Professional Development Situation: Training

Skill Focus: Asking Purposeful Questions

Time Required: 85 minutes

TRYING OUT QUESTIONS

Participants will classify questions as open- ended and scientific and analyze facilitators' talk in the "When Youth are Struggling" video-based learning module to learn how to ask youth meaningful questions.

Agenda

Welcome – 5 minutes
Introduction – 15 minutes
Types of Questions – 35 minutes

- Talk Moves Card Sort

See the Skill in Action – 15 minutes

- When Youth Are Struggling video-based learning module
- Transcript: When Youth Are Struggling

Conclusion - 15 minutes

Materials

- Computer with internet connection
- Projector and speakers
- Flip chart paper and markers
- Pens for participants
- Scissors
- One set of Talk Moves Card Sort for each table group
- When Youth Are Struggling video-based learning module
- One copy of Transcript: When Youth Are Struggling for each participant

Before the Session

- **Read this training guide** to become familiar with the content and allow time to personalize the activities to best suit your presentation style. Watch all videos and read informational materials.
    - *Italics indicate text that can be read aloud or emailed to participants.*
- Send reminder email about the training. Determine if any participants require accommodations (sight; hearing; etc.).
    - *The next professional development opportunity to enhance our STEM skills will be on DATE at TIME at LOCATION. Our focus for this session will be "Asking Purposeful Questions". Let me know if you require any accommodations to participate in the training. I am happy to answer any questions you have and look forward to seeing you at the workshop. I can be reached at CONTACT INFO.*
- Gather all materials needed for the training.
- Develop a list of possible questions participants might have during the training. Create potential responses to be explored through informal conversation. Review any key terms or ideas that may be unclear.
- On the day of the training, test the audio and video equipment.

Training Outline

Welcome (5 min)

- Greet participants as they arrive. Make sure everyone feels welcome and comfortable.
- Introduce yourself and the focus of the session: "Asking Purposeful Questions".
- Ensure participants are aware of the locations of restrooms facilities, refreshments, etc.

Introduction (15 min)

- Have participants make a name tent. Have them put their name on one side and their favorite talk moves on the other.
    - *A talk move is a question, comment, or statement that you use to get youth to go deeper with their thinking. For example, I use the talk move "Who can say that in their own words."*
- Share their name tents and talk moves with their tablemates.

Types of Questions (35 min)

- Pass out a copy of the common facilitator Talk Moves to each table. Ask them to cut the paper so that each question is on a card. The participants will now sort the cards into piles according to different characteristics.
- Note: There are no correct answers to this part. You want participants to be actively discussing the kinds of questions that are on the cards and what those kinds of questions afford. You also want participants to talk about the difference between open/closed, yes/no, scientific/school-like questions so that they can use these differences in their practice.
    1. **Free sort** (7 min) Sort the cards into any piles that make sense to you.
    2. **"Right-wrong"**(2 min) Find the "right-wrong" questions and put them into a pile. Put the other questions into a pile together.
        - ***A right-wrong question*** *is a question where the adult knows the right answer and they are trying to get the youth to say this right answer. These questions are also called "known-answer" questions. The process of asking known-answer questions is sometimes called "fishing for right answers" because you are just waiting for someone to say the words you're thinking, rather than engaging youth in complicated sensemaking work.*
        - *What are the advantages of right-wrong questions?*
            - *They are quick; good for cuing students' ideas, but not good for complex explanations or for students to show what they really know*
        - *What are the advantages of the other kind of questions?*
            - *They can let students explain in their own words, which is a powerful mechanism for learning.*
    3. **Open v. Closed** (3 min) Sort them into a pile of open-ended questions and a pile of closed-ended questions.
        - ***Closed-ended questions*** *are questions where there is a right answer that's usually short. (Ex: "What is a circuit?")* ***Open-ended questions*** *are questions where there is no right answer, such as "Explain how a circuit works."*
        - *What are the advantages of closed-ended questions?*
            - *They are quick; good for cuing students' ideas*
        - *What are the advantages of open-ended questions?*
            - *They can let students explain in their own words, they allow for you to deeply understand what a student is thinking, they*

challenge me to listen deeply rather than "fish" for a correct answer

4. **Rote v. Complex questions** (5 min) Sort the questions that require a "rote," memorized answer (such as one-word answers or vocabulary definitions) into a pile. Put the others in a pile together.
    - *Why might we emphasize complex questions?*
        - *They require students to think deeply in order to answer the question rather than just recalling a fact.*
5. To **Try**/To **Not Try** (5 min) Sort the questions into two piles. One should be for questions you want to try out, one pile for questions you don't want to try out.

