

Assessing the Effectiveness of Training Methods on Preparedness for Peer Instructors Within a High School Scientific Instructional Training Program

*Katherine Hendrickson
Sophia Hernandez-Bueso
Gabriella Boehm*

*College of Education
Department of Educational Leadership
and Research Methodology
Florida Atlantic University*

Abstract

Training of peer instructors prepares them with the proper skills to effectively communicate the scientific curriculum to younger students. Evaluating training methods helps determine the preparedness of the peer instructors and allows for more effective training development. This research study focused on high school students within a K–8 teaching environment to determine the perceived effectiveness of various training methods in preparing peer instructors to guide scientific curricular experiences. Data were evaluated using a mixed-methods approach, employing post-training and post-instruction reflection surveys, which allowed students to reflect on their experiences. Preliminary findings suggest that students prefer in-person training sessions lasting longer than 45 minutes, with a notable preference for incorporating online lesson plans and training in behavior and classroom management. Peer instructors believed that these aspects helped them successfully answer students' questions and understand the lab's organization and curricular material, thereby further improving their instructional capabilities.

Keywords: peer instructor, instructional preparedness, training methodology

Description of Educational Context

This research evaluated a high school program involving 40 students across Grades 10–12 who were trained as peer instructors for science curriculum activities in school labs and classrooms in Grades K–8. As an incentive, peer instructors earned service hours based on their volunteered time. Each student participated in an accelerated pre-collegiate program requiring full dual enrollment in ninth grade. The research focused on peer instructors' evaluations of training session length, instructional performance, benefits, challenges, and suggestions for training improvements. The study gathered data from August 2023 to December 2024.

Purpose of the Study

This study aims to assess the effectiveness of different training methods for preparing peer instructors in a cross-age scientific curricular experience program model called Student Talent Ambassadors for Results or S.T.A.R. (Hendrickson, 2023). The S.T.A.R. program features a rigorous peer instructor training program that equips program members to serve as peer instructors, delivering scientific curricular experiences to younger students. The program's goal is to offer students opportunities to develop their leadership, communication, and teaching skills.

The study draws on research related to student teacher preparation methods, which suggests that effective training programs should provide teachers with the knowledge, skills, and dispositions they need to be successful in the classroom (Hinck, 2013; Swim, 1999). Previous studies have shown that students teaching students is one of the most effective teaching methods (Anderson et al., 2019; Whitman, 1988). Not only do the students being taught benefit from this experience, but the students acting as teachers also gain valuable skills in communication and collaboration. Students also gain understanding of complex topics while teaching other students and gain confidence not only in their knowledge of the topics but in presenting that knowledge to others (Stigmar, 2016; Swim, 1999).

Additionally, studies on the theory of self-efficacy in peer-to-peer instructors helped frame our evaluation of training effectiveness (Gregory et al., 2011; Wagner & Gansemer-Topf, 2005). The S.T.A.R. program has been studied to show its efficacy and its impact on scientific curricular experiences (Hendrickson, 2023), and as the program has grown, we saw the need to evaluate the effectiveness of our training initiatives to maintain and enhance the previously documented positive impacts.

Teacher Inquiry Questions

To explore how peer instructors perceive the effectiveness of training methods in preparing them for instruction, enhancing their instructional performance, and identifying areas for S.T.A.R. program improvement, this study focused on the following guiding questions:

1. Which training method (comprehensive or brief) do peer instructors perceive as the most effective in preparing them for their instructional role?
2. What specific aspects of the training do peer instructors identify as most beneficial to their instructional performance?
3. How do peer instructors perceive their own instructional performance following different types of training?
4. What areas of the training program do peer instructors believe need improvement to better support their role as instructors?

