Professional Development Facilitator's Guide for Facilitating Program Quality in STEM

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This professional development (PD) guide is for facilitators of PD programs for activity leaders (ALs) and counselors in summer and afterschool science, technology, engineering, and mathematics (STEM) programs for middle grades youth. The PD should be appropriate for those who work with youth in Grades 5 through 9.

This guide accompanies the PowerPoint slide deck pertaining to facilitating program quality in an Informal STEM Learning (ISL) program. It provides background and procedural information about the content and activities presented in the PowerPoint deck. Facilitators are encouraged to customize the PD to their needs. Some of the slides and activities can be selected depending on needs and the time available for PD. Several of the practical methods in the *How Activity Leaders Can Support Program Quality* section can be used as stand-alone sessions.

The ultimate goal of the STEM Interest and Engagement (IE) project was to disseminate the practical implications of the National Science Foundation-funded study of summer STEM programs to ALs and directors of ISL and summer programs. A toolkit developed by the STEM IE project can be found at www.niu.edu/stemie. It contains information about the project, resources, and highlights five aspects of programs (quality, activity settings, promoting relevance, facilitating interest, and supporting youth agency) that are important to engaging youth in STEM programs. You might want to refer to it while organizing the PD session(s).

PowerPoint Slide Deck for
Group Professional Development


Slide 1. Title Slide.

Fill in the presenter's names and the date of the training. If available, you can replace the photo with one from your program or the program(s) receiving PD. If participants do not know one another, have them share their names and, if they come from different programs or locations, ask them to identify the program or organization with which they are affiliated.
(1-3 minutes)

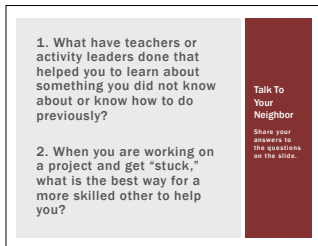**Slide 2.** Motivating and Engaging Youth in Informal STEM Learning Programs.

Slide briefly shares the purpose of the professional development.
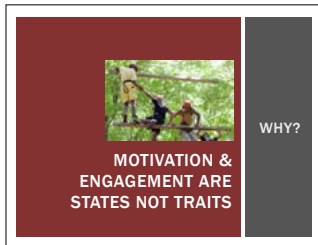
Slide 3. Motivation is a State, Not a Trait.

Slide shows concept that motivation is a state, not a trait with the thought that states can be influenced.
(1-2 minutes)

Slide 4. Talk to Your Neighbor.

Introductory Activity. Have participants read and think about their answers to the questions on the slide. Be sure everyone has a partner and that they take turns as teller and as listener/ questioner. Have the dyads share out. Ask the group to identify any patterns that emerge in the responses. Alternately, conduct a group discussion to answer the questions.

(10-15 minutes)
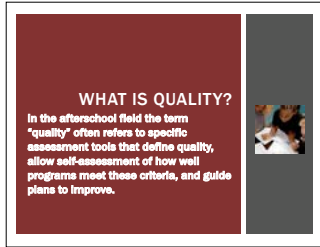
Slide 5. What is Quality?

Review the general definition of instructional quality presented on the slide. The broad definition of quality in the afterschool field focuses on creating developmentally appropriate settings for youth, where youth feel safe, form meaningful relationships, and experience belonging.

> The STEM Youth Program Quality Assessment (YPQA) and the Dimensions of Success (DoS) are often used as assessment tools in afterschool STEM programs.
> (1 minute)

> **Optional Activity:** Have participants review an assessment tool. The STEM YPQA can be obtained free of charge by clicking on the link and completing the form.
> (10 minutes)
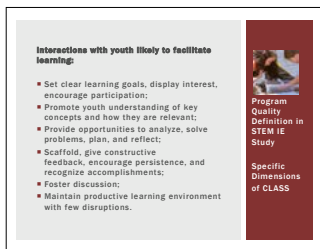
Slide 6. Program Quality Definition in the STEM IE Study.

Specific dimensions of the CLASS, which was used in the STEM IE study to assess quality, are presented. [Share with Participants:] CLASS stands for Classroom Assessment Scoring System. The upper elementary version of the CLASS was used in the STEM IE study.
(1 minute)

Slides 7-12.
Why Quality Matters in ISL Programs.
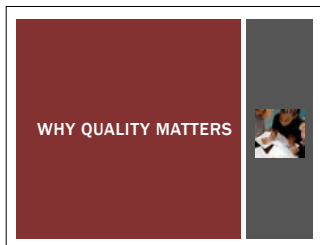
Slide 7. Section Title.

> Slides 10–12 pertain to the research methods and specific findings from the STEM IE study. Some will want to know this detailed information and others will not. Accordingly, as facilitator of the PD, you can decide whether to include or delete some of the slides. Slide 12 presents an overview of findings, which is important to understand the practical suggestions in the next section.
> (Slides 9-12: 7 minutes)

Slide 8. Importance of Quality in STEM Programs.

Slide 9. Research Methods.

Research methods used in the STEM IE study are outlined.

> **Detail to share with participants:** Youth were signaled several times during their ISL learning and activity time. They used an app on a cellular phone to provide in-the-moment reports of how they were feeling in the 15 minutes before being signaled. Video segments were coded for quality dimensions shown on Slide 6.

(2 minutes)

Slide 10. Average Quality Scores by Program.

Ask participants to study the chart and discuss what they are seeing.

