Professional Development Situation: Training

Skill Focus: Making Authentic Assessments

Time Required: 90 minutes

CREATING STEM RUBRICS

Afterschool staff and volunteers will develop an understanding of rubrics and how to create them with youth.

Agenda

Welcome and Introduction— 5 minutes
Choosing Quality Lesson Plans— 20 minutes

- Lesson Plan 1: Making Line Graphs and Lesson Plan 2: Studying Smiles

Creating a Rubric – 20 minutes
Gallery Walk—20 minutes
See the Skill in Action— 15 minutes

- Creating a Rubric video-based learning module

Conclusion— 10 minutes

Materials

- One adhesive chart paper for each group
- Markers
- Nametags
- One packet of sample lessons for each group: Lesson Plan 1 and Lesson Plan 2
- Creating a Rubric video-based learning module

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 "Making Authentic Assessments". 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 (2 min)

- Greet participants as they arrive. Make sure everyone feels welcome and comfortable.
- Introduce yourself and the focus of the session: "Making Authentic Assessments".
- Ensure participants are aware of the locations of restrooms facilities, refreshments, etc.
- Have each participant make a name tag with their name written on it and their favorite color underneath their name.
- Review objectives.
    - *Over the next 90 minutes, we will: Work together to create a lesson planning rubric. Analyze the process that we used to create the rubric. Apply it to our work with students.*

Introduction (5 min)

- Brainstorm a list of characteristics of high-quality lesson plans.
    - *When you think about quality lesson plans, what elements would you want them to include?*
- As participants share ideas, write them on the white board or chart paper. Allow the participants to share ideas about what a quality lesson plan entails until all of the ideas have been written up on the board.

Choosing Quality Lesson Plans (20 min)

- Split the participants into groups of 4-5.
- Introduce the task.
    - *Now that we've shared the elements that are important to a high-quality lesson, we are going to look at sample lesson plans and choose the best lesson and the worst lesson based on these qualities.*
- Pass out packets with Lesson Plan 1: Making Line Graphs and Lesson Plan 2: Studying Smiles to each participant.
- Give participants time to discuss the lessons with their tablemates. While groups are working, walk around the room and listen in on conversations, adding ideas or helping move the conversation along as needed.
- **Share out: Best lesson plans.** Ask groups to share their favorite lesson plans and explain why they felt those were the highest quality. Go around the room until each group has shared. As participants are sharing, add ideas to a list of what a good lesson plan needs on the white board or chart paper.
- **Share out: Worst lesson plans.** Ask participants what recommendations they might make to improve the activity. For instance, if they say it lacked details, you can add to the list that good lesson plans need to have sufficient details.

Creating a Rubric (30 min)

- Introduce rubrics.
    - *A rubric is a way of setting the standard for work – in this case lesson planning. You also can use a rubric for any student project, describing the standard for different elements of the process and product.*
- Group the products and processes to include in the rubric. Look through the list of qualities of a good lesson plan and brainstorm logical groupings. For instance, one component might be "Structure of the lesson plan." Participants will have differing levels of experience thinking about student work this way. It is important to allow them a voice in rubric creation.
- Use the chart paper to color code a rubric. As you group the items on the list, choose a color for each component and circle the items that go with that component. For example, participants might select, "Structure of the lesson plan," you might choose to circle them all in green and include "Materials" or "Clear introduction."
- **Define the standard** and rating system for each component.
    - *A standard is a statement of what you want youth – or in this case, the lesson plan writers – to accomplish.*

- *A rating system allows instructors to assess whether youth meet the components of the standard or not. A common rating system is the 1-4 number system:*
  - *4: better than we expect*
  - *3: exactly on standard*
  - *2: not quite to standard yet*
  - *1: below the standard*

- Assign each group one component to write the standard for. For example, if a group who has "clear beginning," may write the standard to be *"The lesson has an introduction that is compelling and allows students to use their background knowledge."* Remind groups to work with a 1-4 number system.
- Direct the group to **create a statement of the standard** at each of these levels for that particular component. Tip: It is often easiest to start with the 4 and the 1 and then fill in the middle.
- Give groups time to work, about 5-10 minutes.

Gallery Walk (15 min)

- Direct groups to use walk around and read other groups' list of standards and think about what could be added or clarified.
  - *Finalize your standards for your component, and then we will share them with the group.*
  - *Please use your colored marker to make notes right on the other groups' posters. We will move all the way around the room so everyone has a chance to share.*
- To start the process, move each group one to the left of their original poster. Give them some time to look at and read the poster of that group and make any additions/subtractions. Once each group has had a chance to do so, move them to the next poster.
- Continue moving groups until they have visited all the posters and been able to make their comments. Each group should come back to their own poster. Give them just a few minutes to look at the comments and prepare to present the new product to the group.
- Have groups share.
  - *How did you feel about the process? Why do you think I didn't give you all of the answers?*
  - *How do you think students would respond to being able to create their own rubrics for projects?*

Emphasize that the process is just as important as the product.

