Professional Development Facilitator's Guide for Making Content Relevant in STEM

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MICHIGAN STATE UNIVERSITY

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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 Power Point slide deck pertaining to making content relevant 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 Make Content Relevant* 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 the program or programs 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.

Slide 2. Motivation is a State, Not a Trait.

Slide shows concept that motivation is a state, not a trait. States can be influenced by ALs.
(1 minute)

Slide 3. What Engages You in Learning? Motivates You?

Introductory Activity: Ask participants to think individually about what engages them in learning and motivates them; they can jot down a list if they like.
(1 minute)

Have them turn to a person sitting next to them to discuss their responses.
(2-3 minutes)

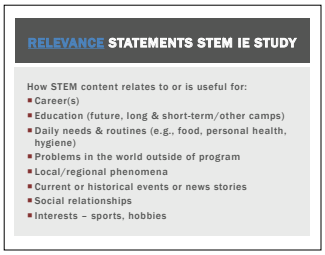
Then, they should share out to the whole group (4 minutes). As participants share, note how many of the responses have to do with the content being important or relevant to them in some way. If many participants identify relevance as a factor, comment on that and discuss the ways they saw content as being relevant to them. If only some or a few do, then acknowledge what they did identify and mention that often people say that they are engaged by perceiving the content as relevant to them. Ask them whether that pertains to them, too, and why they think that only a few mentioned that.
(10 minutes)

Slide 4. What Is Relevance?

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

1. Are you familiar with the daily lives, goals, interests, and concerns of the youth with whom you work/will work? How can you learn about these if you are not familiar?
2. Have you ever noticed how youth react to learning about things that matter to them? Can you share an example?

(Discussion time approximately 5 minutes)



Slide 5. Relevance Statements STEM IE Study.

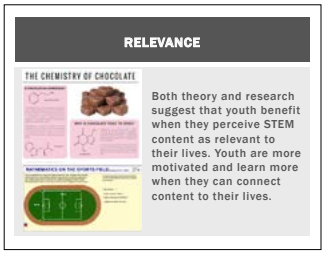
This slide presents what was coded as a relevance statement in the STEM IE study (print this page to serve as a handout to use while doing the activity). Click *Relevance* in the title of the slide (it is underlined). That will take you to Slide 27, which contains links to videos (preview them to see which one might be best for your participants). Play the video and have them listen for "relevance" statements. Did the activity leader make many relevance statements? What kind of relevance statements were made? Click *Relevance* in the slide title to return to Slide 5.
(10-15 minutes)

Optional: Were opportunities missed to tie content to any of the things in the list (e.g. careers, daily experiences, etc.)? What could the AL have said?
(5 minutes)

This is similar to the activity on Slide 13; you might want to choose one of the activities.

Slides 6-11.
Why Making Content Relevant Matters in ISL Programs.

Slide 6. Section Header w/Title.



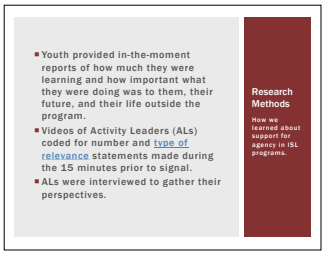
Slide 7. Relevance.

A general statement about why relevance matters appears on the slide.

Details to share with participants: Youth are more interested, motivated, engaged, and persistent when they perceive what they are learning as relevant. Few youth in the United States perceive STEM content as relevant to their lives. This negatively impacts their STEM learning, which, in turn restricts career options and everyday decision making.

(1 minute)

Slides 8–10 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. As facilitator of the professional development you may decide to include or delete slides 8-10.
(Slides 8-10: 8 minutes)



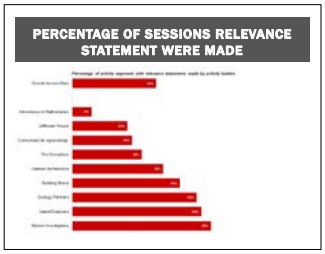
Slide 8. Research Methods.

Research methods used in the STEM IE study are outlined.

Details to share with participants:

1. 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. Videos of ALs were coded for number and type of relevance statements made during the 15 minutes prior to the signal. A link to Slide 5 allows the facilitator to go to that page (if desired) to review how specifically the video was coded.

(2 minutes)



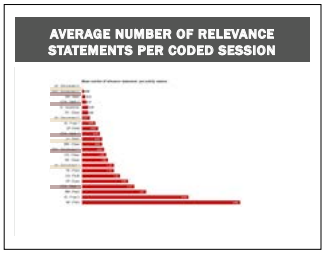
Slide 9. Percentage of Sessions Relevance Statements Were Made.

The figure on Slide 9 displays the percentage of STEM activity sessions in which activity leaders made relevance statements in the nine programs that were studied.

Ask participants the following questions about the figure:

1. What do you notice about the variation between programs?
2. The three programs in which the fewest statements were made focused on mathematics and the top three focused on biological and ecological sciences. Might that explain this pattern? Why do you think so?