Inquiry Design

We evaluated the different types of training methods offered to S.T.A.R. peer instructors to discern if our peer instructor training methods could deliver the proper knowledge base and skill set to fulfill an instructor role. Training methods included both in-person and virtual training options with varying timeframes and content levels (Table 1). When the program started in 2022, we exclusively offered comprehensive, in-person training for all S.T.A.R. peer instructors. The comprehensive training provided an in-depth review of the entire curricular experience, spanning various lesson plans for upcoming experiences, regardless of whether the peer instructor was teaching at the time. Additionally, these trainings provided instructional practice through role-play and extensive question-and-answer sessions, including information on behavior and classroom management. These comprehensive training sessions typically lasted 60 to 90 minutes and occurred a week before the curricular experience. After providing these for the 2022–2023 school year, peer instructors asked for shorter training due to time constraints. For the 2023–2024 school year, we began offering brief, in-person training, individualized for the specific curricular experience that the S.T.A.R. peer instructor signed up to teach. The brief in-person training sessions, which occurred 15 to 30 minutes before the curricular experience, covered only the essential materials for the upcoming lab. The brief in-person training did not include coverage of more general topics like classroom or behavioral management, and instead focused on specific, curated training for the curricular experience. For the 2024–2025 school year, peer instructors asked for a virtual option that allowed them to review the material and have information about behavioral and classroom management specific to that curricular experience. We began offering virtual self-guided training by providing a customized lesson plan with simplified

resources and specific information relating to behavior and classroom management. This focused content, designed for enhanced accessibility, was provided to instructors at least two weeks in advance of the curricular experience.

In the fall of 2023, after expanding our training methods and offerings, we implemented an online survey to gather attendee feedback on the various trainings, aiming to better understand which ones were most effective and why.

Table 1. *Types of Trainings Offered: Context for the Three Types of Trainings*

Type	Timing of instruction	Duration of training	Training objectives
In-person comprehensive	One week before	60–90 minutes	<ul style="list-style-type: none"> • Training in multiple types of curricular experiences • Instructional practice through role play and hands-on stations • Extensive question-and-answer • General training in behavior and classroom management
In-person brief	Day of	15–30 minutes	<ul style="list-style-type: none"> • Training in specific curricular experience • Brief overview of stations • Lesson plans provided prior to training • Basic question and answer
Virtual	Two weeks before	At students' leisure	<ul style="list-style-type: none"> • Customized lesson plan • Simplified resources • Specific information related to behavioral and classroom management

Inquiry Methods

The study used a mixed-methods approach to data collection and analysis. The quantitative data analyzed the number of training attendees, duration of training, and preferred training lengths. The qualitative data were collected through open-ended questions provided within two separate surveys completed by peer instructors. The post-training reflection survey collected reflections from S.T.A.R. peer instructors after training. This post-training survey gathered peer instructor reflections on how the training equipped them for instruction, aspects that most benefited them as instructors, and ways the training could be improved. A post-instructional survey, completed by peer instructors after they taught a curricular experience, allowed S.T.A.R. peer instructors to reflect on their experience during instruction by asking them about their instructional performance, identifying their most challenging moments, and their students' level of engagement while contemplating how their previous training has proven beneficial to their instruction.

For the purposes of this study, we evaluated 29 peer instructors using two self-reported reflection surveys: one was administered post-training, and another was administered post-instructional (Table 2). The surveys were administered to peer instructors through the S.T.A.R.'s online learning platform, Canvas, with the use of the announcement feature, reminding peer instructors to fill out the relevant survey after completing their training and/or instructional experience. Verbal reminders and additional time were provided after each training and instructional experience to ensure completion of the survey.

Table 2. *Post-Training and Post-Instructional Survey Reflection Questions for S.T.A.R. Peer Instructors*

Post-training reflection questions	Post-instructional reflection questions
1. Length of Training: How long was the training today?	1. What type of activity did you volunteer for today?
2. What part(s) of your training do you think will help you as a S.T.A.R.? Why?	2. What parts of training do you feel you benefited from the most, and why?
3. What part(s) of your training do you think need more improvement? Why?	3. How do you feel about your instructional performance today?

More specifically, the post-training reflection survey asked peer instructors about the length of the training session, which aspects of the training they felt were most beneficial, and which parts of the training they thought needed improvement. The total length of all trainings (in minutes) was averaged to evaluate perceptions of the training type, categorized by duration: comprehensive (greater than 45 minutes) or brief (less than 45 minutes). The post-instructional reflection survey focused on the type of activity they participated in (training or curricular experience), their feelings about their instructional performance, and which aspects of the training they found most helpful.

