Professional Development Facilitator's Guide for Fostering Interest 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 fostering interest 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 Foster Interest* 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
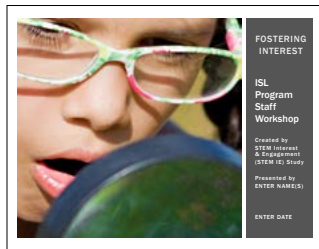
Slide 1. Title Page:

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.
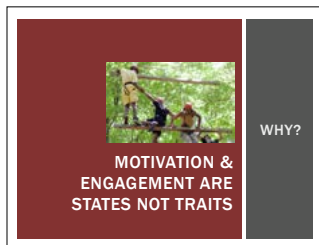
(1-3 minutes)
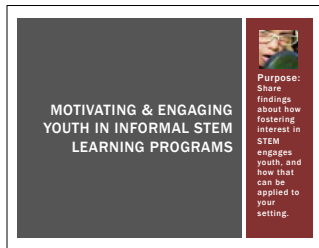
Slide 2. Motivating & Engaging Youth in Informal STEM Learning Programs.

Slide briefly shares the purpose of the professional development.
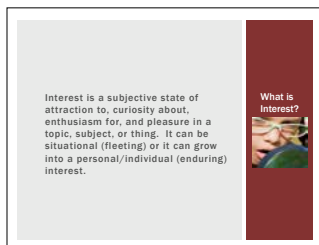
(1 minute)

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. Discuss what this means.

(1-2 minutes)

> **Note:** People are motivated and engaged in some situations and not others – being motivated or engaged is dependent on the context. It's valuable for activity leaders to learn how to plan and create contexts that are most likely to motivate and engage youth in the programs.

Slide 4. What Does it Mean to be Interested in Something?

You can show this slide and move on (approximately 1 minute to introduce) or you can choose to prompt group discussion in pairs or small groups with these questions (recommended):

1. In general, how interested are the youth with whom you work when they enter the class or program?

2. In your experience, do any particular things tend to foster youth interest?

3. Have you led activities that interested youth in the moment, but did not sustain their interest? How about when situational interest grew into personal interest?

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.

(5-10 minutes, depending on the size of the group)

Slide 5. Talk to Your Neighbor.

Introductory Activity. Have participants read and think about their answers to the questions. 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. Note the differences between those activities that led to enduring interest and the patterns they may have noted on fleeting interest here or in the previous slide's discussion. (10 minutes)

Slide 6. Interest Develops.

Review the material presented on slide. View the 3-minute video (click link "in phases) exemplifying support for the first two phases of interest development. Ask participants to identify how the program fosters phases 1 and 2. [Share with participants:] Not all youth will reach phases 3 or 4. A reasonable goal is to expose youth to high-quality learning environments, providing them with the opportunity to discover an interest and passion for this field that they otherwise may not have known they had. (5-6 minutes)

Slides 7-12.
Why Fostering Interest Matters in ISL Programs

Slide 7. Section Title.

Slide 8. Importance of Interest in STEM.

The slide briefly reviews reasons that fostering interest in STEM is important for youth. (1 minute)

Slides 9–12 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. Slides 11 and 12 presents an overview of findings, which are important to understand the practical suggestions in the next section.
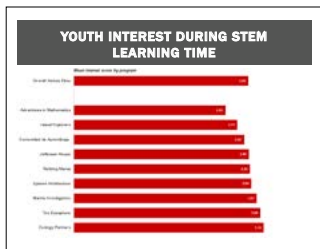
(Slides 9-12: 8 minutes)

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 cell phone to provide in-the-moment reports of how they were feeling in the 15 minutes before being signaled.
(2 minutes)

Slide 10. Youth Interest during STEM Learning Time.

Lead a discussion of the chart adding this information: The interest scale ranged from 1-4. Interest scores were highest in two programs with a field-based component related to studying the local ecology and animals in that environment. Adventures in Mathematics (which had the lowest score) was a classroom-only program that focused on the development of basic math skills. Island Explorers, which had the 2nd lowest score, had a passionate activity leader in the field. Youth rated that part of the program as interesting but the classroom portion as low in interest.
(2 minutes)

Slide 11. Study Linked Program Experiences and Situational Interest.

Review findings presented on the slide.
(1 minute)

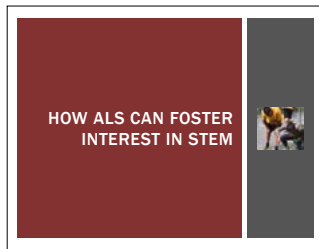## Slide 12. Study Linked Program Experiences and Growth in Individual Interest.

Review findings presented on the slide.
(1 minute)

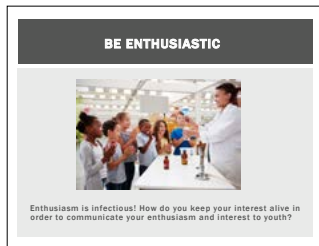**Slide 13.** **Section Title.**


Slide 14. Be Enthusiastic.

Share with participants: Many STEM professionals credit the enthusiasm of a teacher or out of school leader as the reason they pursued their career.

Emphasize: Enthusiasm is rarely observed yet important. It is difficult to always be "up" but, given the importance of being enthusiastic, it is worth trying to express enthusiasm more often.

