEM industries are based in Dallas.

In response to these statistics, a partnership between the Texas Instruments Foundation, the O'Donnell Foundation, Southern Methodist University (SMU), and Dallas Independent School District (ISD) was established. A primary goal of this partnership was to determine how students' interest and perseverance in STEM could be improved, and how this ultimately affects the STEM pipeline and equity in the technical fields. Four key areas were identified, including (a) active-learning which includes inquiry-based STEM instructional strategies such as project based learning (PBL) and maker-based instruction (MBI), (b) scientific process standards, (c) teacher content knowledge, and (d) differentiated support for all learners, with an emphasis on social and emotional learning (Perry, Reeder, Brattain, Hatfield, & Ketterlin-Geller, 2017). Through these conversations, desired outcomes were determined that would help initiate and refine the goals of this 4-year project. The primary desired outcomes included (a) an increase in student science achievement and engagement, and (b) an increase in teacher implementation of active learning experiences.

During the first year of implementation (2017-18), 15 science teachers at six campuses participated in the Academy. During the second year of implementation (2018-19), 40 teachers at 15 campuses participated in the Academy. During the final year of implementation, 21 teachers at 11 campuses participated in the program.

Coaching Evaluation Questions

The purpose of this report is to focus on the *teacher coaching component* of the STEM Academy. This report provides an overall description of the components of the 2019-20 STEM Academy coaching. In addition, this report focuses on two primary evaluation questions:

1. To what extent was coaching implemented with fidelity in 2019-20?

2. What are teachers' perceptions of coaching and PLC meetings in 2019-20?

For information about implementation and teachers' perceptions in 2017-18 and 2018-19, please reference existing external reports (Adams, Hatfield, Cox, Mota, Sparks, & Ketterlin-Geller, 2018; Sparks, Adams, Cox, Hatfield, & Ketterlin-Geller, 2019).

Description of STEM Academy Teacher Coaching and PLC Meetings

Core components of the STEM Academy include instructional coaching and professional learning communities (PLC) meetings. During the first year of implementation, the project team selected schools with at least three participating science teachers. In subsequent years, the team continued to follow the teachers regardless of whether they remained at their original campus or transferred to a different Dallas ISD middle school. As a result of participation changes, seven schools had only one teacher during the third year of implementation.

Structure of the STEM Academy Teacher Coaching and PLC Meetings

In the first year of implementation, one coach provided instructional coaching and led PLC meetings with the 15 teachers. In the second year of implementation, four additional coaches were added to serve the increased number of schools and teachers with the original coach serving as the lead coach. During the third year, due to attrition, fewer coaches were needed to provide coaching support to the participating teachers, and four of the five coaches from year two were retained in this position. The lead coach was responsible for coach training and supporting problem solving with scheduling or challenges observed in classrooms. Similar to the first and second years of the STEM Academy, one-on-one coaching consisted of a pre-conference, observation, and post-conference. In addition, participating teachers received one hour of graduate credit for their participation in coaching and PLC meetings.

Coach 1

Coach 1 is the returning lead coach, whose title is STEM Development and Implementation Coordinator at RME. In this role, he supports campus leaders and science teachers in the delivery of classroom lessons that focus on the integration of STEM and active learning techniques through individualized coaching, co-planning and facilitating PLCs, and feedback following classroom observations. This role is intended to increase student achievement in science, student interest in STEM and students' persistence in STEM coursework by supporting teachers' professional knowledge and skills, and campus administrators' instructional leadership skills.

Coach 2

Coach 2 was a teacher and then vice principal in Jamaica from 1996-2009. She left Jamaica for Washington, D.C. where she became involved in STEM and earned an M.A. in STEM Curriculum Development and Implementation with Concordia College, Portland, OR. She was a part of a team selected by Pearson to set the rubric for the mathematics component in Partnership for Assessment in Readiness in College and Careers (PARCC). She has experience in curriculum development focused on engineering using the Next Generation Science Standards (NGSS).

Coach 3

Coach 3 earned her bachelor's degree in biology and master's degree in teaching from Austin College. She then taught high school science in New Mexico for eight years. During that time, she taught a wide variety of courses including biology, physics, AP chemistry, genetics, microbiology, and pharmacology. Her academic interests include curriculum design and vertical alignment. She is currently working towards her Ed.D. in Higher Education from SMU.

Coach 4

Coach 4 holds a bachelor's degree from the University of North Carolina at Greensboro with a concentration in secondary education. While teaching, he pursued his master's degree in education with a concentration in English as a second language. The coach completed his Ph.D. in Education in 2019 at SMU. His dissertation focused on reclassification policies of English learners. In addition, he completed a master's degree in statistics through Texas A&M in 2019. Prior to working with RME, the coach was a graduate research assistant with the Budd Center where he co-collaborated on research projects. His research interests include mathematics instruction of English learners and policies that impact English learners.

The Teacher Coaching Model

A complete description of the coaching model can be found in the previous years coaching reports (Adams et al., 2018; Sparks et al., 2019). The STEM Teaching Observation Protocol (STEM TOP; see Appendix A) was utilized during year three, as it had been during year two for classroom observations. The purpose of adopting the observation protocol was to standardize coaching procedures with coaches. Coaches participated in calibration sessions before the school year and routinely double-scored observations throughout the school year to ensure fairness of ratings. For more information about the STEM TOP, please request the internal report focused on the STEM TOP development and data collection (Pierce, Adams, Sparks, Burton, Hatfield, & Ketterlin-Geller, 2019). For more information about the coaching training, please request the internal report titled *STEM Academy for Science Teachers and Leaders: Coach Training and Development* (Mota, Pierce, Hatfield, Adams, & Ketterlin-Geller, 2019).

PLC Meetings (Professional Learning Communities)

For a complete description of the PLC models used during the first and second years of implementation, please see the previous coaching reports (Adams et al., 2018; Sparks, Adams, Cox, & Ketterlin-Geller, 2019). During the third year of program implementation, the instructional coaches helped facilitate PLCs in four schools with the goal of increasing protocol

use as a means of assessing student and teacher classroom artifacts. During the first several PLC meetings the coach guided the participating teachers and leaders through an introductory challenge called Traffic Jam, a norm setting protocol, and two activities called Peeves and Traits and Compass Points that were intended to help the PLC members understand group preferences of all participants. For more information about these activities see their descriptions in Appendix C.

After the abovementioned activities were completed, the instructional coach transferred facilitation to either the leader or one of the participating teachers for each subsequent PLC meeting. The PLC team members determined which protocol they were going to utilize at each meeting and team members collected artifacts for analysis. The protocol options were: the Tuning Protocol, the Consultancy Protocol, the Charette Protocol, and the Notice and Wonder Protocol. For specific details on each of these protocols please see their descriptions in Appendix C.

For both cohort 1 and 2 teachers at campuses with only one participating teacher, the instructional coach did not facilitate formal PLCs. Cohort 1 teachers at these schools engaged in additional coaching focused on leadership skills during each cycle.

Participating Teachers and Their Schools

This section of the report describes the participating teachers, who engaged in coaching during the 2019-20 school year.

Participating Teachers

During the third year of the STEM Academy (2019-20), 26 teachers participated in the summer STEM Academy. Cohort 1 teachers participated in Academy 3 and cohort 2 teachers participated in Academy 2. The descriptive information for the participating teachers by cohort is depicted in Table 1. Most teachers were female (73%), identified as black (54%), and were non-Hispanic (81%).

Table 1

Descriptive Information for 2019-20 Participating Teachers (n = 26)

Characteristic	# (%) of Teachers Cohort 1	# (%) of Teachers Cohort 2	Total
Female	7 (78%)	12 (71%)	19 (73%)
Male	2 (22%)	5 (29%)	7 (27%)
White	4 (44%)	4 (24%)	8 (31%)
Black	5 (56%)	9 (53%)	14 (54%)
Asian	0 (0%)	0 (0%)	0 (0%)
Other	0 (0%)	2 (12%)	2 (7%)
Multi-racial	0 (0%)	2 (12%)	2 (7%)
Hispanic	2 (22)	2 (12%)	4 (15%)
Non-Hispanic	7 (78%)	15 (88%)	22 (85%)
Total	**9 (100%)**	**17 (100%)**	**26 (100%)**

Table 2 shows participating teachers' average number of years teaching and in other professional careers by cohort. Cohort 2 teachers had on average more overall experience teaching, experience teaching science, and years at their current school relative to cohort 1 teachers. In contrast, cohort 1 teachers had on average more experience in other professions.

Table 2

Participating Teachers' Average Number of Years in Teaching (n = 26).

# of Years	Average # of Years (SD)	Min	Max
Cohort 1 (n = 9)			
Teaching	5.4 (1.7)	3	8
Teaching Science	5.0 (1.5)	3	7
In other professions	7.2 (7.0)	0	18
At current school	3.7 (2.8)	0	7
Cohort 2 (n = 17)			
Teaching	9.1 (5.7)	2	18
Teaching Science	7.9 (5.9)	2	21
In other professions	4.9 (4.2)	0	15
At current school	5.2 (3.1)	2	12

Participating Schools

The 21 participating teachers taught at 11 middle schools in Dallas ISD. Descriptive information for each school relative to the district and state overall are highlighted in Table 3. Ten of eleven (91%) participating schools enrolled a majority of students who identified as Hispanic. All eleven participating schools enrolled a majority of students from economically disadvantaged

backgrounds. Seven of eleven (64%) participating schools enrolled a majority of students who were identified as English learners.

Table 3

Descriptive Information for Participating Schools for 2019-20

School Name	% Hisp	% Black	% White	% Asian	% ED	% EL	% Male
School A	82.2	16.2	0.5	0.1	95.4	56.3	55.0
School B	54.7	36.7	1.4	0.5	91.4	41.5	53.3
School C	76.5	13.0	5.0	3.3	88.0	54.0	51.4
School D	73.6	15.6	8.9	0.2	90.1	51.3	53.1
School E	93.4	5.8	0.6	0.1	93.2	62.2	51.4
School F	33.4	64.8	0.3	0.3	97.2	28.0	54.7
School G	92.4	5.4	1.5	0.0	92.5	65.0	50.8
School H	85.8	13.0	0.8	0.0	92.2	60.0	57.6
School I	88.5	7.0	3.7	0.3	77.1	42.1	46.3
School J	62.8	8.0	26.3	0.8	64.9	27.9	52.1
School K	94.5	3.9	0.9	0.0	95.2	75.9	52.7
District	72.1	21.1	4.4	1.1	87.6	47.4	51.8

Note: ED indicates students who are identified as economically disadvantaged; EL indicates students who are English learners.
Source: Dallas ISD (2020)

Overall, students from participating schools were majority Hispanic, from economically disadvantaged backgrounds, and identified as English learners.

Method

To answer the evaluation questions specified in this report, fidelity of implementation data were tracked by the SMU coaches and project team. For teachers' perceptions of coaching, teachers completed a coaching evaluation near the end of fall 2019 and spring 2020. Data collection methods are summarized in this section.

Fidelity of Implementation

Across all coaching sessions, the SMU instructional coaches recorded the number of minutes for each coaching session (i.e., pre-conference, observation, and post-conference). The coaches entered these data into an online survey platform called Qualtrics (Qualtrics, 2019). Completion was also tracked through the sharing of the post-conference form with the teacher through the online learning management system, Canvas.

Coaching Evaluation Survey

The participating teachers were invited to complete a coaching evaluation survey via email within Qualtrics in late fall 2019 and late spring 2020. During 2019-20, five teachers did not

continue with coaching during the academic year following the summer 2019 academies. By late fall 2019, one additional teacher had exited the program; by late spring 2020, a second teacher exited the program. In fall 2019, one teacher was on maternity leave. As such in fall 2019, 19 teachers were invited to participate in the coaching evaluation survey; in spring 2020, 19 teachers were invited to participate in the coaching evaluation survey.