Survey results were analyzed using Microsoft Excel to organize responses, calculate training times, and identify themes. A mixed-methods approach was employed to collect and analyze data from the 2023–2024 school year, as well as preliminary data from the first half of the 2024–2025 school year. Quantitative data focused on training duration and peer instructors’ preferences regarding training length. Qualitative data focused on peer instructor perceptions related to their satisfaction with instructional performance, the perceived benefits of training, and areas for improvement, and were coded into themes.

Inquiry Findings

Sixty-six survey responses were collected. Of these, 30 responses were related to training sessions and 36 responses were related to instructional experiences. Among the training-related responses, 14 focused solely on training, while 16 included perceptions of both training and instructional experiences (Table 3). Data collection ended in December 2024, with researchers administering the surveys halfway through the study period, resulting in a discrepancy in the number of surveys from year to year. To evaluate training types, the total durations of all trainings (in minutes) were averaged, resulting in two categories of trainings: those greater than 45 minutes (comprehensive) and those less than 45 minutes (brief) (Table 4).

Table 3. *Number of Students who Completed Surveys*

	Total	2023–2024	2024–2025
Total Number of Surveys Completed	66	44	22
Post-Training Survey	30	19	11
Training Experience Only	14	11	3
Training and Instructional Experiences	16	7	9
Post-Instructional Surveys	36	26	10

Table 4. *Average Duration (Minutes) for Trainings by School Year*

	2023–2024	2024–2025
Comprehensive (Greater than 45 minutes)	73.9	60.0
Brief (Less than 45 minutes)	21.3	27.9

Training Duration

S.T.A.R. peer instructors in the 2023–2024 school year displayed a preference for comprehensive training, while preliminary data from the 2024–2025 school year showed a preference for brief training sessions.

To evaluate preferences related to training types and to explore which type of training peer instructors perceive as the most effective in preparing them for their instructional role, two post-instructional survey questions were analyzed. The first determined the length of training received, and the second asked peer instructors to reflect on what parts of the training they thought were most helpful.

Post-Training Reflection Questions

1. Length of Training: How long was the training today?
2. What part(s) of your training do you think will help you as a S.T.A.R.? Why?

A total of 30 responses were analyzed: 19 involved training sessions longer than 45 minutes (comprehensive), while 11 were under 45 minutes (brief). Of the 19 surveys related to training sessions lasting more than 45 minutes, 10 specified a preference for comprehensive training. Peer instructors reported that these longer sessions helped them grasp the overall experience before instruction, allowing them to feel more prepared, effectively answer students' questions, understand the lab's organization, and become more comfortable with the lab material, which in turn improved their ability to share it with students. In contrast, of the 11 surveys that focused on training sessions lasting less than 45 minutes, eight expressed a preference for brief training. Peer instructors noted that these shorter sessions helped them quickly understand and implement the material, better grasp the lab organization, and effectively deliver the lesson.

Supporting reflections on comprehensive training:

“I think the part that will help the most is the general experience of how things are supposed to flow as an instructor. Because just based on the slide that I read before describing what each station was about, I wasn't really able to form an image of what that would look like in practice. Now I know better what to expect for my next session as an instructor.”

“Understanding the activity, so any questions the students asked, I could answer easily.”

“Being able to ask questions and get interested in the content myself so as to share that interest with the students.”

Supporting reflections on brief training:

“[The training was beneficial] overall; as stated above, getting to know the lab plan and how it functions can make me better understand the STARS lab system in general.”

“How to deliver a lesson.”

“Learning to take brief instructions and implement them.”

Overall, peer instructors preferred more comprehensive training sessions. Among the 30 post-training surveys, 10 indicated a preference for training sessions lasting longer than 45 minutes. Peer

instructors who favored longer sessions cited increased confidence in answering students' questions, understanding lab organization, and better preparation for instruction. Conversely, those who preferred shorter sessions valued the ability to quickly grasp and implement the material.

Training Options

S.T.A.R. peer instructors report an overall positive experience with available training options, with online lesson plans and behavioral and classroom management perceived as the most beneficial.