- Staff are going to learn their most important lessons through the process, and they will be more likely to utilize the rubric when it is completed.

See the Skill in Action (15 min)

- Ensure that you have a set up for the video that allows all participants to see and hear the video. Cue up the Creating a Rubric video-based learning module which is the video in Step 3.
- Introduce the video to participants. Gabby works with a small group of youth on a plant activity and she weaves the use of a rubric into the lesson for the day. While you are watching the video, think about these questions:
    - *How does Gabby guide the students as they create the rubric? (She walks them through each level, encouraging them to share their ideas and also guiding their word choice occasionally as needed).*
    - *What role do you think the rubric plays in the lesson? (The rubric helps define expectations so everyone is on the same page about what a good product will look like after this lesson is finished).*
    - *How does Gabby wrap up the lesson, using the rubric as the guide? (She asks the students to self-rate themselves, which gives them a chance to reflect on their own work).*
- Note: You may want to prepare the questions on a large piece of chart paper ahead of time so you can post them in front while participants watch the video.

Conclusion (10 min)

- **Apply the learning to their program.**
    - *With a partner, discuss some ways you could use student-led rubrics as a strategy in your program. What lessons have you done recently that would lend themselves to this strategy?*
- **Share ideas.**
    - *As you can see, rubrics can be a great tool to help youth take ownership of the expectations for their own work quality. Rubrics can also help you guide the facilitation, especially when doing STEM activities. Remember that the process of creating a rubric together is more important than the final product.*

- **Thank the participants**.
    - *Thank you all for coming. I am happy to be available if you have further questions about this topic.*

After the Session

- Keep the participant-made components for the Lesson Planning Rubric. Type them into the Rubric Template and send them out with the email, thanking them for taking the time to attend the training.
    - Thank you for you participation in the recent Click2Science training on "Making Authentic Assessments". I hope you found it useful. Consider meeting with a co-worker, supervisor, or friend to share what you learned. I look forward to continuing our learning at the next session on SKILL/FOCUS on DATE at TIME at LOCATIONI. Please let me know if you have any questions. I can be reached at CONTACT INFO.
- To support the learning in this training, consider using the Coaching and Staff Meeting materials that accompany this topic.

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

Rubric Template

Components	Criteria for score of 1	Criteria for score of 2	Criteria for score of 3	Criteria for score of 4

Lesson Plan 1: Making Line Graphs

Subject: Science

Grade span: 5 to 10

Duration: Two 45-minute sessions

Series: Part 4 in the series Graphs.

This lesson was excerpted from the Afterschool Training Toolkit under the promising practice: Tutoring to Enhance Science Skills

Description:

This lesson is one example of how you can implement the practice of Tutoring to Enhance Science Skills. In this activity, students take the results, or data, from different experiments and learn to make line graphs.

Note:

This is the last lesson in a series. Start with Interpreting Data from Birdfeeders, then Learning to Make Data Tables. You may want to review Learning to Make Bar Graphs if you feel it would help students understand line graphs.

Learning Goals:

- Analyze data from a data table
- Construct a line graph to represent data
- Understand line graphs and interpret data using line graphs

Materials:

- Notebook paper
- Pencil
- Clear ruler
- Graphing paper (1 cm x 1 cm preferred)

Preparation:

- Connect with the school-day teacher to review students' needs.
- Review the lesson, printouts, and Tips for Tutoring Students in Science (PDF).
- Print all of the PDFs for this lesson. If you are working with more than one student, make copies as needed.
-  **Safety Considerations:**

  There are no safety precautions for this lesson. However, if simple experiments are conducted in expanding this lesson, follow appropriate safety precautions such as using goggles or safety spectacles.

What to Do:

- **Engage** students by asking them what they already know about bar graphs, or asking them to show you a sample of any bar graphs they have made. Or, review the Sample Data for a Line Graph (PDF) or the data table they made in the previous lesson (Learning to Make Data Tables). Select one data set and ask students how they might represent the results in a line graph. Note what students understand and where they need to modify their thinking.
- **Explore** bar graphs.
- Review the Guidelines for Making Line Graphs (PDF) and the Checklist for a Line Graph (PDF). Ask students to select an example from the sample data and create a line graph.
- As students work, review any vocabulary associated with data representations. Watch for typical errors and help students learn to identify them, check their work, and correct errors independently.
- **Explain** the results. Ask students to explain how they organized the data in their line graphs. Review students' line graphs using the line graph checklist. If you feel that sufficient progress has been made, ask students to continue using other sample data sets to create additional line graphs.
- **Extend** learning if you have extra time. Ask students for ideas, or use school-day science lessons or the Internet to collect additional data for more line graphs. If you are familiar with Microsoft Excel®, teach students to create electronic spreadsheets with line graphs.