The survey included items measuring teachers' perception of coaching overall (13 overall), the pre-conference session (4 items), the post-conference session (10 items), and the PLC meeting (6 items). The majority of the items were statements, and teachers rated their agreement on a four-point Likert scale (i.e., strongly disagree, disagree, agree, strongly agree). In addition, the survey included 12 open-ended items asking teachers about: (a) the extent to which coaching supported the utilization of components of the project that align with the four key areas; (b) the aspects of coaching and PLCs that were most useful; (c) the aspects of coaching and PLCs that needed the most improvement; and (d) any other information they would like to share about coaching and PLCs. The coaching evaluation survey for spring 2020 is included in Appendix B.

Results

This section describes the results based on the two evaluation questions.

Extent of Coaching Fidelity Measures

In this section, we summarize the number of coaching cycles teachers received and the number of minutes teachers engaged in those sessions. The frequency and duration of the teacher coaching sessions are summarized in Tables 4 and 5 respectively.

A primary goal of the project was for the participating teachers to engage in seven coaching cycles, each of which included a pre-conference, observation, and a post-conference. Additionally, at schools with more than one participating teacher, a PLC was facilitated or observed by the SMU coach during each cycle. Constraints due to scheduling kept coaches and teachers from engaging in all seven full coaching cycles. In addition, schools switched to virtual learning due to an outbreak of COVID-19, which prevented coaches from completing most of the sixth coaching cycle and all of the seventh cycle. If all teachers engaged in the all seven cycles, 147 complete coaching cycles would have occurred in the 2019-20 school year.

Table 4 shows that coaches engaged in a total of 98 of the targeted 147 complete coaching cycles with teachers. Therefore 67% of the targeted coaching cycles were completed. In total, the coaches engaged in 303 coaching sessions including 98 pre-conferences, 104 observations, and 101 post-conferences with the 21 participating teachers. On average, each teacher engaged in five of seven coaching cycles. Three teachers in Schools A, C and I either exited the program before the end of the school year or were on maternity leave for part of the school year. Teachers left the program due to personal commitments and career changes. For the other eight schools, we observed variation across schools with a range between 43% to 86% in the percentage of completed coaching cycles.

Table 4

Number of Coaching Sessions by School

School	# of Teachers	# of Sessions at Each School			# of Coaching Cycles including Pre-Conference, Observation, and Post-Conference			Average # of Cycles per Teacher
		Pre-Conference	*Observation*	*Post-Conference*	Complete	Goal	% of the Goal Complete	
School A*	5	26	26	26	26	35	74%	5
School B	4	19	20	20	19	28	68%	5
School C*	3	12	12	12	12	21	57%	4
School D	2	10	10	10	10	14	71%	5
School E	1	5	5	5	5	7	71%	5
School F	1	4	4	4	4	7	57%	4
School G	1	6	6	6	6	7	86%	6
School H	1	3	6	5	3	7	43%	3
School I*	1	3	3	3	3	7	43%	3
School J	1	5	5	5	5	7	71%	5
School K	1	5	5	5	5	7	71%	5
All	**21**	**98**	**104**	**101**	**98**	**147**	**67%**	**5**

Note: *Designates schools where a teacher left the program before the end of the school year or was on leave.

Table 5 describes the average number of minutes by coaching component. On average, the coaches met with teachers for 15 minutes during the pre-conference, observed teachers for 45 minutes, and met with teachers for 18 minutes during the post-conference. Lengths for these activities varied due to school schedules, since some schools had 45-minute periods while others had 90-minute periods. The coaching log allowed coaches to record minutes in intervals of five-minutes up to 60 minutes or more.

Table 5

Average Number of Minutes Teachers Engaged in Coaching Sessions by School

School	**# of teachers**	**Average # of Minutes**		
		Pre-conference	*Observation*	*Post-conference*
School A	5	15.6	45.0	19.4
School B	4	15.0	45.0	15.0
School C	3	13.8	45.0	23.3
School D	2	18.5	45.0	21.5
School E	1	16.0	60.0	19.0
School F	1	10.0	57.5	16.3
School G	1	15.0	45.0	17.5
School H	1	13.3	41.7	15.0
School I	1	15.0	45.0	10.0
School J	1	15.0	47.0	20.0
School K	1	14.0	45.0	21.0
All	**21**	**14.7**	**47.4**	**18.0**

Source: STEM TOP Coaching Logs
Note: The STEM TOP Coaching Log recorded minutes in intervals of five-minute ranging from "5 minutes or less" to "60 minutes or more"

In addition to individual coaching sessions, the coaches engaged in PLCs at four campuses. Table 6 shows the number of PLCs provided to each campus and the average length of the PLCs. Overall, teachers engaged in between three and nine PLCs with their instructional coach. In total, coaches facilitated 57 PLCs as a part of the STEM Academy coaching. The average number of minutes of PLC engagement ranged from 10 to 51 minutes. Coaches noted in the coaching log entries that the wide range in number and minutes for PLC sessions related to variation in school schedules. Overall, coaches co-facilitated or facilitated PLCs with high fidelity throughout the school year, as evidenced by the number of PLCs completed out of the goal number (seven total) and average number of minutes conducting PLCs.

Table 6

PLC Implementation Summary

School	# of teachers	PLC's Completed	Average # of Minutes
School A	5	8	46
School B	4	5	45
School C	3	7	46
School D	2	5	29
School E	1	4	19
School F	1	5	51
School G	1	5	12
School H	1	5	12
School I	1	3	13
School J	1	5	10
School K	1	5	24
All	**21**	**57**	**30**

Table 7 lists the different protocols used in the PLCs. The Lead Teacher Development Protocol was most commonly used and the Norm Setting Protocol was used the fewest number of times.

Table 7

PLC Protocol Summary

School	# of Implementations
Lead Teacher Development	12
Other	9
Notice and Wonder	8
Tuning	7
Compass Points	6
Consultancy	6
Peeves and Traits	4
Charette	2
Text-based seminar	2
Norm Setting	1
All	**57**

Teacher Perceptions of Coaching

The results of the 2019-20 fall and spring teacher coaching evaluation surveys are summarized in this section. The quantitative and qualitative results are summarized in four sections focused on teachers' perceptions: (a) overall, (b) focused on the pre-conference, (c) focused on the post-conference, and (d) focused on the PLC. We present the results by cohort. Cohort 1 teachers were in their third year of participation; cohort 2 teachers were in the second year of

participation. Of the eight cohort 1 teachers who participated in coaching, all eight completed the coaching evaluation in the fall of 2019. Over the course of the year, one of the cohort 1 teachers exited the program, and all of the remaining seven completed the spring coaching evaluation. For the 13 cohort 2 teachers who participated in coaching during the 2019-20 academic year, one was on leave during the fall coaching evaluation, so 12 of the 13 (92.3%) completed the coaching evaluation at that time point. At the spring coaching evaluation timepoint, one of the 13 cohort 2 teachers had exited the program, but all 12 participating teachers completed portions of the survey.

Overall. Figure 1 shows that from fall 2019 to spring 2020, the percentage of cohort 1 teachers who agree or strongly agreed that coaching was valuable for their professional development remained consistent (100%) with the number of teachers who strongly agree also remaining relatively constant with a change from 88% to 86% between the two time points. The percentage of cohort 2 teachers who strongly agreed or agreed that coaching was valuable in their professional development remained consistent between the two time points (100%) with the number of teachers who strongly agree increasing from 42% to 60% between the two time points.

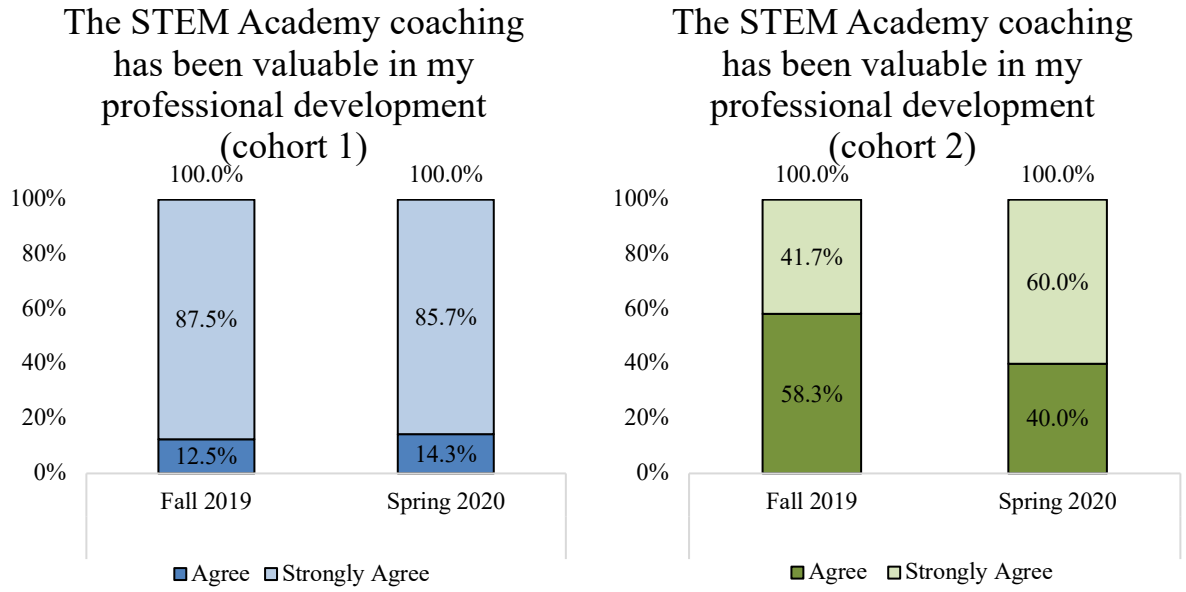

Figure 1. Teachers' perception of value of coaching towards professional development (cohort 1 Fall n = 8, Spring n = 7; cohort 2 Fall n = 12, Spring n = 10)

Coaching deepening understanding. Figures 2 and 3 show change over time in teachers' perceptions of coaching for deepening their understanding of different aspects of STEM education, disaggregated by cohort. For both cohort 1 and 2 teachers, the percentage of teachers who strongly agreed or agreed that coaching deepened their understanding of aspects of STEM education was 100% for each aspect except for science content knowledge. For cohort 1 teachers, 88% of teachers agreed or strongly agreed in fall and 86% in spring. For cohort 2 teachers, 100% of teachers agreed or strongly agreed in fall and 92% in spring.

When we prompted cohort 1 teachers to respond openly about how coaching supported their understanding and utilization of active learning strategies, seven teachers responded to the question with all responses in the positive. Specifically, two cohort 1 teachers mentioned support on project-based learning and maker-based instruction. Themes emerged indicating that individual coaching was positive in supporting teachers with guidance and instructional approaches and strategies that could be applied across the board.

When we prompted cohort 2 teachers to respond openly about how coaching supported their utilization of active learning strategies, 11 out of the 12 teachers responded to the question. Responses indicate that coaching did indeed support their utilization of active learning strategies. Teachers shared that coaching helped them think of ways to provide activities for their students and how to incorporate graphs and data visualization tools into the lessons.

We also prompted cohort 1 teachers to openly respond to ways in which coaching could better improve their implementation of active learning strategies. Seven out of the eight teachers responded to the question. Three out of the seven responding teachers responded favorably to the coaching experience. Suggestions included a refresher course on the MBI and PBL methods or suggestions for books about active learning strategies.

