Professional Development Situation: Training

Skill Focus: Asking Purposeful Questions

Time Required: 75 minutes

DETERMINING THE BEST QUESTIONS

Participants will reflect on the questions they use and watch the "Using Questions for Many Purposes" video-based learning module to learn how to use questions to provoke STEM thinking.

Agenda

Homework before Session

- Questions Tally Sheet

Welcome – 5 minutes

Introduction - 15 minutes

- Discussion Cards

The Best Questions– 20 minutes

See the Skill in Action – 20 minutes

- Using Questions for Many Purposes video-based learning module
- Transcript: Using Questions for Many Purposes

Conclusion - 15 minutes

Materials

- Computer with Internet connection
- Projector and speakers
- Flip chart paper and markers
- Pens for participants
- One copy of the Discussion Cards for each group
- Using Questions for Many Purposes video-based learning module
- One copy of Transcript: Using Questions for Many Purposes for each participant

Before the Session

- **Read this training guide** to become familiar with the content and 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."* ***Before our session, you will need a colleague to help you complete the Questions Tally Sheet as you facilitate an activity with youth****. 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.*
- Be sure to **attach** the Questions Tally Sheet**.**
- 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 sort themselves into groups by the color of their name tag.
    - *Please rearrange yourselves so you are sitting with those who share your name tag color.*
- Once the participants have formed their groups, give them these further instructions:
    - *After you all have received a question card, spend five minutes introducing yourselves and asking your questions.*

  - *I will try to keep it moving, but try to manage for at least 2 -3 people to ask their questions.*
  - *Notice how the questions either encourage or don't encourage further dialogue.*
- Bring the whole group back together. Then discuss how the activity went.
- Talk about how these questions encouraged or discouraged more conversation.
  - *What is a question you enjoyed talking about with your group? Why did you enjoy it?*
  - *What was a question that helped you learn something important about another person?*
  - *What might that tell us about the role of questions?*
  - *Who had the question "Where can you find science?" What are some of your thoughts on this question?*
  - *How about "What you would like to build?" What might be some of the answers to this question?*
  - *What might happen if you asked youth these questions? What do you think their answers might be?*
- Ask participants to help you generate a list of characteristics for good questions.
  - *There are many kinds of questions that educators use. What kinds of questions are on these cards?*
    - *Answers: open-ended, no right or wrong answer, thought-provoking, ties to the current session or to their lives (relevant)*
- Summarize the conversation and explain the purpose of the activity to participants.
  - *When we are working with youth, it is critical for us to think about the kinds of questions we ask and the type of responses we get.*
  - *Purposeful questions drive not only a youth's response but also his or her learning process. To be purposeful, questions should be designed based on what we intend the youth will learn in that activity. In science, that often means that youth are engaging in* ***explaining their thinking****.*

Some common purposes for questions are cuing ideas, encouraging deep thinking, and assessing student knowledge.

- Add "cue ideas," "direct youth to think deeply," "check students' knowledge" to the list of question characteristics you have written on the board.

The Best Questions (20 min)

- Participants will use their Questions Tally Sheet to guide conversation at their tables.
    - *In your small group, pull out the pre-work tally sheet you brought with you and use the following questions to guide your conversation.*
- Have each group member go one at a time and describe his or her activity, the intended outcome for youth, the number of questions tallied, and some examples of questions. Allow discussion.
- Once everyone has had a chance to share, go through the following questions for the group to consider:
    - *How would these questions help youth increase their STEM learning?*
    - *Which kinds of questions got the best responses from youth?*
    - *What makes a question the "best"?*
- Ask participants to share their best questions with the room and describe the characteristics of those questions.
    - *Please choose one question from a member of your group that you think is the "best." We will share these questions with the large group and you will describe what makes the question you selected the "best".*

See the Skill in Action (20 min)

- Cue up the video, Using Questions for Many Purposes video-based learning module.
- Introduce the video.
    - *In this video, Katie is working with a group of youth who are using everyday materials to make effective water filters.*
    - *Katie has specific objectives for this STEM activity. Katie wants youth to use the engineering design process to test and retest their water filter prototypes. She wants them to consider what each material does and how effectively they work. They are also learning about the importance of a clean water supply.*
- Tell participants they will be making notes on what *kinds* of questions Katie asks.
    - *Are the questions designed to encourage youth thinking? Assess knowledge? Redirect behavior?*
    - *Are they open-ended? Right-wrong answer?*
- Watch the short video one time through and allow participants to discuss the questions from the video with a partner or group.
- Pass out the transcript and watch the video a second time. Ask participants to note:
    - Open-ended questions
    - Questions designed to cue youth thinking
    - Right-wrong answer questions
    - Known-answer questions (where Katie knows the answer)

- Watch the video several times to see the different prompts Katie uses to engage the girls in thinking more deeply about what they are seeing and experiencing.