Evaluate (Outcomes to look for):

- Student participation and engagement
- Answers that reflect an understanding of how data can be organized in a line graph (use the line graph checklist)
- Understanding of x axis, y axis, and variables
- Understanding of how to interpret data from a line graph

Standards:

Click this link to see additional learning goals, grade-level benchmarks, and standards covered in this lesson.

Learn More:

Learn more about the 5Es.

Lesson Plan 2: Studying Smiles

This lesson was excerpted from the Afterschool Training Toolkit under the promising practice: *Gathering and Sharing Information*

Description:

In this lesson, students use yarn and metric rulers to measure the lengths of their smiles. They record measurements in an electronic spreadsheet, analyze the data to discover such things as who has the biggest smile and the group's average smile size. They present their findings, using digital pictures to enhance their presentations. This activity provides an opportunity to connect to the day school curriculum in several academic areas, including science, math, and literacy.

Learning Goals:

- Learn the research steps of gathering, analyzing, and presenting data
- Use a metric ruler to accurately measure length (in centimeters and millimeters)
- Use technology tools to record and analyze data
- Create charts that explain resulting data
- Understand "mean," "median," and "mode" (for upper elementary and middle school)

Materials:

- Digital still cameras
- Metric rulers, yarn, data-collection worksheet
- One computer with an electronic spreadsheet application
- One computer for every two students (optimal), with a word-processing application; several computers may be shared during the writing activity
- A projector, large-screen display, or interactive whiteboard (if available) may be used to display data as it is gathered and analyzed
- Digital video camera to document the activity (optional)

Preparation:

- **Instructors should determine students' computer and camera skill levels and select appropriate technology tools. Instructors should also have basic computer skills, including familiarity with digital cameras, electronic spreadsheets and calculation formulas, and word-processing software.**
- Assemble materials
- Test and practice camera functions
- Review electronic spreadsheets and word-processing software functions
- Prepare an electronic spreadsheet that will be used to compile the data
- Rehearse the activity at least once

What to Do:

- **Engage students**

- Ask the following series of questions and discuss their responses. How big is your smile? Who has the biggest smile? How can we measure and then compare the smiles of everyone in the group? How could we describe the length of something (that is, units of measure)?
- Explain that the students are going to become "researchers" to learn more about children's smiles. Ask what they think they will discover. For example, do girls or boys have bigger smiles? Do older children have bigger smiles than younger children?
- Explain that to find the answers, they will need to collect and analyze some "data."
- Present the steps, and mention that they are basically the same for all researchers and scientists who are interested in finding out about things. Elaborate on the steps as necessary.
- Ask a question
- Collect data
- Analyze data
- Interpret results
- Present results
- Share what is learned and plan next steps
- You can write the steps on chart paper or on the board and point out the steps as the activity progresses.
- Explain that students will work in pairs to measure their smiles and then use computer technology to compare collected data. Introduce metric measurements, including "centimeters" and "millimeters," as well as the measuring tool they will use.

Collect data

- Using a piece of yarn, have each student measure his or her partner's smile straight across from corner to corner.
- Transfer the yarn to a ruler and record measurements onto a worksheet or directly into the computer in both centimeters and millimeters. You may choose another unit of measure if desired.
- Have each student take a picture of his or her partner's smile.
- If you wish to document the activity to share with other instructors or parents, ask one or two students to operate the video camera. (optional)

Record and analyze the data

- Discuss how to create an electronic spreadsheet. Decide how to set up the rows and columns of the spreadsheet and assign names to each. Discuss calculations and formulas.
- Have teams enter their members' data into the spreadsheet.

- Once data are entered, show the data table of all students' smiles and ask who has largest smile, who has smallest smile, and how many have the same size smile.

Introduce spreadsheet capabilities

- Introduce the term "average" and how it is computed.
- Show how the electronic spreadsheet application can automatically figure the average. If appropriate, introduce the terms "mean," "median," and "mode."
- After collecting your data, use the graphing capacity of your spreadsheet program, or enter your data into this free graphing tool, http://nces.ed.gov/nceskids/graphing/

Interpret the data

- Discuss findings and make charts from the data.
- Ask each student to write an account of the activity and include a digital picture and the metric measurements of their smile.
- E-mail findings to an older class and ask it to analyze the smile data of the younger students. (optional)

Present the results

- Share stories, pictures, and smile data.
- Evaluate the successful completion of each student's work.
- If problems are evident in data collection or analysis, this can be a valuable learning opportunity. Emphasize that this happens in real science experiments, too.

Evaluate (Outcomes to look for):

- Understanding that collecting and analyzing data helps scientists and others answer questions
- Understanding that electronic spreadsheets can assist in data collection, analysis, and presentation
- Familiarity with measuring tools and their use, units of measure, and (for older students) statistical terminology

Standards:

Click this link to see additional learning goals, grade-level benchmarks, and standards covered in this lesson.