When we prompted cohort 2 teachers to respond about ways in which coaching could better improve their implementation of active learning strategies, all 12 teachers responded. Six of the twelve teachers responded that no changes were needed of the coaching they were receiving. The remaining six teacher offered specific suggestions tailored to their campus experiences.

When we prompted cohort 1 about how coaching supported their understand and utilization of the scientific process standard, seven out of the eight cohort 1 teachers responded. One teacher explicitly responded that their priority shifted from a content focus to a focus on the how. Five other teachers agreed that coaching supported their understanding and implementation of the process standards. Only one teacher reported not receiving support in the process standards.

Eight out of the twelve cohort 2 teachers surveyed provided open responses to how coaching helped improve their understanding and utilization of the process standards. Themes emerged around use of the process standards in unique parts of a lesson and incorporating graphs and charts.

When we prompted teachers on how coaching could be improved to support their understanding and utilization of the process standards, five out of the eight responding cohort 1 teachers provided responses. Two of the teachers offered suggestions for additional ideas on implementation. The other three teachers suggested more examples of how to infuse the process standards to a greater extent within their lesson.

Cohort 2 teachers provided mixed responses to the same question. Themes emerged around content standards versus process standards and a shift away from the process standards compared to the previous year. Six teachers did not offer responses to the question.

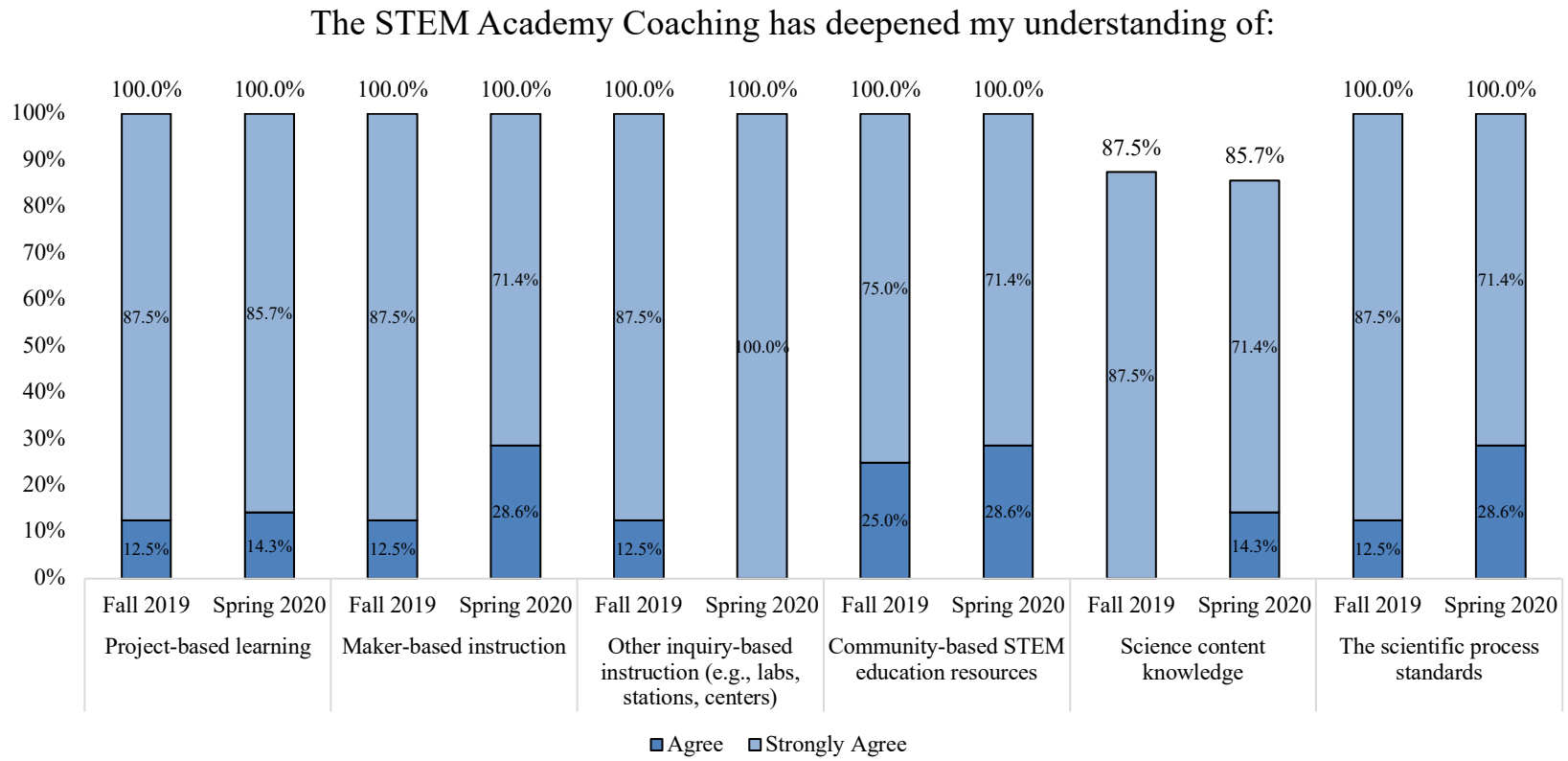

Figure 2. Cohort 1 teachers' perceptions of the influence of STEM Academy coaching on aspects of STEM education (Fall n = 8, Spring n = 7)

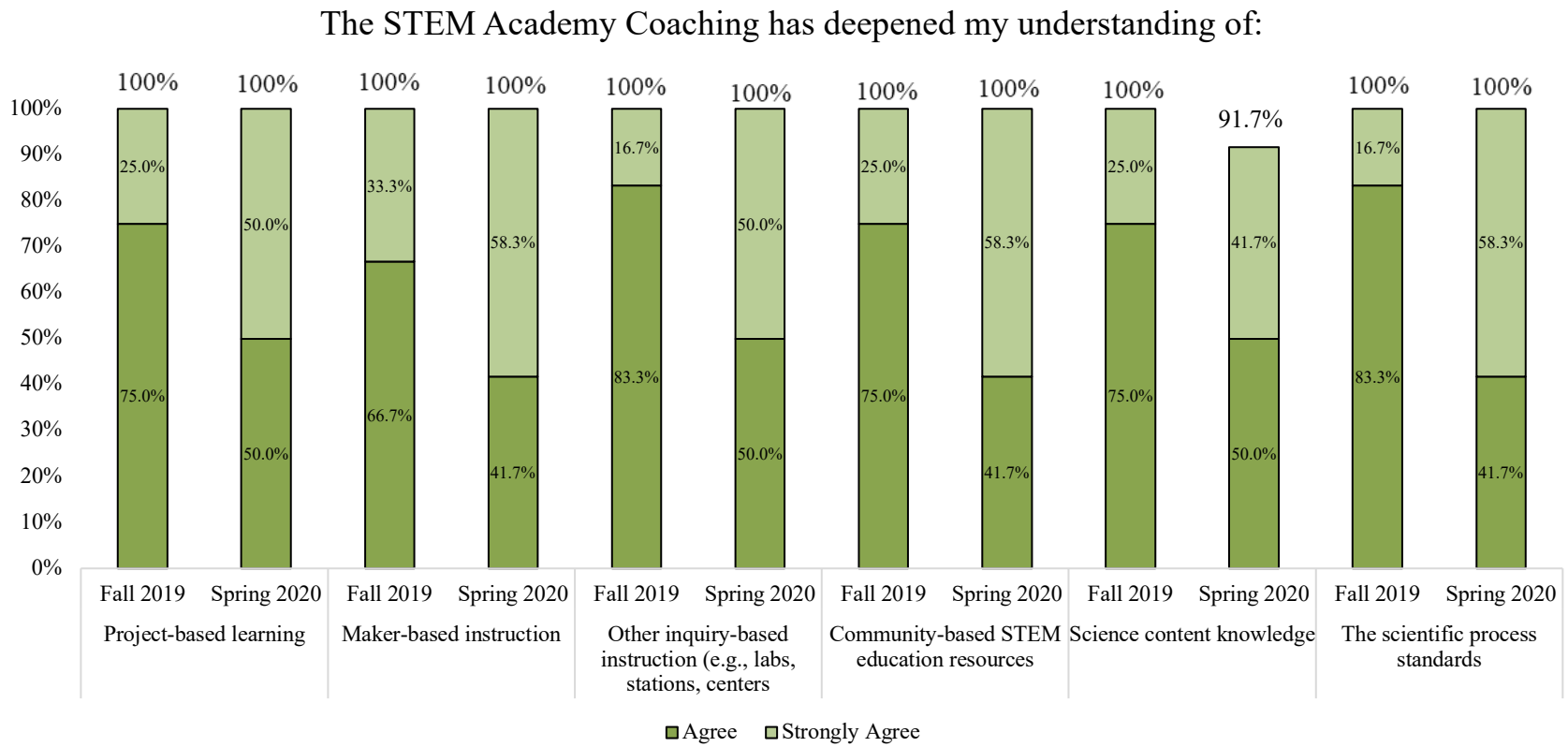

Figure 3. Cohort 2 teachers' perceptions of the influence of STEM Academy coaching on aspects of STEM education (Fall n = 12, Spring n = 12)

Coaching provided tools. Figures 4 and 5 show the change across time in teachers' perceptions of STEM Academy coaching providing tools to implement different aspects of STEM education, disaggregated by cohort. For both cohort 1 and 2 teachers, the percentage of teachers who strongly agreed or agreed that coaching provided the tools they need was 100% for most aspect with some differences across cohorts. For cohort 1 teachers, one aspect, differentiation strategies to support all learners, was below 100% agreement with 88% of teachers agreed or strongly agreed in fall and 86% in spring. For cohort 2 teachers, three aspects were 92% agreement in the fall, increasing to 100% in the spring. These aspects included other inquiry-based instruction (e.g., labs, stations, centers), community-based STEM education resources, and differentiation for all learners.

We prompted teachers in both cohorts on the way in which coaching supported their understanding and utilization of differentiation strategies to support all learners. Six out of the eight cohort 1 teachers provided responses to the question. Themes emerged around motivation provided by the coach to support the teachers in implementing hands-on, experiential learning driven by the scientific method.

Five out of the twelve responding teachers in cohort 2 provided answers to the same question. Themes emerged that through coaching, teachers were able to think of ways to differentiate a lesson, learned several SEL and English Language Learner Strategies, got students to be open with their opinions and knowledge, and that they used questioning to scaffold lessons. One teacher noted that they would continue to struggle in supporting all learners.

When we prompted cohort 1 teachers on how coaching could better support their understanding and utilization of differentiation strategies. Five teachers responded to the prompt. Four of the teachers responded that coaching was already supporting their differentiation needs. The last teacher noted that additional differentiation strategies would be helpful.

Five out of the twelve responding cohort 2 teachers provided responses to the same question. Themes emerged around supporting students from language minorities, given the large number of language minority students on campuses in addition to support for differentiation instruction.

We also prompted teachers to respond to how coaching supported their understanding and utilization of community-based STEM resources. Five out of eight surveyed cohort 1 teachers responded to this question. Themes emerged around exposure to potential community partners and reminders about community resources, including the field trips were positive.

Eight out of the twelve cohort 2 teachers responded to the same question. Themes emerged around real-world connections, setting up field trips and engaging community resources as helpful in addition to reminders about career connections via the monthly newsletters.

We also prompted teachers to explain how coaching could better supported their understanding and utilization of community-based STEM education resources. Three out of the eight surveyed cohort 1 teachers responded to the prompt. Themes emerged around supporting social/semi-professional events where the STEM academy could introduce cohort members and STEM professionals.

Four out of the twelve cohort 2 teachers responded to the same question. Two teachers noted that more resources could be included, while the other two respondents shared the appropriateness of the current number of resources and how the coach was supportive with the resources.