- Debrief.
    - *What are the characteristics of the questions you want to use with your youth?*

See the Skill in Action (15 min)

- Now participants will see an expert in action as they help out youth who are struggling with a circuitry engineering task.
- Cue up the When Youth are Struggling video-based learning module and scroll to the video in step 3: Asking Questions when Youth Are Struggling.
- **Play the video** one time through and tell a partner what kinds of questioning strategies you notice the facilitator using.
    - *What do the facilitators say? How do they say it?*
- Pass out the Transcript: When Youth Are Struggling.
    - *Transcripts help us slow down and recognize the powerful statements that both adults and youth say in their interactions. Sometimes when we read or write down spoken language we see things we didn't notice before. Let's watch the video again with the transcript. Follow along as I play the video and listen for the talk moves that the facilitators use.*
- **Play the video** again and ask participants to reflect on what kinds of questions the facilitators are asking. For each of these questions, allow time for participants to **add evidence** from their transcript.
    - *Would you classify her questions as rote or complex? Open-ended? Closed-ended?*
    - *Ask them, "Can you give an example? What line do you see that in?"*
    - *And the most important question of all: which kinds of questions allow youth to expand their thinking? These questions are important because they are opportunities for us to engage youth in science explanation.*

Conclusion (15 min)

- Pass out notecards.
- **Participants will write three talk moves they want to use** in their next scientific interactions with youth.
    - *Now take a moment to reflect on how you can start using scientific talk moves to get youth to explain their thinking more deeply. Let's watch the video one more time and listen to the youth explain his thinking. I want you to write down three talk moves you can use to get the youth to go deeper in explaining the circuit.*
- Ask participants to share their talk moves with each other. As they do this, have them "steal" a fourth talk move that they could use in their next interaction with youth.
- Debrief: Ask participants to share what they have taken away from this training and what they plan on using in the future.
    - *What have you learned from today's session? What do you plan on using in the future?*
- **Thank participants for participating in your training.**
    - *I hope you have gained several talk moves that you can use to support youth to explain their thinking. I also hope you'll consider observing colleagues as they work with youth in STEM. I have even used tally sheets in the past to count open versus closed-ended questions or "school-like" versus scientific questions. If you have a close colleague perhaps you could each observe the other and collect this kind of information to discuss as you incorporate more and more STEM activities into your program. Please contact me if you'd like other resources related to Asking Purposeful Questions.*

After the Session

- Within 2-3 weeks of the training, email to all participants. Include the Talk Moves Card Sort as a resource for participants.
    - *Thank you for your participation in the recent "Asking Purposeful Questions" training. I hope you found it useful. I am attaching the Card Sort activity we did to give you extra strategies to try with youth. Consider meeting with a co-worker, supervisor, or friend to collaborate. I look forward to continuing our learning at the next session on SKILL/FOCUS on DATE at TIME at LOCATION. Please let me know if you have any questions. I can be reached at CONTACT INFO.*

Want to Earn Credit? Click2Science has teamed up with Better Kid Care to provide continuing education units. Check it out at: http://www.click2sciencepd.org/web-lessons/about

Talk Moves Card Sort

What is this called?	How can we make this work?	I notice that…
Does this remind you of anything you've seen in real life?	So you're saying you tested the polarity. (wait time for youth to add)	You need to do step 4 next.
What's friction?	Wait – can you say that again?	Do you think anyone else here knows what to do?
I wonder if you could ask another group for help with that.	Why do you think it's doing that?	What is the name of that process?
What will you try next?	How do you explain (what you see here)?	Who can tell me the three types of (rocks)?
What are the steps in the process of (photosynthesis)?	Who can say what (David) said in their own words?	Tell me how you think this works.