Peer instructors reflected on specific aspects of the training they felt were most beneficial to their instructional performance in post-training reflection question number two: *"What parts of the training did you benefit from the most, and why?"* Of the 66 total survey responses, 42 included reflections indicating benefits from the training options, while the remaining 24 did not provide a response. Common themes among the responses included online lesson plans, behavioral and classroom management, activity overview, positive experiences, question sessions, and lab safety. All responses were considered positive; however, seven responses were nonspecific about which aspects of the training were beneficial, providing more general statements. Figure 1 highlights the overarching benefits that peer instructors felt they received from training, categorized into the following themes: online lesson plans, behavioral and classroom management, activity overview, positive experience, question sessions, and lab safety. Supporting reflections follow.

Online lesson plans:

"I think it [online lesson plan] is a lot more efficient, since this was my first training as an instructor, and it was really easy to follow along what exactly I had to do for this activity."

Behavioral and classroom management:

"Knowing when to keep students engaged and when to keep them focused on the teacher was helpful during instruction."

Activity overview:

"The overview of all the activities helped me with timing. It allowed for little to no delays in the change of stations."

Positive experience:

"All of it since we needed all that information to explain to the kids."

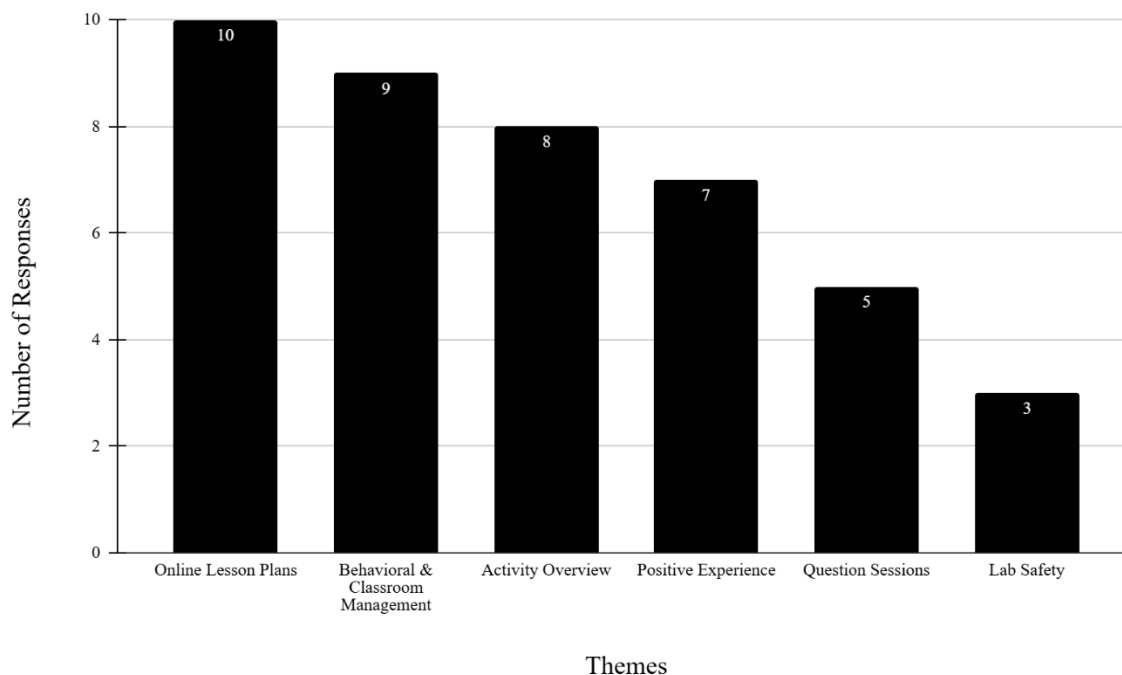
Question sessions:

"Today was the training, and I found it very helpful. I think being able to ask questions while in the room was very beneficial because they came up while we were there."

Lab safety:

"Laboratory safety trainings."

Figure 1. *S.T.A.R. Peer-Instructor Response to “What part of the training do you feel you benefited from the most, and why?”*



Instructional Performance

S.T.A.R. peer instructors commonly report satisfactory instructional performance reflecting training benefits. Peer instructors reflected on their instructional performance following training by answering the post-instructional reflection question three: *“How do you feel about your instructional performance today?”* In response to post-instructional reflection question number three, 66 responses reflected on instructional performance. Of these, 52.27% of peer instructors felt satisfied with their performance (Figure 2). They credited their familiarity with lab material and the combination of online lesson plans, worksheets, and in-person training as key factors in their positive performance.