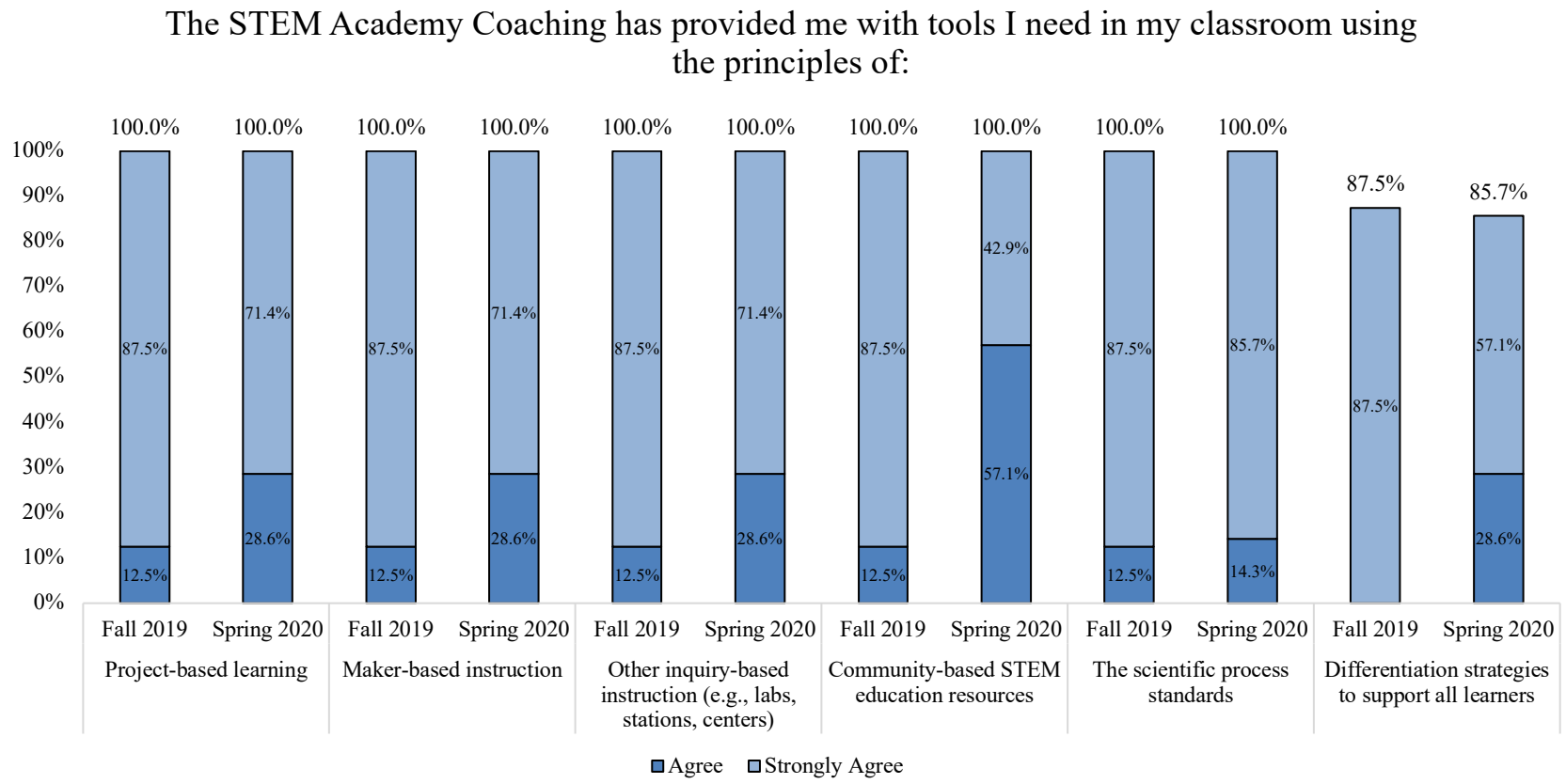

Figure 4. Cohort 1 teachers' perception of STEM Academy coaching providing tools for aspects of STEM education (Fall n = 8, Spring n = 7)

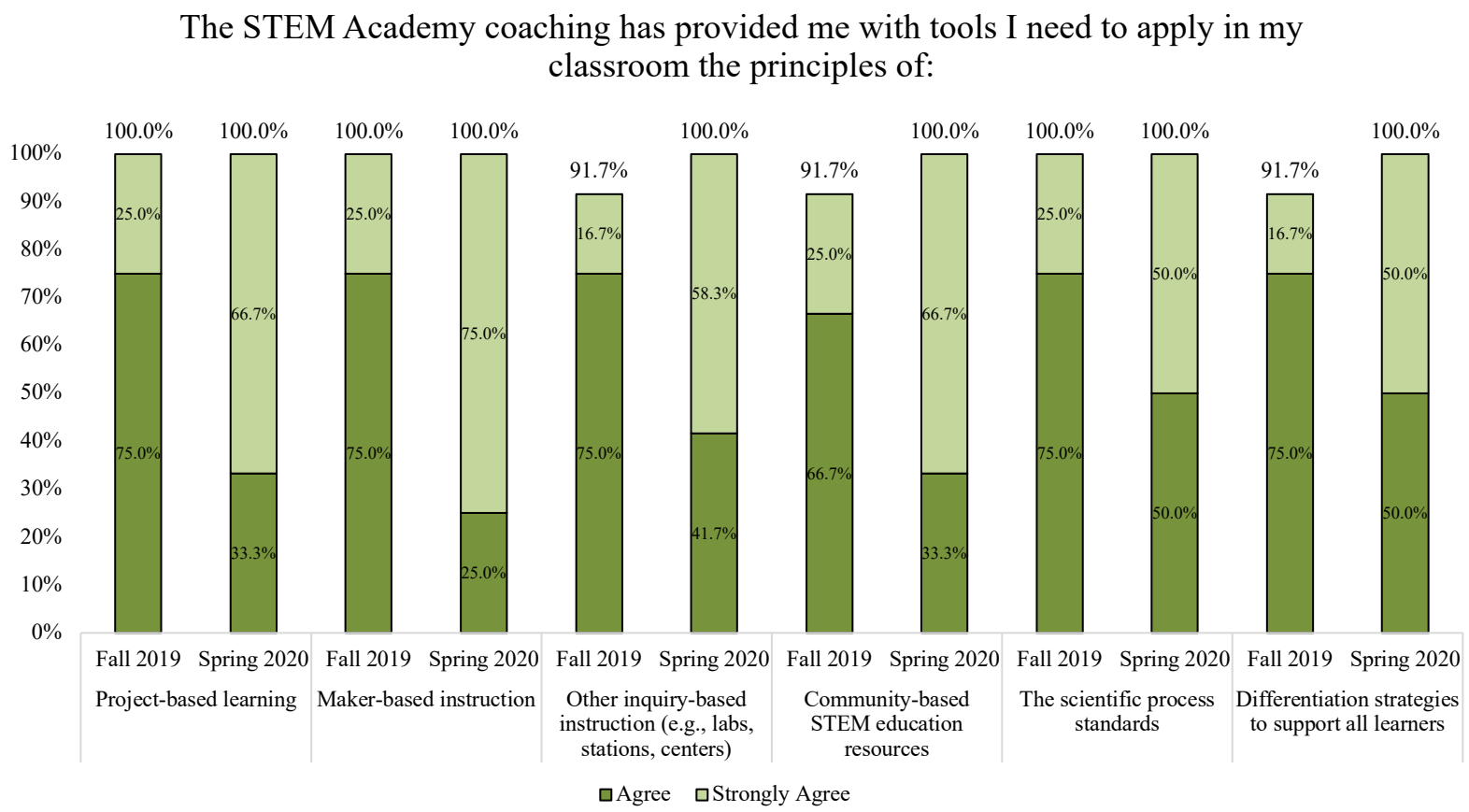

Figure 5. Cohort 2 teachers' perception of STEM Academy coaching providing tools for aspects of STEM education (Fall n = 12, Spring n = 12)

Pre-Conference. Figure 8 shows the change over time in cohort 1 and 2 teachers' perceptions of the pre-planning sessions with their coaches. For cohort 1, teachers' perceptions of the pre-planning sessions were consistently high with 100% agreement for three of four statements. The only exception was "increase my personal science content knowledge". For this statement, one hundred percent of cohort 1 teachers agreed or strongly agreed with this statement in the fall; whereas, 86% of teachers agreed or strongly agreed in spring. For cohort 2 teachers, teachers' perceptions increased from fall to spring for four of four statements, going from either 83% or 92% to 100% for each statement.

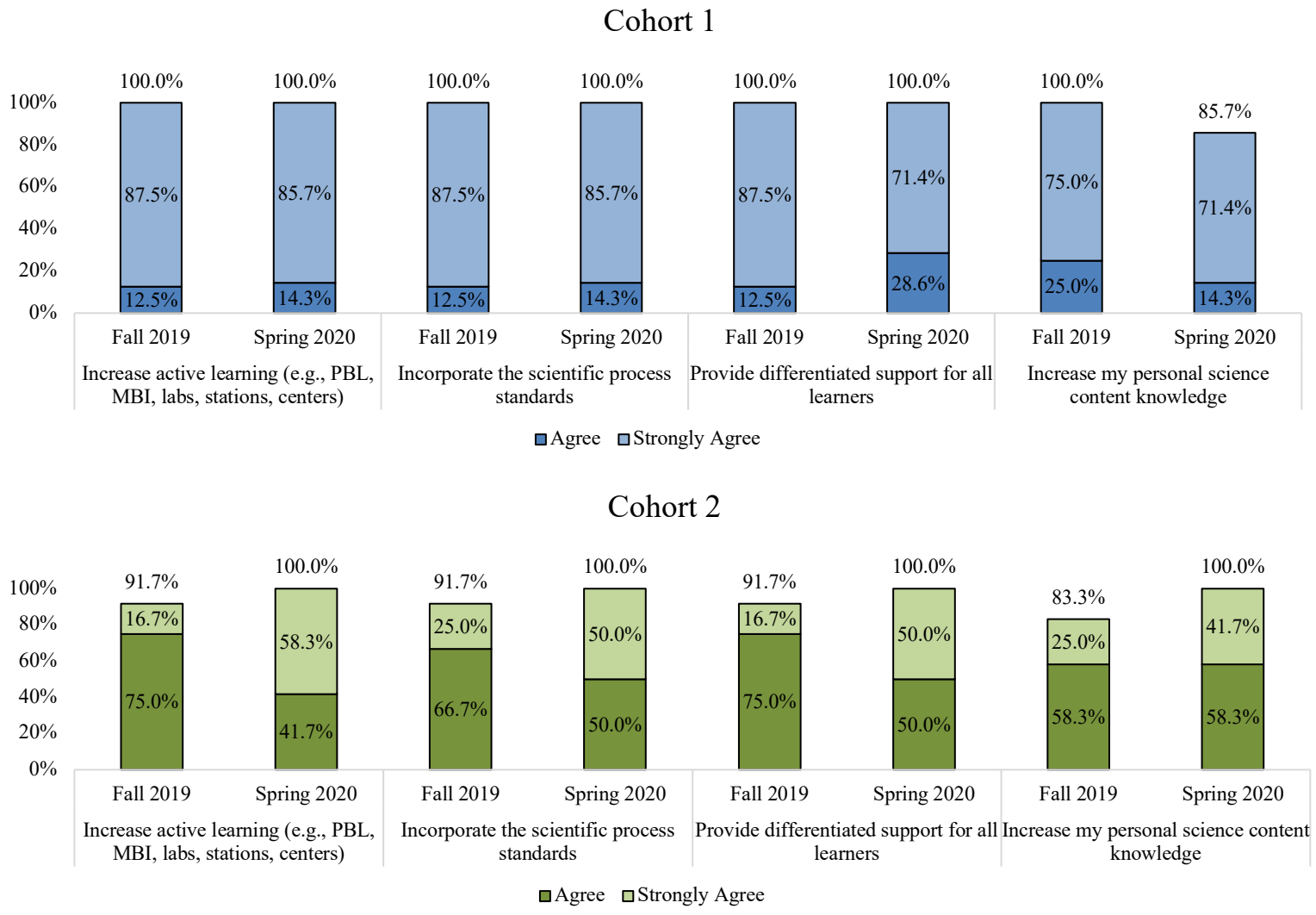

Figure 8. Teachers' perceptions of the pre-planning sessions (cohort 1 Fall n = 8, Spring n = 7; cohort 2 Fall n = 12, Spring n = 12)

Post-Conference. Figures 9 and 10 show the change in teachers' perception in the post-conference session over time for cohort 1 and 2 teachers. In most instances, cohort 1 and 2 teachers rated that they strongly agree or agree. One notable increase in cohort 1 teachers' perception was in "increases my personal science content knowledge". In fall, 88% of cohort 1 teachers strongly agreed or agreed to the statement but this percentage increased to 100% in the spring. Likewise, cohort 2 teachers' perceptions increased related to this item. In the fall, 83% of cohort 2 teachers rated that they strongly agree or agree and in spring 92% rated strongly agree or agree.

