



# **STEM Academy for Science Teachers and Leaders: Coaches Training and Development**

RESEARCH IN  
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# **STEM Academy for Science Teachers and Leaders: Coach Training and Development**

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## Abstract

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The purpose of this report is three-fold. First, we offer an overview of the ongoing support that a team of instructional coaches provided during the 2018-2019 academic year to teachers and leaders who are a part of the STEM Academy for Science Teachers and Leaders. Second, the training provided for those instructional coaches, which allowed them to fully understand the coaching model utilized during the previous year of ongoing support, is summarized. Finally, this report describes the forms used and the procedures developed when scheduling each coaching cycle for teachers and leaders.

Over the course of the 2018-2019 academic year, seven cycles of coaching occurred, each involving a pre-conference, observation, and post-conference. At schools with systems-level program implementation (e.g., two or more science teachers participating), the leader also participated in a pre-conference, PLC, post-conference, and frequently, classroom walk-throughs. These cycles began in October of 2018 and concluded in May of 2019. The coaches followed developed procedures for both organizing and conducting these meetings.

To begin the training process, e



# **STEM Academy for Science Teachers and Leaders: Coach Training and Development**

## **Introduction**

The STEM Academy for Science Teachers and Leaders (STEM Academy) project includes two major components for participants. For teachers, an intensive 90-hour summer academy focused on inquiry-based instruction is followed by academic year support comprised of regular on-site coaching and observation with an SMU coach. Each campus that has two or more participating teachers also has a leader participant, typically an instructional coach or assistant principal. The leader attends a two-day professional development workshop during the summer and then receives coaching support throughout the academic year. For additional detail about the project, please reference previous evaluation reports (Adams, Hatfield, Cox, & Ketterlin-Geller, 2018; Adams, Hatfield, Cox, Mota, Sparks, & Ketterlin-Geller, 2018; Perry et al., 2017; Pierce, Adams, Rhone, Hatfield, & Ketterlin-Geller, 2019).

In order to deliver the onsite coaching support during the academic year, STEM Academy staff recruited, trained, and then supported one coach for the 2017-2018 school year and five coaches for the 2018-2019 school year. The initial coach from 2017-2018 was retained as the lead coach for the 2018-2019 school year. The increased number of teachers, leaders, and campuses participating in year two of the project necessitated this expansion; however, the STEM Academy team also recognized the increased need for uniform training and calibration exercises. Since the primary observation tool, the STEM Teacher Observation Protocol (STEM TOP) was also being utilized as a part of the research agenda, it was essential that the coaches approach their classroom observations in as consistent a manner as possible.

## **Ongoing Academic Year Support Model**

During the academic year of 2018-2019, a team of instructional coaches independently provided ongoing support during the academic year to STEM Academy participants. The ongoing support included, one-on-one coaching for teachers and leaders and professional learning community (PLC) facilitation for teachers. Seven cycles of each support interaction were conducted.

### **Teacher one-on-one Coaching**

During the spring semester, the coach led four different PLC meetings for the STEM Academy participants at their campus. Depending on the campus, additional science teachers who were not in the STEM Academy also attended. These were developed by the STEM Academy team and were intended to provide an opportunity for the participating teachers to continue to develop an understanding of and reflect on the pedagogical practices that were discussed at the summer STEM Academy. Action plans were created during the PLC to support how the practices could be used to affect a wide range of students.

For campuses with only one teacher participating in the STEM Academy (single teacher campuses), a PLC was also conducted. During the first cycle of the year, a coach attempted to host a remote PLC with all of the single campus teachers. This proved to be challenging to schedule and have everyone participate due to after school commitments such as tutoring and staff meetings at the campuses. The PLC was redesigned to an online discussion board. The coach identified a reading for the teachers to read. After reading the article, the teachers were asked to post responses to questions and respond to two peers. The assigned reading in the fall was based on areas of growth the coaches identified for the teachers based on the observations. In the spring, the readings aligned to the PLC designed for the campuses with two or more teachers.

## **Training for Coaches**

In year one of the STEM Academy for Science Teachers and Leaders, ongoing support was provided to 15 teachers and a leader from each of six participating schools. All of the coaching was conducted by a single STEM Academy team member. In year two, the program grew to 42 teachers across 15 schools, 10 of which also had a leader participating. Based on the growth in the program, additional staff was needed to provide the ongoing support during the academic year.

The incoming coaches were recruited from various backgrounds, and therefore needed to have training that established a shared understanding of the goals of the program and the coaching model. For more information about the professional background of each coach, see Appendix A.

Initial training for the coaching team occurred before the first cycle in the schools began in October of the 2018-2019 academic year. The training was approximately 35 hours total, and included individual tasks, as well as individual meetings with the lead coach and professional development with the full coaching team. As the first requirement, all coaches were required to complete research compliance training for human subjects.