(2 minutes)

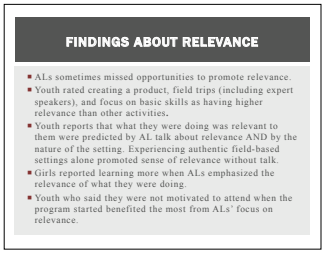


Slide 10. Average Number of Relevance Statements per Coded Session.

The figure on slide 10 shows the average number of statements that were made by each AL during the portion of the program that they led which was coded (recall that video was coded for the 15-minute segment prior to each signal that youth responded to by providing in-the-moment reports) . The program name is abbreviated before the leader number on the figure. Notice the individual CDA (Communidad de Aprendizije) activity leaders as well as the four individual JH (Jefferson House) leaders.

Ask participants the following question about the figure:
What does this tell you about the role of the activity leader despite the content that the program focuses on?

(4 minutes)

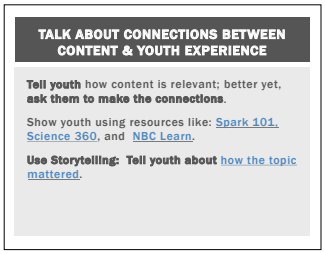


Slide 11. Findings about Relevance.

This slide summarizes findings pertaining to relevance from STEM IE research. (1 minute)

Slides 12-25
How ALs Can Make Content Relevant.

Slide 12. Section Header with Title.

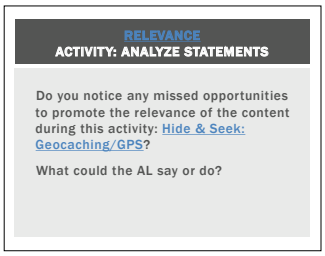


Slide 13. Talk About Connections between Content and Youth Experience.

Introduce the topic by emphasizing that research has found that there are benefits to youth when ALs talk about the relevance of a topic.

Details to share with participants:

1. Some studies have found the greatest benefits when youth are asked to make the connections in response to prompts by teachers. (1 minute)
2. Story telling is an excellent way to make the connections. (The "tell stories" link goes to a page that contains some resources for storytelling, which can be shown. The link *How the Topic Mattered* is connected to a video of a high school AP Biology teacher and her students.) What the teacher says and what her students say is universally applicable and serves as an excellent example that would be useful for activity leaders in ISL programs with younger adolescents. (5 minutes)



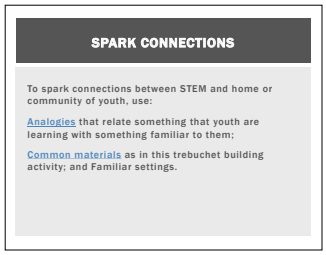
Slide 14. Relevance Statement Activity.

Show the Hide & Seek: Geocaching/GPS) video clip (10 minutes, can chose to show part) from an ISL program for young adolescents.

Ask participants the following questions:

1. Do you notice any missed opportunities to promote the relevance of the content?
2. What could the AL say or do to connect this activity to the world outside the program?

The Relevance link in the title goes to Slide 5, which lists categories to which content might be connected to make it relevant.
(20 minutes)



Slide 15. Spark Connections.

Analogies are one way to make the content relevant for youth. An analogy relates something that youth are learning with something familiar to them.

Show the Botanic Value Analogies video clip the shows Duane talking about why he uses analogies together with an example of him using analogies when introducing a lab activity.
(2 minutes)

Activity: Handout a paper or write on the board and ask participants to complete at least one of the following analogies and to identify how the two are alike:

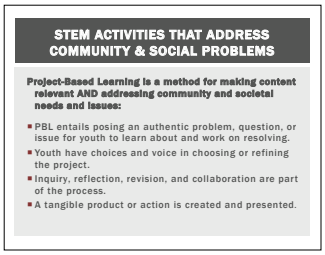
- Infinity is like ...
- DNA is like ...
- A cell (cell nucleus, cell membrane) is like ...
- Equilibrium is like ...

Participants then share their ideas.
(5 minutes)

Use Common Materials

When youth are engaged in science activities related to their everyday lives, they tend to transfer and use what they learned in other contexts. Tools and other everyday items seem to spark connections between home and school science.

This video clip from an Informal Science Learning program shows youth building Trebuchets using common materials. You can preview and show only part to save time, if desired.
(11 minutes)



Slide 16. STEM activities that Address Community and Social Problems.