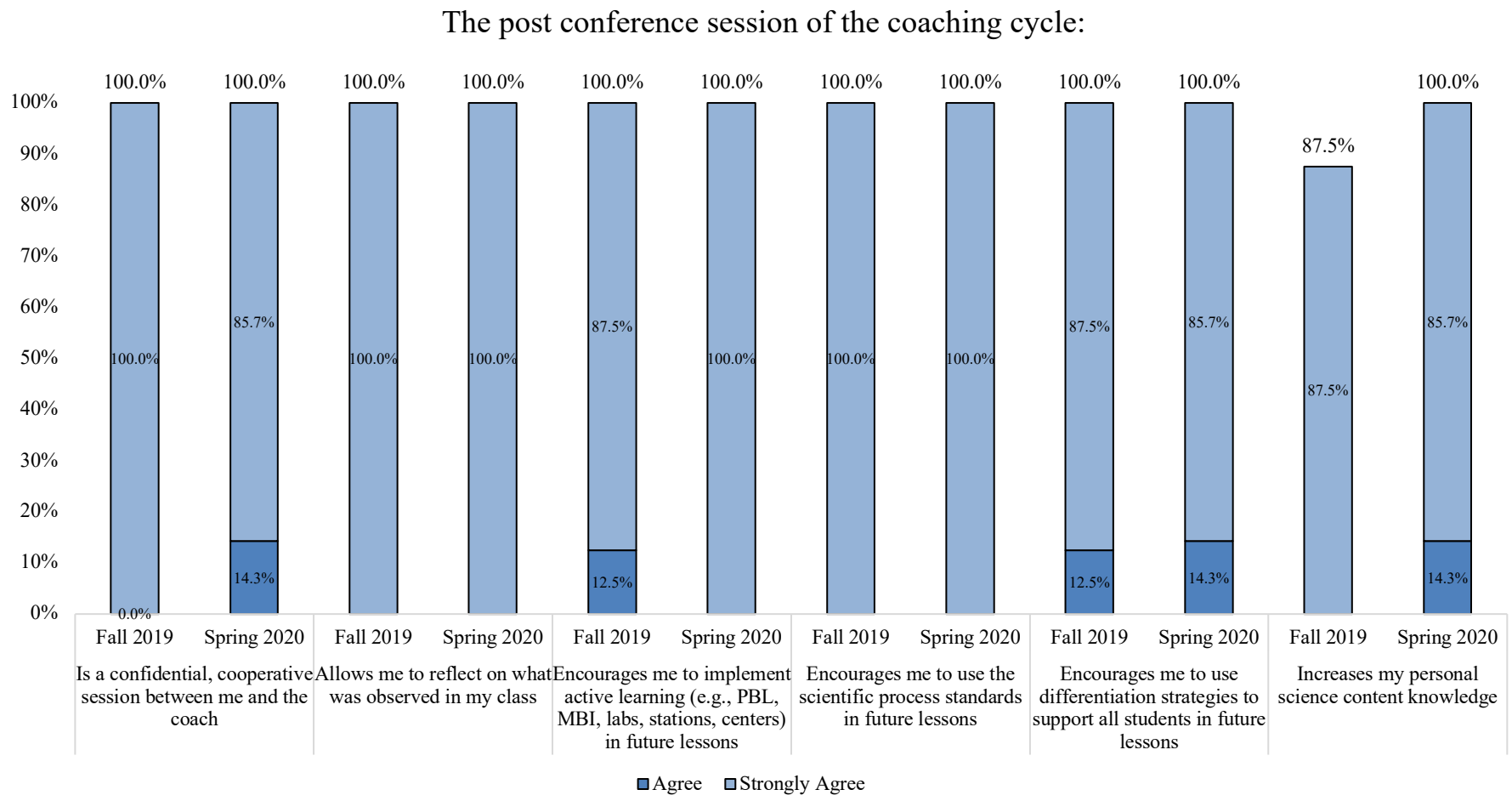

Figure 9. Cohort 1 teachers' perceptions of the post-conference session (Fall n = 8, Spring n = 7)

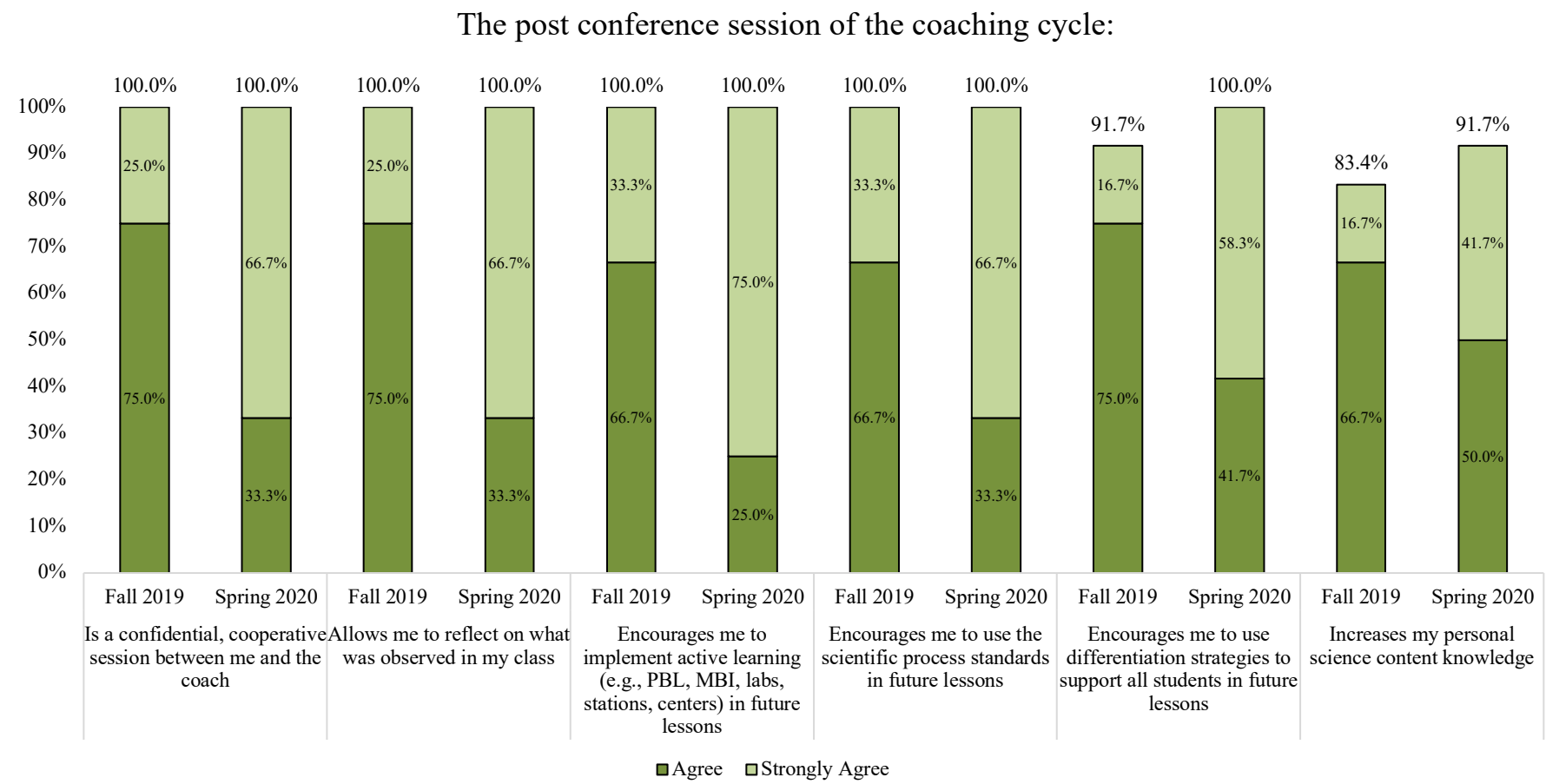

Figure 10. Cohort 2 teachers' perceptions of post-conference sessions (Fall n = 12, Spring n = 12)

Teacher confidence. We also asked teachers about their perceptions of their confidence after the post-conference. Figure 11 shows the change across time for cohort 1 and 2 teachers. Cohort 1 teachers consistently rated high agreement to four of four aspects, as evidenced by the 100% agreement at both time points. For cohort 2 teachers, agreement rates increased for three of four statement and was 100% in both fall and spring for one statement. Cohort 2 teachers reported increases in their confidence from either 83% or 92% to 100% from fall to spring for confidence related to active learning, the scientific process standards, and new science content knowledge.