The training for the coaches provided a baseline of knowledge and desired actions necessary to execute the coaching cycles with each teacher and leader. These were achieved by:

- preparing the coaches to engage in professional discourse grounded in trust and mutual respect,

- developing skills necessary to conduct crucial conversations with a wide range of individuals,



familiarizing the coaches with the four guiding principles of the academy and informing the coaches of the approach and strategies used throughout the initial year of coaching,

understanding of the Scientific Process Standards, and their relationship to the frameworks of active learning facilitated during the summer academy, and

utilizing the Science, Technology, Engineering, and Mathematics Teacher Observation Protocol (STEM TOP) and other discussion facilitation forms as tools and integral parts of the systems of support for the teacher coaching cycles.

## **Developing Professional Coaching Relationships**

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The first part of the training for the coaching team focused on building professional relationships with teachers and leaders. This portion of the training used article readings and discussion to pinpoint crucial ideas and actions designed to enable a growth mindset. This portion of the training utilized the work of Jim Knight, a senior research associate at the University of Kansas, considered to be one of the leading researchers in coaching. He has been Co-PI or PI for grants from the Department of Education for the last decade. Two articles were specifically selected, from Knight's larger body of work, to provide a perspective that orients the coaches, the leaders, and the teachers being coached as collegial collaborators. One of the main principles that Knight's work espouses is to consider the teachers as valued sources of knowledge. When coaches acknowledge teachers as collaborators, a culture that is more open to change emerges (Knight, 2011). The ultimate goal of this portion of the training was to provide the coaches with the tools necessary to improve culture at the camw nh 38.0002CaW\*hf0000 g/F3 12 G[(im)-13(prove)7( c)4(ult)

trends, which served to establish better understanding and create a more cohesive interpretation of their roles as coaches of the academy.

*Figure 1 Items representing beliefs about coaching. From Better Conversations: Coaching ourselves and each other to be more credible, caring, and connected (Knight, 2015).*

During the next training activity, the coaches ranked ten habits (Figure 2) in order of relevance to their practice as coaches (Knight, 2015). The team members individually shared with the group about their thought process in ranking the habits using examples from their own experiences of being coached or as coaches. As a summary exercise, the team members reflected on their level of agreement to the statement “building trust is the main habit,” which was a focal point of the lecture that was viewed at the beginning of the session (Knight, 2016). The lead coach then facilitated the coaching team in developing

*Figure 2 Items representing habits to form while coaching. From Better Conversations: Coaching ourselves and each other to be more credible, caring, and connected*



*Figure 3 Crucial Conversations Model from Crucial Conversations Participant Toolkit (McMillan et al., 2012).*

The next two phases of conducting crucial conversations occur while the conversation is taking place, and the coaches participated in role playing and reflective discussion about identifying ‘My Meaning’ and also determining ‘Their Meaning’ (McMillan et al., 2012). To conclude the training, the coaches looked at different ways to follow up after a crucial conversation and provided examples from conversations in which they had previously personally been involved. Specifically, techniques for making decisions, assigning actions, and the documenting of progress and results were covered (Patterson et al., 2012).

This course was included in the coaching training because the techniques and skills explored align with the above-mentioned goals of building trust and developing healthy professional relationships with both teachers and leaders.

## **Active Learning Frameworks and the STEM Academy**

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The next objective was to build the coaches’ understanding of the professional development that the teachers engaged in during the summer academies. Teachers in Cohort 1 had participated in two academies. See Perry, Reeder, Brattain, Hatfield, & Ketterlin-Geller (2017) and Pierce et al. (2019) for more information. Teachers in Cohort 2 had participated in one academy. See Adams

et al., 2019 for more information. A discussion of the main components of the training resulted in a baseline of knowledge to guide conversations during coaching. The overarching principles of the academy were also discussed and reviewed so that the coaches had a perspective of the main goals, the experiences, and the content that the teachers were exposed to as part of their participation. The coaches reflected on the practices the teachers were trained on during the summer including active learning through Project Based Learning (PBL), Maker Based Instruction (MBI), and the 5E lesson model. By engaging in training on the teachers' experiences, the coaches should be better able to collaboratively promote the four pillars of the academy training in the classroom throughout the coaching cycles. These four pillars were the use of active learning, differentiated instruction, the use of the scientific process standards, and deepening content knowledge.

## **Scientific Process Standards**

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Throughout year one of coaching, teachers reflected a need to invest in more conversations about the process standards during the coaching cycles. In a survey given regarding participating teacher's perceptions of coaching, only 66% of the responding teachers agreed or strongly agreed that coaching "provided me with the tools needed to apply the scientific process standards" (Adams et al., 2018, pg. 14). Additionally, only 66% of the responding teachers agreed or strongly agreed that coaching "deepened my understanding of the scientific\$ h the tools needt

After studying the scientific process standards, the coaching team engaged in investigations of classroom vignettes to clarify inquiry-based instructional practices that incorporate the process standards (Contant, Tweed, Bass, and Carin, 2018). The coaches compared and discussed two different lessons to distinguish factors and components in inquiry-based instruction. The conversations focused on process standards and also included personal classroom experiences. This was used to establish a baseline of practices in engaging the teachers during the coaching cycle.