Ask: How do/can you keep your own interest and enthusiasm alive? Take ideas from participants and record them on the board or on a large sheet of paper.

Add these possibilities if they are not mentioned:

1. Keep up with new developments by reading (magazine or news articles) or watching educational films.
2. Visit museums, nature preserves, open-houses or talks at local institutions related to the content you teach.
3. Put yourself in the shoes of young people seeing or experiencing the content for the first time.
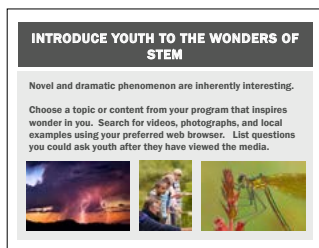
Slide 15. Introduce Youth to the Wonders of STEM.

Have participants work alone or in teams, depending on the make-up of the group. (These instructions appear on the slide:) Choose a topic or content from your program that inspires wonder in you. Search for videos, photographs, and local examples using your preferred web browser. List questions you could ask youth after they have viewed the media. Ask participants to share any ideas that they think are especially exciting. (10-12 minutes)
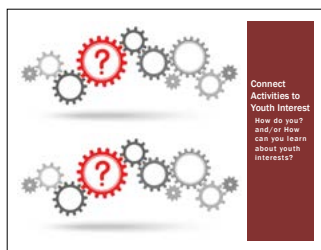
Slide 16. Connect Activities to Youth Interests.
Learn about Youth Interests.

Have participants discuss how they do and can learn about youth interests in the whole group, small groups, or with a partner. You can distribute the youth and/or parent report interest inventories available under the *Connect Activities to Youths' Personal and Community Interests* heading of the Fostering Youth Interest page of the STEM IE website and have them review and customize either or both of them for their programs. If there were small group or partner discussions, rather than a large group discussion, have them share the ideas they discussed. Youth generally develop more interest when they have a sense of agency. If youth-led decision making is brought up, bring up the Girl Scout model of girl-led programs; the troops that last through high school are the troops where leaders did the best job of relinquishing decision making to the girls. This model may not be practical in all programs, but it is a valuable example.

(10 minutes)

For more in depth professional development. A professional development module developed by the STEM Teaching Tools initiative presents cultural formative assessment as a way to help educators learn about the interests, knowledge, and experiences of youth. The module explains how educators can use this information to plan instruction and activities that overlap with the lives of youth. The method presented is that of self-documentation, which was described previously. An explicit purpose of the module is to promote equity and social justice. A PowerPoint slide deck, a facilitator's guide, and student work samples are available at the link. The module is open source and takes about one hour to complete.

Slide 17. Connect Activities to Youth Interests.

Have participants work individually or in small groups with others who teach the same or similar topics. As directed on the slide, ask them to select an activity from the program and to identify several common interests of youth in the program and suggest ways of incorporating youth interests into the activity. Ideas might include using examples of how STEM concepts relate to a particular interest category or how youth projects could be individualized to incorporate an interest area. If possible, find ways to allow some participant choice in variations of the activity to increase personal interest. At the least, small groups of youth could select a name or logo representing shared interests of group members. Do your activities or choices allow for variations among your participants in age, gender, ethnicity, as well as existing STEM interests?
(10 minutes)

Slide 18. Plan Fun Learning Experiences.

Click on the "make activities fun" link on the slide and view the 3- minute video.

Ask: How important do you think it is to plan educational and meaningful activities that are also fun?

Share with participants: Researchers have found that students sometimes rate activities high in "fun" but simultaneously low in learning and value.

Ask: What experiences do the youth in the video identify as fun?

(10 minutes)

Slide 19. Help Youth to Realize their Ideas and Overcome Challenges.

Many projects that are meaningful and interesting are also very challenging. As a result, youth can become frustrated with them. It is important for activity leaders to be able to help youth overcome their frustration and accomplish their goals. View a video clip that presents practices that facilitates youth making in an ISL program (click on the "this video" link). Ask participants to discuss the ideas presented in the video. Consider providing a handout Managing Student Frustration During Engineering Design Projects. Have participants find projects for youth that are appropriate for their context at https://www.instructables.com/teachers. Instructables is free for educators and is an outgrowth of the MIT Media Lab.
(12–15 minutes)

> To extend this topic, consider having a workshop in which activity leaders participate in a making experience.
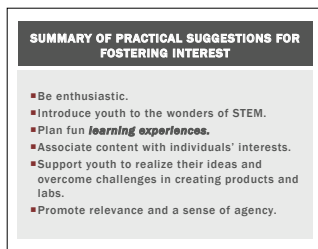
Slide 20. Summary of Practical Suggestions for Fostering Interest.

Quickly review the summary of research-based suggestions for fostering interest in ISL programs. (1 minute) Print as a handout or return to this slide when doing the final activity on the next slide. Note: PD materials on making content relevant and on supporting youth agency in resources section of the STEM IE website.

Slide 21. Review Aspects of Fostering Interest.

Click the links to view each of the two video clips of the Chicago Botanic Garden (CBS) Science First Program (3 minutes each). Ask participants to listen and watch for how interest is developed in the program (and in the subsequent programs at the CBS). The "aspects of fostering interest" 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 fostering interest they saw in the program. Note: One of the two videos 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, so ALs can both foster interest and support youth agency within the same lesson or activity.
(10-12 minutes)