Conclusion (15 min)

- Hang a piece of chart paper near each table.
- Ask participants to reflect on the activities they have done which include: using the tally sheet in their classroom, the discussion cards, and analyzing Katie's practice.
- Now participants will make a list of the questions they can ask youth in their setting. Try for ten questions at each table. Encourage them to use open-ended, thought-provoking questions that do not have a right-wrong answer.
- Share their lists of questions with the room.
- As they share, take notes and send these notes out with a follow-up email.
- Thank participants for coming today and encourage them to keep asking questions.

After the Session:

- From notes you took on the pieces of chart paper, compile a list of strategies for asking purposeful questions. Share this in your follow-up email to participants.
- Within 2-3 weeks of the training, email participants:
    - *Thank you for your participation in the recent Click2Science training on "Asking Purposeful Questions". I hope you found it useful. I'm including the list of questions you brainstormed. Consider having a co-worker, supervisor, or friend help observe you as you ask questions. 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

Questions Tally Sheet

Please complete this form and bring it to the training session.

This activity requires you to track your own questions as you work with youth. It might be useful to have a supervisor, friend, or even an older student tally how many questions you ask during a 30 minute period and what kind of questions you ask

Brief Description of the STEM (or other) activity:

Youth Outcome (what you expect youth to learn as a result of this activity):

Tally – number of times you ask questions during a 30 minute period:

Sample Questions you used (list as many as possible):

Discussion Cards

What do you enjoy most about working with youth?	If you were a vegetable, which vegetable would you be? Why?	What is a gift you have received that you will never forget? Why?
What is one thing on your bucket list you hope to accomplish this year?	What are three things that are always in your car?	What about where you were raised do you think influenced you the most?
If you were a scientist, what would you study?	Where can you find science?	Describe your favorite teacher.
What would you most like to try to build?	Who inspires you and how are you like them?	What are some of the things you noticed on the way to this training?
Who has most influenced how you work with youth?	What is one thing you would like to get out of the next 90 minutes?	Describe one young person you enjoy working with.

Transcript: Using Questions for Many Purposes

(intro) [0:30]

Katie: So, with your partner, the first step that you're gonna be doing is you're gonna be brainstorming how to make your water filter, you're gonna build your filter in this top part, and then we're gonna test them out as a group in the end to see whose filter does what. Which group would like to start sharing their material?

Youth: We were thinking we would have the dirty materials on top of this and we would put the water through and it would come out and leave the dirty materials behind.

Katie: What do you think the different functions might be?

Youth: They all catch gravel or dirt.

Katie: Okay so gravel or dirt is being caught. Do you think they'll catch the same size dirt?

Youth: No

Katie: Why not?

Youth: All different things get passed through the materials.

Katie: Do you think the different size might affect it?

Youth: (nod)

Katie: Okay

[1:18]

Katie: Can you talk me through what you were thinking here?

Youth: We can put a little slit right there!

Youth 2: And then we can put the straw!

Youth: And the straw will just go through there.

Katie: Oh, so you're saying the straw will come up

Youth: But then a little dirty water might go. Because this is supposed to filter out some dirty water and this is supposed to filter out the rest.

[1:34]

Katie: Next, what do you see?

Youth: It's a little bit yellow and like, one or two pieces of charcoal got in it. So maybe we'll skip the charcoal next time.

Katie: What do you think you could try to maybe get rid of that yellow color?

Youth: Maybe um, a little bit more of the cotton or a little of the cheesecloth.

Katie: So maybe that's part of your redesign where do you wanna put that. Everyone's gonna get a chance to redesign these.

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.

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.

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.

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."