Supporting reflections on satisfactory instructional performance:

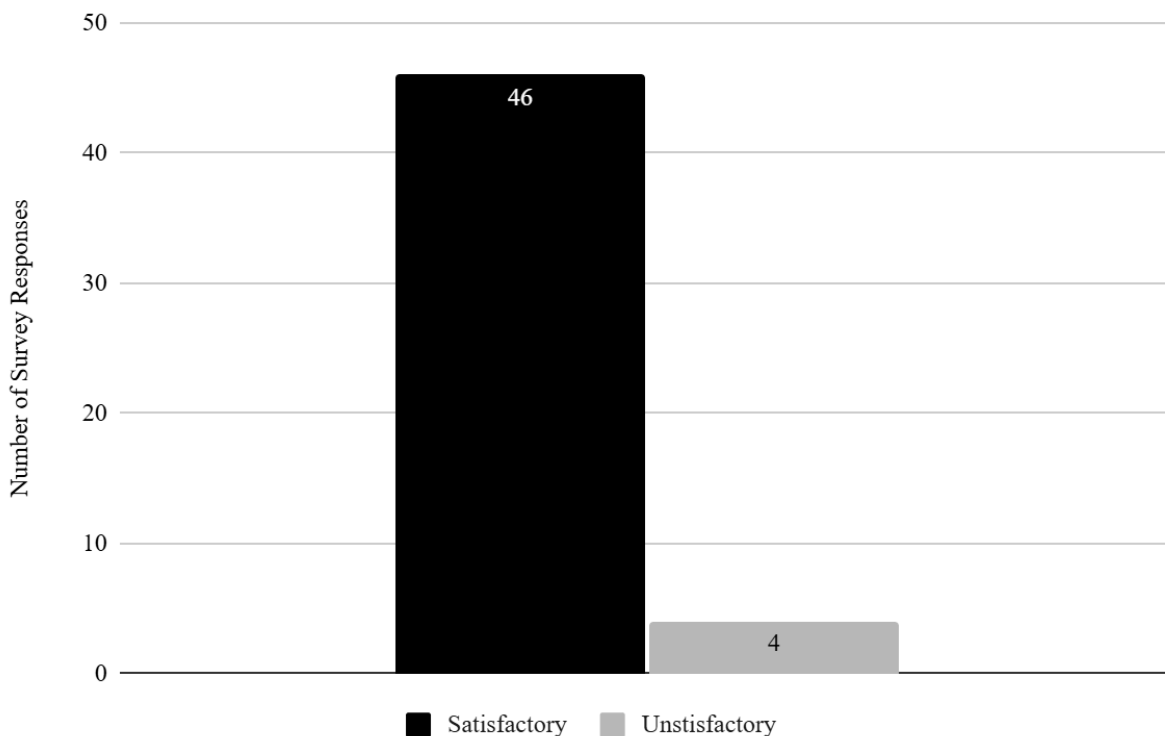
“I feel very good about my instructional performance, I think I explained what I needed to in an effective way.”

“I was prepared to recite information to the students as I had become familiar with it during training.”

“The combination of in-person training and the online component helped me during my instruction.”

“I had gone to the instructor training at the beginning of the year, along with going over the worksheets that were sent to us. The walk through the lab and hearing how Ms. Hendrickson phrased certain things helped the most though, as sometimes I worry that I might be speaking too formal for the kids so it was beneficial to have a reference point.”

Figure 1. *S.T.A.R. Peer-Instructor Response to “How do you feel about your instructional performance today?”*



On the other hand, four responses reflected unsatisfactory instructional performance. Peer instructors noted challenges with behavioral and classroom management. The remaining 16 survey responses came from peer instructors who attended training but did not instruct and thus were not included in the analysis. Overall, S.T.A.R. peer instructors expressed greater satisfaction with the available training opportunities, which contributed to positive performance outcomes.

Supporting reflections on unsatisfactory instructional performance:

“I felt that it was a bit difficult because it was more of a challenging class, especially since the kids weren’t familiar with the plant parts, so extra explaining had to be done to get the point across. This caused time to run out.”