How can you test that?	What's your prediction?	What's the opposite of (an acid)?

Transcript: When Youth Are Struggling

[00:00:11.28]
Facilitator: Did that work?
Youth: Uh no still have green
Facilitator: What did you turn around? What do you need to (gestures) turn around?
Youth: Maybe
Youth 2: Oh!
Facilitator: And what could you do with...
Youth 2: Maybe you could put them on the opposite sides
Facilitator: Ah! Try it! Okay!

(narration)

[00:00:56.23]
Facilitator 2: So one thing I notice that your copper tape is here and here. What can you do to the legs of your LED to make it touch the copper tape here and here?
Facilitator: So that's step one of the troubleshooting the LED is actually working. What else might be the problem?
Youth: I turned it around
Facilitator: You turned it around. [00:01:16.10] we checked we checked the polarity and that seems to be working. What's the other component that we have (points to paper) on here?
Youth: The battery.
Facilitator: The battery. Well, did you check this battery? Do we know if this battery is actually working? Okay so the battery's working okay. All right. So let's put the batter back on here so then what's the last thing I heard some friends earlier saying that they had to do something with the rails what did they have to do with the rails?
Youth: (gesture)
Facilitator: Yeah. They had to press 'em, really, really tight and make it smooth right? So that's the last part of our troubleshooting here.
Youth: Oh.

Facilitator: The only thing is we need to make a GAP here so what could we do?
Youth: Use a scissors?
Facilitator: What could we do to make the gap?
Youth: Need to…
T: Yeah so take this up.

[00:02:05.08]
Youth: I just realized I'm having a problem and I don't know how to figure out how to make it like a little nose like an LED nose.
Facilitator: Okay
Youth: It glows, but...
Facilitator: The placement of your LED allright so so, what can we do? How can we address this problem? You really want that that nose in there right?
Youth: Yeah but the (inaudible)
Facilitator: Okay well let's try one first.
(Student works it out)
Youth: I realize that if I'm folding it close, oh, I got a hole.
Facilitator: You realize that if you fold it closer to the paper it doesn't bend
Youth: Yah
Facilitator: Okay! So now we're gonna flip this over and now you have to MOVE some of your copper tape.

Resources: Asking Purposeful Questions

This skill focuses on asking purposeful questions to deepen STEM learning in youth. Questions asked purposefully, with direction, tend to increase and focus learning. Effective types of questions or comments help learners think about concepts in different ways, thereby expanding their learning experience. Facilitators should vary question types and formats. A facilitator's strategic questioning can encourage youth to think more deeply about what they are observing, predicting, testing and discovering, and to further explain their thinking. Youth learn more effectively when they need to observe, think, reflect, use their critical thinking skills, explore, discover, document their findings, share their findings and apply that information to their real world. This can all be done through facilitator talk moves.

Why is asking purposeful questions important in STEM? All of the STEM fields, to some degree, essentially focus on answering questions. Scientists begin with a question related to a natural phenomenon, such as "Why are leaves green?" and their work focuses on finding an answer through methodical investigation. Engineers and technologists work to solve a problem and often use questioning as they define their problem statements, determine criteria for success and identify constraints. The questions youth ask will be enhanced by seeing adults ask meaningful questions. One of the ultimate goals of STEM education is training youth to be inquisitive and ask questions on their own.

Choose one of the following free, research-driven resources to help educators ask purposeful questions in STEM:

Michaels, S., & O'Connor, C. (2012). Talk Science Primer. TERC. Retrieved from http://inquiryproject.terc.edu/shared/pd/TalkScience_Primer.pdf

National Research Council. (2012). A Framework for K-12 Science Education: Practices, Crosscutting Concepts and Core Ideas. Washington DC: National Academy Press. Read here for more on the role of questions in "Constructing Explanations and Designing Solutions."