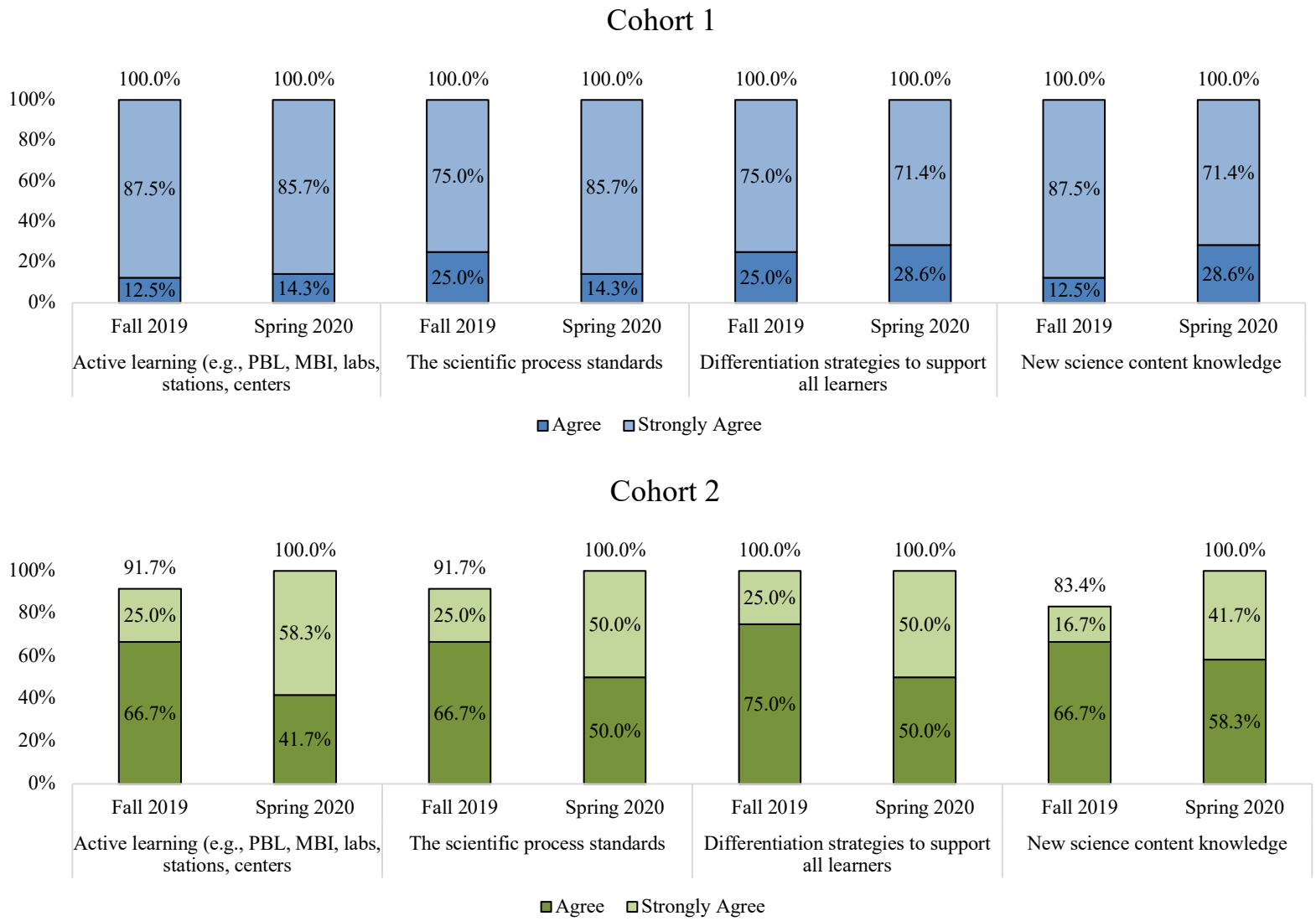

Figure 11. Teachers' perception of confidence after the post-conference session

PLCs. Figure 12 shows the change across time in cohort 1 teachers' perception of the professional learning communities (PLCs). In fall, 100% of cohort 1 teachers agreed or strongly agreed with six of six statements. Agreement rates decreased to 86% in the spring for four of six statements. In the spring, fewer teachers agreed that the PLC at their school provided high quality information about PBL, MBI, how to engage students with STEM career information, and science content. The aspect that remained consistent between the two time points was differentiation strategies for all learners, with 100% of teachers rating strongly agree or agree at both time points.

Figure 13 shows the change in time in cohort 2 teachers' perception of their PLCs. In contrast to cohort 1 teachers, we observe increases in cohort 2 teachers' rating of the PLCs in six out of the six aspects between time points. For example, 83% of cohort 2 teachers rated strongly agree or agree to "differentiation strategies for all learners" in the fall, which increased to 100% in the spring.

Overall, teachers perceived the PLC as beneficial for improving instructional in their individual classrooms in the fall, which decreased for four of six aspects in the spring for cohort 1 and increased in six of six aspects for cohort 2.

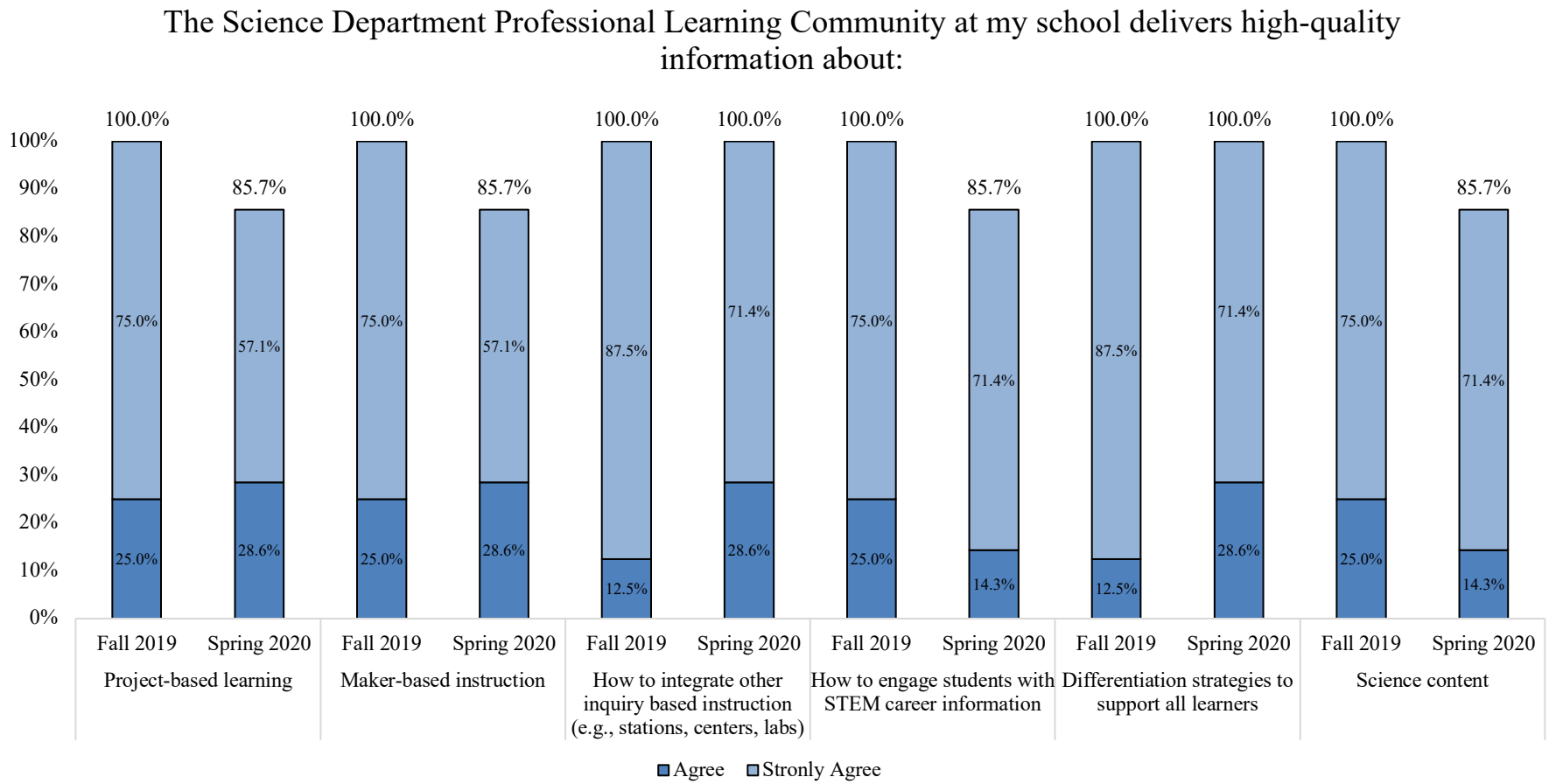

Figure 12. Cohort 1 teachers' perception of PLC practices (Fall n = 8, Spring n = 7)

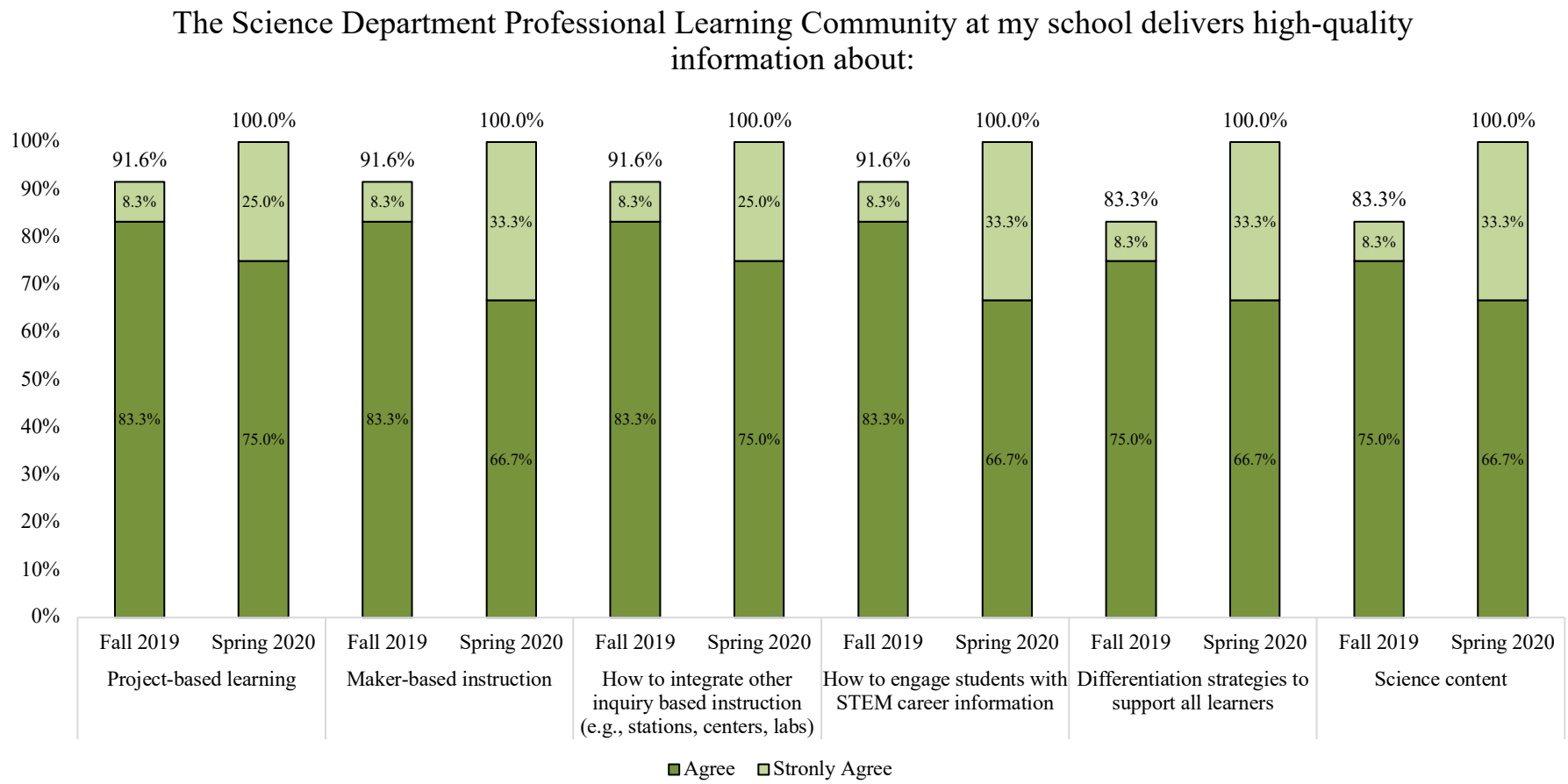

Figure 13. Cohort 2 teachers' perceptions of PLC practices (Fall n = 12, Spring n = 12)

Summary

The STEM Academy coaching and PLC meetings during the 2019-20 school year were designed to reinforce active learning instructional strategies. Teachers worked individually with a SMU instructional coaching for up to seven coaching cycles and PLC meetings. Each cycle included a pre-conference, observation, and post-conference. The coaching cycles, coupled with the PLC meetings, were designed to affect long-term change in teachers' instructional practices, guided by the four key areas of the STEM Academy, which included (a) active learning strategies, (b) scientific process standards, (c) deepened content knowledge, and (d) differentiation across students' needs.