This slide provides and introduction to project-based learning. (1 minute)

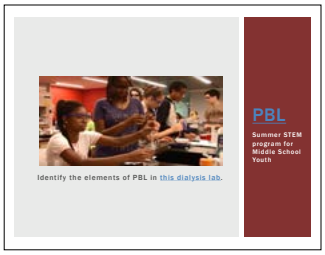
For those facilitators and programs that intend to do extensive professional development on project-based learning, there are several professional development programs that are available:

1. You for Youth, the US Department of Education's online professional development and technical assistance program for 21st Century Community Learning Centers, provides trainings to go, training starters, and tools on the topic of project-based learning. Trainings to go are comprised of PowerPoint slide decks, handouts, and guides; the trainings are customizable. The first training, Project Based Learning in Action, takes approximately 75 minutes. The second training, How to Craft a Driving Question, takes approximately 50 minutes. The third training, Incorporating Student Voice, takes approximately 60 minutes. The fourth training, Introduction to Civic Learning and Engagement, takes about 45 minutes.
2. An online comprehensive project based learning professional development program developed by Edutopia can be used in anything from two- to three-hour to one- to two-day workshops depending on what the facilitator chooses.
3. The National Center for Quality Afterschool has resources for project-based learning.
4. The Buck Institute also provides a wealth of archived resources on project-based learning, including webinars, which may be appropriate for an extensive professional development series.

Ideally, participants would work through a problem in a professional development program. The problem chosen could be related to the content that the afterschool or summer program teaches or it could be related to educating youth in an informal setting.

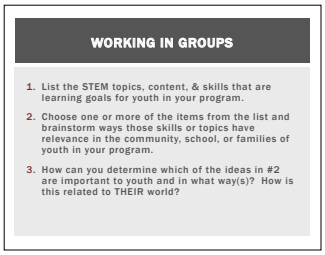
The introductory workshop provided in subsequent slides here introduces project-based learning and asks participants to begin planning a project-based learning module for youth in their ISL setting. This would best be done over the course of several sessions, but users will have different needs and constraints. Please customize to fit your situation.

Optional: Framework for PBL success Video which can be shown. (13 minutes)



Slide 17. Identifying the Elements of PBL.

(listed on Slide 16) Show video clip of a summer STEM program lab activity. Ask participants to identify and share example of the elements. (6 minutes)



Slide 18. Working in Groups.

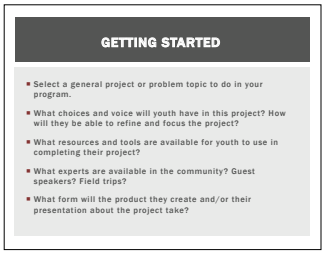
Divide participants into groups. Ideally, they will be in groups with others who work in the same program or whose programs have similar content (e.g. ecology, engineering).
(15 minutes)

Ask them to:

1. List the STEM topics, content, and skills that are learning goals for youth in their program.
2. Choose one or more of the items from the list and brainstorm ways those skills or topics have relevance in the community, school, or families of youth in your program.
3. Share how they can determine which of the ideas in #2 are: (a) important to youth and in what way(s)? (b) Related to THEIR world and in what way(s)? How can/will they discover this?

Slide 19. Design and Plan.

Click on the link to watch a four-minute video.
(4 minutes)

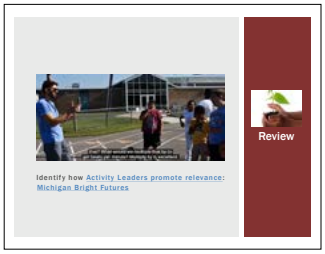


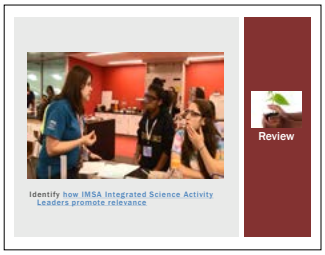
Slide 20. Getting Started.

Instructions for individuals or small groups appear on the slide:

- Select a general project or problem topic to do in your program.
- What choices and voice will youth have in this project? How will they be able to refine and focus the project?
- What resources and tools are available for youth to use in completing their project?
- What experts are available in the community? Guest speakers? Field trips?
- What form will the product and presentation they create about the project take?

(15 minutes)





Slides 21 and 22. Two videos provide examples of ISL programs for young adolescents that promote relevance.

Review them and choose the one that best fits your participants. Ask participants to notice and then discuss the ways that these activity leaders promote relevance. Link, Activity Leaders Promote Relevance goes to Slide 20, which can be shown during the discussion:

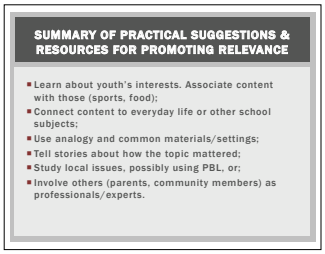
Michigan Bright Futures

IMSA Integrated Science

(8 minutes)

Slide 23. Culminating Activity.

Assign participants to a group based on content they are responsible for in the ISL program. Their task is to develop two concrete ways of making specific content from their program relevant to youth. You can either assign the content or provide them with a choice of several concepts or skills that youth will focus on learning in the program. The goal is for them to plan things they can try with youth in their program.
(10+ minutes)



Slide 24. Summary of Practical Suggestions and Resources for Promoting Relevance.

Show this slide while the small groups are working on the culminating activity.

Slide 25. Sharing Plans.

Each group will share their ideas with the larger group and receive feedback.