> **Add this:** The CLASS scale ranges from 1-7. The average shown on the chart comes from averaging the dimension scores shown on Slide 10. Most programs were, on average, in the mid-range of quality. The two highest scoring programs, Marine Investigators and Island Explorers were characterized by very strong and capable community educators associated with ecology organizations.
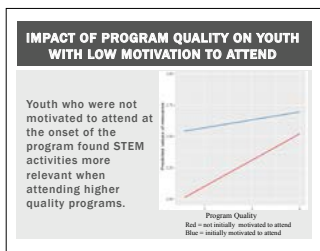
(2 minutes)

Slide 11. Program Quality Was Associated with Youth Experience.

Review findings presented on the slide.
(1 minute)

Slide 12. Impact of Program Quality on Youth with Low Motivation to Attend.

Review findings presented on the slide, which exemplify the importance of program quality. Many want to know how to engage youth who are not initially motivated to attend an educational program. Findings from STEM IE study suggest quality is one way to do that.
(1 minute)

Slides 13-21
How ALS Can Foster Interest in STEM.

Slide 13. Section Title.

Slide 14. Plan Effective Lessons.

Review the three strategies presented. Click the link "Watch ALs" and ask the participants to talk about how the AL connects classroom and field learning. (5 minutes)

PRACTICE: Select a topic that youth learn in your program. Plan a "classroom" lesson and a "field" experience that tie content together. Write a clear statement about what youth will know, be able to do, or understand after participation in the classroom and the field experience.
(10-12 minutes)

For those who would like more in-depth professional development on establishing and communicating learning goals to youth, an intensive program can be found at http://www.ascd.org/publications/books/108049/chapters/ Module-2@-Establishing-and-Communicating-Learning-Goals.aspx

Slide 15. Promote Content Understanding.

View video to see activity leader connect physics content to real world examples and big ideas.

These practices are tied to the Next Generation Science Standards (NGSS). Examples of BIG IDEAS are conservation of energy, homeostasis, and infinity. Examples of assigning meaningful practice are calculating distances for a field trip or halving a recipe.
(5 minutes)

Practice Activity: Continue working with the topic(s) from the Slide 14 planning activity. Apply the suggestions for promoting content understanding to content youth are expected to learn about the topic(s).
(5-10 minutes)

Slide 16. Ask Youth to Analyze and Inquire.

Review practices that entail analysis and inquiry.
(1 minute)

For more extensive professional development material on using an inquiry approach, see the Supporting Agency tab on the website, and select the Resources section. The professional development PowerPoint Slide 17 and the accompanying activities in the Facilitator's Guide for that slide contains links, activities and information.

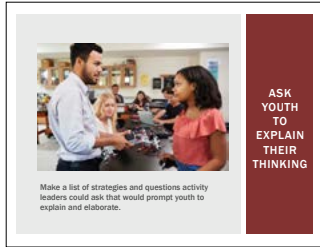**Slide 17. Provide High Quality Feedback.**

Click on the scaffold link to view a brief video. Discuss the way that the activity leaders assisted youth with their projects. What challenges have you encountered (or might you encounter) with scaffolding?
(5 minutes)

Slide 18. Ask Youth to Explain their Thinking.

Have participants work individually for a few minutes and then in small groups to generate questions that could be asked to prompt youth to explain and elaborate. Have them write their questions on post it notes that they will post on the board.
(5-8 minutes)

Here are two handouts that provide ideas that you can distribute if desired: http://learndbir.org/resources/HANDOUT_Teacher_and_Student_Talk_Moves.pdf (a handout from the PD listed on slide 19) and http://stemteachingtools.org/assets/landscapes/taf.jpg

Optional: Have those who are finished first organize the questions into those that are similar on the board.

Slide 19. Facilitate Instructional Dialogue.

View the 9-minute video by clicking on the "facilitate" link. Discuss how the teacher facilitates instructional dialogue (verbal interaction about content).
(15 minutes)

The teacher in the video mentions how scientists work. This one-page handout about norms for thinking and acting like a scientist can be printed and distributed. Talk about how to concretely communicate those norms in your ISL program.
(12–15 minutes)

For those who wish to conduct in-depth professional development sessions on talk in the program, two publicly available PD sessions are (a) promoting student science talk in the classroom (50 minutes, PD that goes with handout from Slide 19) and (b) incorporating scientific argument into a classroom.
(105 minutes)
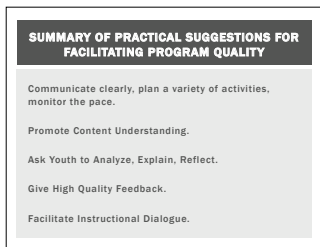
Slide 20. Summary of Practical Suggestions for Facilitating Quality.

Quickly review the summary of research-based suggestions for facilitating quality in ISL programs.

Note: Reflection could include asking "What would you do differently next time?" and/or "How could you improve it based on what you learned?"
(1 minute)

Print this slide as a handout for participants to use when viewing the video.

Slide 21. Facilitating Program Quality.

Click the links to view youth working on an activity in an ISL program. (5 minutes)

Ask participants to listen and watch for whether and how quality can be facilitated. The "facilitating program quality" link goes to the previous slide, which can be printed as a handout and then displayed on the screen as participants discuss the examples of facilitating quality that they saw in the program.

> **Note:** The video used in this activity is one that can be selected to be viewed and analyzed in the supporting youth agency PD in this series. For those who have also participated in that PD the point can be made that ALs can and do use various strategies that engage youth in a single lesson or activity.

(10 minutes)