Participating teachers and schools. Twenty-six teachers participated in the summer STEM Academies during the summer of 2019. Twenty-one of these teachers participated in at least one coaching and PLC cycle during the 2019-20 school year. Teachers taught in 11 Dallas ISD middle schools. Participating middle schools included high percentages of students who belong to subgroups who have been historically underrepresented in STEM. Schools had higher number of Black and Hispanic students, more ED students, and more EL students, supporting the need to intervene with students' STEM outcomes.

Fidelity of implementation. A goal of the STEM Academy was for participating teachers to receive up to seven coaching cycles, which included a pre-conference, observation, and post-conference. During the third year, 304 coaching sessions including 98 pre-conferences, 104 observations, and 102 post-conferences were completed. Overall, SMU coaches facilitated 98 complete coaching cycles with the 20 teachers, with an average of five complete cycles per teacher. Implementation was similar across schools with a few notable exceptions. The majority of schools participated in between 43% and 86% of goal number of complete coaching cycles. Schools C and I participated in fewer coaching cycles due to teacher attrition from the program or due to the teacher being on leave. On average, the coaches pre-conferenced with teachers for 15 minutes, observed teachers for 47 minutes, and engaged in post-conferences for 18 minutes. Furthermore, coaches engaged with teachers and leaders in 57 PLC meetings for an average of 30 minutes. Even with schools closed before the end of the school year, evidence of implementation is strong supporting that participating teachers received on average five of seven complete cycles designed to support and increase their utilization of active learning strategies, content knowledge, and differentiation across students' needs.

Teachers' perceptions of coaching. Overall, 100% of teachers agreed that coaching was a valuable aspect of their professional development and supported their utilization of STEM education practices across fall 2019 and spring 2020 timepoints. Between 83% and 100% of teachers across timepoints and cohorts agreed or strongly agreed that the pre-conference helped them increase their use of active learning, incorporate scientific process standards, provided differentiated support for all learners, and increase their personal science content knowledge. Between 83% and 100% of teachers across timepoints and cohorts agreed or strongly agreed that the post conference was confidential and reflective; encouraged the implementation of active strategies, the scientific process standards, differentiations strategies, and increased their content knowledge. Furthermore, teachers reported high confidence in implementing STEM instruction after the post-conference sessions including active learning strategies, scientific process

standards, differentiation strategies, and new science content knowledge. Between 83% and 100% of teachers agreed or strongly agreed to confidence in implementing these different aspects of STEM education.

Teachers' perceptions of the PLC. Between 83% to 100% of teachers agreed that the science department PLC delivers high quality information about STEM instruction practices. Overall, teachers agreed or strongly agreed that the STEM Academy coaching improved their implementation of STEM instructional practices. This is evidenced by the high agreement on the multiple aspects of the coaching cycle (pre-conference, post-conference, PLCs). Specifically, cohort 2 teachers perceived PLC meetings to be beneficial, with the agreement rates increasing for all six indicators as the year progressed. Conversely, cohort 1 teachers began the year with 100% agreement towards the beneficial statements about PLCs, and this agreement rate decreased during the spring for four of the six indicators. This indicates that there may be opportunities for improvement related to PLCs near the end of the year for teachers in their third year of the program.

Recommendations

This report highlights areas of strength and opportunity for others interested in implementing interventions similar to the STEM Academy. As such, the evidence presented in this report supports three key recommendations including:

a. Increase the amount of content knowledge integration for the pre-conference. This is evidenced by a decrease in the percent agreement among cohort 1 teachers who rated this as a beneficial aspect of the pre-conference. It is also evidenced by the decrease in their perception of how their understanding was deepened.

b. Increase the amount of differentiation strategies for teachers to use in the classroom. This is evidenced by a decrease in the percentages of teachers in cohort 1 who agreed that the STEM Academy provided the tools to support differentiation.

c. Continue to implement the coaching with a similar structure including a pre-conference, post-conference, and PLC. Most teachers agreed or strongly agreed that the components of the STEM Academy coaching and coaching overall were beneficial to their professional growth.

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Appendix A – STEM Teaching Observation Protocol

SMU | Annette Caldwell Simmons School of Education & Human Development

STEM Teaching Observation Protocol

Teacher: _____ **Coach:**_____ **Observation Date:**_____ **Double Observation**
Campus:_____ **Start Time:** _____ **End Time:** _____ **Y N**
Instructional format (circle all that apply): **Number of Students:** _____ **Grade Level:** _____ **Cycle:** _____
Whole class Individual Small group **Day of Week:** _____ **Class Type (Regular/PreAP):** _____

Rate the extent to which each indicator was:

0= *Not observed: Not demonstrated at all*

1= *Emerging: This is an opportunity for growth; demonstrated at a low level*

2= *Proficient: Demonstrated at an expected level*

3=*Exemplary: Demonstrated at a high level*

Domain	Indicator	Score (0-3)	Notes
1. Lesson Structure	a. The lesson objectives are clear to students		
	b. The lesson is structured to build understanding and maintain a sense of purpose		
	c. The lesson includes an investigative or problem-based approach (e.g., students investigate or discover scientific ideas)		
	d. The lesson is clearly connected to students' prior knowledge and experiences		
2. Learner Centered Instruction	a. Students explain and justify their thinking		
	b. Students engage in behaviors reflective of the process standards		
	c. Students direct their own learning (e.g., are provided with flexibility or choices during the lesson)		
	d. Teacher engages students in appropriately challenging content (e.g., critical thinking, problem-solving strategies)		
	e. Teacher openly welcomes discussion about mistakes or misconceptions		
	f. Teacher poses cognitively demanding, open-ended questions		
	g. Teacher explicitly connects learning to the real world (e.g., careers, current events)		
	h. Teacher explicitly connects learning to other disciplines (e.g., social studies, mathematics)		
	i. Teacher involves all students (e.g., calling on non-volunteers, facilitating student-student interaction, checking in with hesitant learners, etc.)		
	j. Teacher is attentive to students' academic and social/emotional needs (e.g., use of cooperative learning, language-appropriate strategies and materials, awareness of student comfort)		
3. Evaluation and Feedback	a. Teacher uses a variety of assessment strategies (e.g., large group questions, one on one discussion, small group feedback, exit tickets, quiz or test, informal progress check)		
	b. Teacher provides feedback focused on expanding learning and understanding (formal and informal formative), not correctness or the end product (summative)		
	c. Students evaluate their own or other's work		
4. Management and Discipline	a. Students are on task throughout the class		
	b. Students demonstrate an understanding of expectations for behavior		
	c. Students demonstrate an understanding of classroom procedures/routines		
	d. Teacher efficiently manages time (e.g., transitions, wait time, pacing)		
	e. Teacher redirects off task or disruptive behavior *(NA if no disruptive behavior)*		

STEM Teacher Observation Report

Summary of Lesson (optional):
Praise/Reinforcement:
Polish/Refinement:
Recommendations/Questions:

Coach Initials: _____

Appendix B – Teacher Coaching Evaluation Survey

STEM Academy for Science Teachers and Leaders: On-Campus Support Evaluation for Teachers

To what extent do you agree with the following statements?

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. The STEM Academy coaching has been valuable in my professional development.				
2. The STEM Academy coaching deepened my understanding of: o project-based learning o maker-based instruction o other inquiry-based instruction (e.g., labs, stations, centers) o community-based STEM education resources o science content knowledge o the scientific process standards				
3. The STEM Academy coaching provided me with tools I need to apply in my classroom using the principles of: o project-based learning o maker-based instruction o other inquiry-based instruction (e.g., labs, stations, centers) o community-based STEM education resources o the scientific process standards o differentiation strategies to support all learners				
4. The pre-planning session of the coaching cycle helps me think about how my lesson will: • increase active learning (e.g., PBL, MBI, labs, stations, centers).				

• incorporate the scientific process standards. • provide differentiated support for all learners. • increase my personal science content knowledge.				
5. The post conference session of the coaching cycle: o is a confidential, cooperative session between me and the coach. o allows me to reflect on what was observed in my class. o encourages me to implement active learning (e.g., PBL, MBI, labs, stations, centers)in future lessons. o encourages me to use the scientific process standards in future lessons. o encourages me to use differentiation strategies to support all students in future lessons. o increases my personal science content knowledge.				
6. After the post conference session, I feel confident I will be able to implement: • active learning (e.g., PBL, MBI, labs, stations, centers • the scientific process standards • differentiation strategies to support all learners • new science content knowledge				
7. The STEM Academy Professional Learning Community at my school delivers high-quality information about: o project-based learning o maker-based instruction o how to integrate other inquiry based instruction (e.g., stations, centers, labs)				

o how to engage students with STEM career information o differentiation strategies to support all learners o science content				

8. In what ways, if any, did coaching support your understanding and utilization of **active learning (e.g., PBL, MBI, labs, stations, centers)**?

9. How could coaching better support your understanding and utilization of **active learning (e.g., PBL, MBI, labs, stations, centers)**?

10. In what ways, if any, did coaching support your understanding and utilization of **the scientific process standards**?

11. How could coaching better support your understanding and utilization of **the scientific process standards**?

12. In what ways, if any, did coaching support your understanding and utilization of **differentiation strategies to support all learners**?

13. How could coaching better support your understanding and utilization of **differentiation strategies to support all learners**?

14. In what ways, if any, did coaching support your understanding and utilization of **community-based STEM education resources**?

15. How could coaching better support your understanding and utilization of **community-based STEM education resources**?

16. Overall, which areas of the STEM Academy including on-campus support and the summer academy were **most useful** to you?

17. Overall, which areas of the STEM Academy including on-campus support and the summer academy **need improvement**?

18. Is the STEM Academy Professional Learning Community different from your campus-led professional learning communities? If yes, how so?

19. Is there anything else you would like to share about the STEM Academy?

Appendix C – Protocols Used During PLC Meetings

Traffic Jam

A team-building activity that mirrors the characteristics of a PLC.

Time allotted: 45 minutes (25 minutes for task, 20 minutes for debrief/discussion)

Materials: 7 mouse pads, cardstock paper, or masking tape to mark off the "stones"

Participants: 6 volunteers

There are seven stepping stones placed on the floor in a line, with spaces between them. On the three left-hand stones, facing right, stand three of the people. The other three people stand on the three right-hand stones, and face left. The center stone is not occupied to start.

The challenge: exchanging places

Participants move so that the people originally standing on the right-hand stepping stones end up on the left-hand stones, and those originally standing on the left-hand stepping stones end up on the right-hand stones, with the center stone again unoccupied.

The rules:

- After each move, each person must be standing on a stepping stone.
- Participants may only move forward, in the direction they originally face.
- There are two ways to move forward:
  - Participants may *jump* one person if there is an empty stone on the other side. Only one person may be *jumped,* and that person must be facing the *jumper.* (i.e., someone from the other side of three).
  - Participants may *slide* to an empty stone directly in front of them.
- If the group finds itself in a "traffic jam," participants must go *all the way back* to the starting position and try again. They may *not* simply redo the last few moves.

Explanation:
https://www.youtube.com/watch?v=KizRWfuT5uQ

Compass Points

An exercise in understanding preferences in group work. Developed in the field by educators affiliated with the National School Reform Faculty (NSRF).