“I believe my instructional performance was better than in previous labs, but I could work on keeping all the students engaged throughout the entire duration.”

“I felt it was okay; it was difficult to keep the kids’ attention as it was early in the morning and they seemed a bit low energy. But overall positive experience!”

“I feel that I could have done better because I arrived late to the training which had me miss some of the instruction.”

Suggestions for Improvement

S.T.A.R. peer instructors want more training on behavioral and classroom management, and more time interacting with the curriculum. Peer instructors reflected on improvements needed for the training program, which would better support their role as instructors in post-training reflection question three: “*What part(s) of your training do you think need more improvement? Why?*”

S.T.A.R. peer instructors felt that they had satisfactory instructional performance but requested more training in behavioral and classroom management, as well as time to interact with the curriculum.

Supporting reflections on suggestions for improvement:

“Time management and managing a group.”

“Managing the kids and keeping them focused.”

“Keeping the children engaged for the whole time.”

“It was a bit difficult to get some of the kids to focus on one thing and not get distracted.”

“Simulating the actual environment (pretending we’re the 2nd graders getting lectured on the material)”

“More time to interact with the course curriculum.”

Reflections highlight that while peer instructors generally feel confident in their instructional roles, they recognize specific challenges that impact student engagement and classroom flow. Feedback indicates a clear need for training that extends beyond content delivery, with special emphasis on student and classroom management strategies, as well as increased hands-on interaction with the curriculum. Addressing these areas will be key to strengthening the overall effectiveness of the S.T.A.R. program training and enhancing peer instructor preparedness in student-centered learning experiences.

Limitations of Inquiry

At the start of the program, peer instructors were highly encouraged to submit their surveys directly after volunteering, but it was not mandatory. As a result, some students participated in training or provided instruction without submitting the corresponding survey for that day. Much of this was a consequence of time constraints; peer instructors had to leave directly after the training or curricular experience and would complete the survey at a later date. This influenced the accuracy of the peer instructor’s perspective, which may have shifted over time. Also, with optional surveys, the researchers often found that the same peer instructors would complete surveys regularly for different training or instructional experiences; therefore, there could be a repeated perspective and familiarity among the survey responses. Moreover, peer instructors’ prior knowledge on a topic and their length of time in the S.T.A.R. program impact how they perceive the training and how useful they find it. As peer instructors gained experience, their responses may not be as comprehensive or indicative of the needs of a beginning instructor. Through this study, we recognized the importance of requiring peer instructors to complete surveys directly after a training or curricular experience to maintain accurate reflections on their experiences. Additionally, future survey responses will capture the peer instructors’ level of experience to better understand their feedback.

Implications of Inquiry

This research revealed that peer instructors generally prefer comprehensive training sessions that are longer than 45 minutes, which they associate with better preparation, a stronger understanding of lab content, and an overall greater sense of confidence. However, more recent feedback suggests a growing interest in shorter training options, indicating the value of maintaining flexible formats. Across all training types, peer instructors found online lesson plans and behavioral and classroom management strategies to be the most helpful in preparing for instruction. Most reported satisfactory instructional performance, attributing their success to the quality of the training given to them. Nonetheless, peer instructors noted recommendations for additional support in managing classroom behavior and more hands-on interaction with curriculum materials.

Evaluating STAR Training Methods

Initial findings have implications for the design of training programs for S.T.A.R. peer instructors. Incorporating in-person training sessions and online resources may be beneficial in enhancing instructor preparedness and overall effectiveness. In-person training durations are determined based on the needs of instruction and utilize online resources for supplementary training. Insights from the study have informed the development of new training materials for specific tasks such as dissections and student focus and attention, aimed at improving content delivery and increasing peer instructor confidence. As a result, these new training modalities and the expanded training resources are currently being assessed to determine their efficacy. Moving forward, we plan to implement surveys before the trainings to see how the peer instructors' prior knowledge and confidence contribute to their perceived effectiveness and preparedness for instruction.

Overall, these insights emphasize the importance of combining resourceful and engaging training content with opportunities for peer instructors to interact with materials and practice classroom engagement strategies, thereby guiding future refinements in S.T.A.R. training design.

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Corresponding Author: Katherine Hendrickson

Author Contact Information: Khendri6@fau.edu

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