## **Use of the STEM TOP Observation Protocol**

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In addition to developing the team knowledge of above-mentioned pedagogical strategies, the coaches were integrated into the process of the development of the STEM TOP observation protocol through an iterative design process. After finalizing the observation protocol, coaches calibrated scores utilizing the observation tool prior to conducting classroom observations. Additionally, ten percent of all classroom observations were co-observed as a means to continue calibration and gather validity evidence to support the ongoing development of the protocol. For more information about the STEM TOP development see the *STEM Teacher Observation Protocol Instrument Development* report (Pierce et al., in press).

## **Coaching Protocols and Forms**

Following training focused on providing a baseline understanding of STEM inquiry-based instruction and desired coaching behaviors necessary to execute the coaching cycles with teachers and leaders, the coaching team was provided with protocols and forms to utilize during the ongoing support. The purpose of the protocols and forms was to help guide the pre- and post-conference discussions in a way that allowed for both the teacher and coach to evaluate and reflect on the inquiry-based pedagogical approaches being implemented in the classroom. The utilization of forms provided a way of ensuring that the ongoing coaching was consistent across coaches.

## **Teacher Coaching Cycle Forms**

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The coach conducted a pre-conference with each teacher approxi

What is the objective(s) of your lesson? What are the TEKS?

How will you know that students have mastered the objectives in this lesson?

What are the prerequisite skills that the students have to know in order to be successful in this lesson?

How will you incorporate active learning and process standards into your lesson?

Are there any particular grouping structures in place (pairs, cooperative groups, etc.)?

If so, how will you hold students accountable for their work?

What are your plans for lesson closure and reflection?

Is there anything you want me to particularly observe of your lesson?

Is there anything else you want me to be aware of before observing this lesson?

The STEM TOP was utilized during each observation and allowed the coach to quickly and efficiently document different teacher and student behaviors that were occurring in the classroom. The STEM TOP is divided into four domains (Lesson Structure, Learner Centered Instruction, Evaluation and Feedback, and Management and Discipline) which encompass 22 indicators. In addition, coaches documented areas of strength and areas in need of improvement and provide direction for the coach and teacher to focus their energy and attention during the post conference.

For each indicator the coach scored whether the behavior was present and the level at which the teacher performed the behavior. Score options were:

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

Following the observation, the coach met with the teacher in person or over video chat to reflect on the classroom visit. The behaviors observed were discussed along with each teacher's goals for future class periods. Each meeting lasted between 15 minutes and one hour. The following questions that were included on the post-conference form.

Why do you think the lesson went the way it did?

What evidence from the lesson tells you if the students achieved your goals?

What did you learn that you will apply to your future lessons?

What would you like to work on for the next time?

Also, the coach provided the following feedback based on their notes from the observation:

Reinforcement Area (Praise/I Like)

Refinement Area (Question/I wish)

Recommendations (Polish/I wonder)

## **Leader Coaching Cycle Forms**

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During each cycle the coach met with the leader prior to the observation day to ask questions about the upcoming PLC and get an understanding of what was occurring at a systems level on campus. The fall semester included questions about the PLC content and preparation, since the coach was observing a typical PLC led by the campus. In the spring semester the pre-conference form included questions about what the leader expected to see during the walkthrough observations and the questions about the PLC procedures and preparation were removed since the coach would be delivering this content.

The pre-conference form in both iterations initiated a discussion about whether the leader had been able to visit the teachers in their classrooms and what behaviors they had observed. The questions guided the coach to explore culture and climate, process and content TEKS, and specific focal instructional practices.

During the observation no official form was completed during the walkthrough observations, but the coach was able to use their notes from the STEM TOP to guide discussion of observed behaviors. The coach also completed a STEM Academy Campus Summary form as a record of the PLC meeting. This included information about the participants, topic, agenda, future teacher action steps, and relevant TEKS discussed or included.

To conclude the observation cycle, the coach led a post-conference meeting with the leader to reflect on the pedagogical behaviors witnessed and discuss the goals that the leader had for each teacher and the department. The guiding questions for this meeting are below.







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**Appendix A –**

where he co-collaborated on research projects. His research interests include mathematics instruction of English learners and policies that impact English learners.

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## Appendix B – Scientific Process Standards Vertical Alignment

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2018 Streamlined TEKS Scientific Process Standards		
6 <sup>th</sup> grade	7 <sup>th</sup> grade	8 <sup>th</sup> grade

(A) Scientific investigations and reasoning

(i) To develop a rich knowledge of science and the natural world, students must become familiar with different modes of scientific inquiry, rules of evidence, ways of formulating questions, ways of proposing explanations, and the diverse ways scientists study the natural world and propose explanations based on evidence derived from their work.

6 <sup>th</sup> grade	7 <sup>th</sup> grade	8 <sup>th</sup> grade
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