Time: 35 minutes

1. The room is divided into four sections: North, South, East, and West.
2. PLC members are asked to place themselves at one of the four stations based on their style in working as part of a group (see below). It is worth noting that most teachers see themselves as some combination of these four; they should nonetheless commit to one that is most dominant in their style. (3 minutes)

North
Acting–"Let's do it."
Likes to act, try things, plunge in

West
Attention to Detail–Likes to know the who, what, when, where and how before acting

East
Speculating–Likes to look at the big picture and possibilities before acting

South
Feeling–Likes to know that everyone's feelings have been taken into consideration and that their voices have been heard before acting

3. At each Compass Point, the teachers answer the following and post their group responses on chart paper. (20 minutes)
   a. List three strengths of your style.
   b. List three limitations of your style.
   c. Which style do you find most difficult to work with and why?
   d. What do people from other styles need to know about you so you can work together effectively?
   e. What do you value about each of the other three styles?
4. The group of teachers at each Compass Point shares out to the large group. (12 minutes)

Peeves & Traits Protocol

Time: 20 minutes

1. Participants are each given an index card (5″ × 7″).
2. On one side of the card, participants write down *one* pet peeve they have regarding working in groups or at teacher meetings. They begin their pet peeve with the following phrase:

   "It burns my butt when . . ."

   (e.g., *"It burns my butt when people come late to meetings,"* or *"It burns my butt when people are interrupted during discussions,"* or *"It burns my butt when one person does all the talking,"* etc.) (5 minutes)
3. On the other side of the card, participants write *one* trait about themselves that everyone in the group should know about them in order to work best with them in a group setting. They begin their trait with the following phrase:

   "One thing you all should know about me is . . ."

   (e.g., *"One thing you all should know about me is that my silence is not due to disinterest; I just need process time,"* or *"One thing you all should know about me is I get excited during discussions and sometimes people are put off by my enthusiasm,"* or *"One thing you all should know about me is I am very visual and need to see on chart paper or on the Smart Board what we're discussing,"* etc.) (5 minutes)
4. Participants share both sides of their card in volunteer order without discussion (or elaborating on the card). (10 minutes)

Norm-Setting Protocol

Time: 60 minutes

1. The coach gives participants three index cards (5″ × 7″) and a black marker.
2. Writing on only one side of the card, participants write down *one* group norm they would like to see. No more than one norm per card; participants can write as many cards as they like. (5 minutes)
3. The coach collects all cards and randomly passes them out to participants. Each participant reads the cards she has been given and other participants share their card if theirs is the same or closely related to the one being read. As cards are read, they are collected by the facilitator and posted in groups of like norms (e.g., "respect," "disagreements," "agenda," etc.). Discussion is limited to grouping norms and identifying similarities between norms. (20 minutes)
4. *Dissent option.* After the coach posts all cards into categories (though some will be "stand alones"), participants can propose to eliminate any norm. If one other participant "seconds" the opinion that a particular norm be eliminated, the index card of that norm is removed. (5 minutes)
5. As a whole group, the facilitator leads a discussion of condensing each group of norms into a single norm (without stringing them all together with the use of "and"). The goal is to word a single norm that captures the essence of the group of like norms. (30 minutes)
6. *Next steps.* The facilitator asks for a volunteer to do whatever "wordsmithing" is still needed for the norms, after the meeting. The final product is a list of four to six group norms that will govern all discourse in the PLC. [I like to make a poster of the final list and have all PLC members sign the poster. It is then displayed prominently in the meeting room.] Hereafter, the group norms should appear at the bottom of each meeting agenda.

Tuning Protocol

Developed by Joseph McDonald and David Allen.

1. Introduction (5 minutes)
   - Facilitator briefly introduces protocol goals, guidelines, and schedule
   - Participants briefly introduce themselves (if necessary)
2. Presentation (15 minutes)

   The presenter has an opportunity to share the context for the student work:
   - Information about the students and/or the class—what the students tend to be like, where they are in school, where they are in the year
   - Assignment or prompt that generated the student work
   - Student learning goals or standards that inform the work
   - Samples of student work—photocopies of work, video clips, etc.—with student names removed
   - Evaluation format—scoring rubric and/or assessment criteria, etc.
   - Focusing question for feedback
   - Participants are silent; no questions are entertained at this time
3. Clarifying Questions (5 minutes)
   - Participants have an opportunity to ask "clarifying" questions in order to get information that may have been omitted in the presentation that they feel would help them to understand the context for the student work. Clarifying questions are matters of "fact."
   - The facilitator should be sure to limit the questions to those that are "clarifying," judging which questions more properly belong in the warm/cool feedback section.
4. Examination of Student Work Samples (15 minutes)
   - Participants look closely at the work, taking notes on where it seems to be in tune with the stated goals, and where there might be a problem. Participants focus particularly on the presenter's focusing question.
   - Presenter is silent; participants do this work silently.
5. Pause to reflect on warm and cool feedback (2–3 minutes)
   - Participants take a couple of minutes to reflect on what they would like to contribute to the feedback session.
   - Presenter is silent; participants do this work silently.
6. Warm and Cool Feedback (15 minutes)
   - Participants share feedback with each other while the presenter is silent. The feedback generally begins with a few minutes of warm feedback, moves on to a few minutes of cool feedback (sometimes phrased in the form of reflective questions), and then moves back and forth between warm and cool feedback.
   - Warm feedback may include comments about how the work presented seems to meet the desired goals; cool feedback may include possible "disconnects," gaps, or problems. Often participants offer ideas or suggestions for strengthening the work presented.
   - The facilitator may need to remind participants of the presenter's focusing question, which should be posted for all to see.
   - Presenter is silent and takes notes.

7. Reflection (5 minutes)
   - Presenter speaks to those comments/questions he or she chooses while participants are silent.
   - This is not a time to defend oneself, but is instead a time for the presenter to reflect aloud on those ideas or questions that seemed particularly interesting.
   - Facilitator may intervene to focus, clarify, etc.
8. Debrief (5 minutes)
   - Facilitator-led discussion of this tuning experience.

Consultancy Protocol

The Consultancy Protocol was developed by Gene Thompson-Grove, Paula Evans, and Faith Dunne as part of the Coalition of Essential Schools' National Re:Learning Faculty Program, and further adapted and revised as part of the work of NSRF.

A consultancy is a structured process for helping an individual or a team think more expansively about a particular, concrete dilemma.

Time: Approximately 50 minutes

Roles:

Presenter (whose work is being discussed by the group)

Facilitator (who sometimes participates, depending on the size of the group)

1. The presenter gives an overview of the dilemma with which s/he is struggling, and frames a question for the consultancy group to consider. The framing of this question, as well as the quality of the presenter's reflection on the dilemma being discussed, are key features of this protocol. If the presenter has brought student work, educator work, or other "artifacts," there is a pause here to silently examine the work/documents. The focus of the group's conversation is on the dilemma. (5–10 minutes).

2. The Consultancy group asks clarifying questions of the presenter—that is, questions that have brief, factual answers. (5 minutes)

3. The group asks probing questions of the presenter. These questions should be worked so that they help the presenter clarify and expand his/her thinking about the dilemma presented to the Consultancy group. The goal here is for the presenter to learn more about the question s/he framed or to do some analysis of the dilemma presented. The presenter may respond to the group's questions, but there is no discussion by the consultancy group of the presenter's responses. At the end of the 10 minutes, the facilitator asks the presenter to restate his/her question for the group. (10 minutes)

4. The group talks with each other about the dilemma presented. (15 minutes)

   Possible questions to frame the discussion:

   What did we hear?

   What didn't we hear that we think might be relevant?

   What assumptions seem to be operating?

   What questions does the dilemma raise for us?

   What do we think about the dilemma?

   What might we do or try if faced with a similar dilemma? What have we done in similar situations?

Members of the group sometimes suggest actions the presenter might consider taking. Most often, however, they work to define the issues more thoroughly and objectively. The presenter doesn't speak during this discussion, but instead listens and takes notes.

5. The presenter reflects on what s/he heard and on what s/he is now thinking, sharing with the group anything that particularly resonated for him or her during any part of the Consultancy. (5 minutes)

6. The facilitator leads a brief conversation about the group's observation of the Consultancy process. (5 minutes)

Charette Protocol

Original written by Kathy Juarez, Piner High School, Santa Rosa, California.
Revised by Gene Thompson-Grove, January 2003, NSRF.
Revised by Kim Feicke, October 2007, NSRF.

The following list of steps attempts to formalize the process for others interested in using it.

1. A team or an individual requests a charette when
   a. the team/individual is experiencing difficulty with the work,
   b. a stopping point has been reached, or
   c. additional minds (thinkers new to the work) could help move it forward.

2. A group, ranging in size from three to six people, is formed to look at the work. A moderator/facilitator is designated from the newly formed group. It is the moderator's job to observe the charette, record information that is being created, ask questions along the way, and occasionally summarize the discussion.

3. The requesting team/individual presents its "work in progress" while the group listens. (There are no strict time limits, but this usually takes 5 or 10 minutes.) Sometimes, the invited group needs to ask two or three clarifying questions before moving on to step 4.

4. The requesting team/individual states what it needs or wants from the charette, thereby accepting responsibility for focusing the discussion. The focus is usually made in the form of a specific request, but it can be as generic as "How can we make this better?" or "What is our next step?"

5. The invited group then discusses while the requesting team/individual listens and takes notes. There are no hard and fast rules here. Occasionally (but not usually) the requesting team/individual joins in the discussion process. The emphasis is on improving the work, which now belongs to the entire group. The atmosphere is one of "we're in this together," and our single purpose is "to make a good thing even better."

6. When the requesting team/individual knows it has gotten what it needs from the invited group, they stop the process, briefly summarize what was gained, thank the participants and moderator, and return to the "drawing board."

7. Debrief the process as a group.

Notice & Wonder Protocol—Student Work

A protocol for analyzing and discussing student work.

Time: 45 minutes

1. Participants are presented with a sample of student work pertaining to their practice. This might be a single piece of work from one student copied for all participants or class samples of the same assignment, with each participant getting an individual student's work. It generally provides richer discussion if the work is corrected or scored by the presenting teacher.

2. The presenter of the work briefly provides the context in which the work was assigned (e.g., grade level of students, description of the unit on which the students were working, prior knowledge of students, how long the students were given to complete the work, etc.). *Participants are silent and take notes.* (5 minutes)

3. The participants ask clarifying questions of the presenter. These are questions that provide information that participants feel they need to better understand the context. The presenter answers each clarifying question briefly, in a sentence or two. (5 minutes)

4. Each participant is given a 5″ × 7″ index card. Quietly and individually, participants write three observations evident in the work sample. These observations must be free of inference or speculation; they are factually based from objectively examining the work sample. Each observation starts with the phrase, *"I notice that. . . ."* (5 minutes)

5. *Round 1.* In turn, each participant reads aloud one new observation that has not yet been shared, each time beginning with the phrase, *"I notice that . . . ."* After the last participant shares one new observation, the first participant offers a second new observation and the process continues until all observations have been shared aloud, *without discussion. The presenter is quiet and takes notes.* (5 minutes)

6. Each participant turns over his index card and quietly writes three suggestions or question-statements based on any observations heard in Round 1. These comments attempt to offer possible suggestions or pose questions for the presenter to think about. No attempt should be made to *evaluate* the work or the assignment; the intent is for the presenter to gain insights into how to strengthen the assignment or the method used to score the assignment. Each comment starts with the phrase, *"I wonder if . . . ."* (5 minutes)

7. *Round 2.* In turn, each participant reads aloud one new thought that has not yet been shared, each time beginning with the phrase, *"I wonder . . . ."* This process continues as in Round 1 until all speculations have

been shared aloud, *without discussion. The presenter is quiet and takes notes.* (10 minutes)

8. *Reflection.* The presenter quietly reviews her notes and then reflects aloud to the group any thoughts related to the comments she heard. *The participants are silent.* (5 minutes)

9. *Debrief.* The team now debriefs the *process* and refrains from additional comments pertaining to the student work samples. (5 minutes)