

How Does Authenticity Grow?

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Time Frame 3 hours

Essential Question(s)

How can we increase teachers' understanding of authentic instruction and build their capacity to adapt lessons to more effectively implement authentic instructional practices?

Summary

In this interactive session, teachers will participate as learners in a 5E LEARN lesson. Through this experience, they will build formal knowledge of 5E concepts and evaluate the lesson's alignment with the 5E model and its elements of authenticity. After observing modifications made to the 5E LEARN lesson, participants will identify opportunities for further modifications to make the lesson more authentic or more strongly aligned to 5E principles. These activities serve as a foundation for the subsequent PD activities related to authenticity and 5E.

Learning Goals

- Participants will engage in and analyze an authentic science learning experience and reflect on this to determine the relevant components of authenticity.
- Participants will be able to identify how their authentic learning experience aligns with a 5E lesson model.
- Participants will maximize authentic instruction by practicing modifying existing 5E lessons for potential use in their classrooms with their students.

Attachments

- 5E Lesson Roles—How Does Authenticity Grow.pdf
- Activity Slides—How Does Authenticity Grow.pptx
- Authentic Lesson Reflection Tool—How Does Authenticity Grow.pdf
- Breakout Answer Key—How Does Authenticity Grow.docx
- Breakout Answer Key—How Does Authenticity Grow.pdf
- Breakout Codes—How Does Authenticity Grow.docx
- Breakout Codes—How Does Authenticity Grow.pdf
- Explore Sources—How Does Authenticity Grow.docx
- Explore Sources—How Does Authenticity Grow.pdf
- HDYGG Full Lesson (HS)—How Does Authenticity Grow.pdf
- HDYGG Full Lesson (MS)—How Does Authenticity Grow.pdf
- How Does Your Garden Grow Explain Phase—How Does Authenticity Grow.docx
- How Does Your Garden Grow Explain Phase—How Does Authenticity Grow.pdf
- Instructional Strategy Note Sheet—How Does Authenticity Grow.docx
- Instructional Strategy Note Sheet—How Does Authenticity Grow.pdf
- Lesson Design Proof Rubric—How Does Authenticity Grow.pdf
- Soil Investigation Handout—How Does Authenticity Grow.docx
- Soil Investigation Handout—How Does Authenticity Grow.pdf
- Window Notes—How Does Authenticity Grow.docx
- Window Notes—How Does Authenticity Grow.pdf

Materials

- Activity Slides (attached)
- Breakout Codes handout (optional; attached; one per participant)
- Breakout Answer Key (attached)
- 5E Lesson Roles (attached; one per participant)
- Authentic Lesson Reflection Tool (attached; one per participant)
- Lesson Design Proof Rubric (attached; one per participant)
- How Does Your Garden Grow Explain Phase (attached; one per participant)
- HDYGG Full Lesson (HS) (optional; attached; one per participant)
- HDYGG Full Lesson (MS) (optional; attached; one per participant)
- HDYGG Full Lesson (HS) (optional; attached; one per participant)
- Window Notes graphic organizer (attached; one per participant)
- Sticky notes
- Internet-enabled research devices
- Soil samples
- Soil containers
- Mineral-free water (e.g. DI water)
- Soil test kit or chemical test strips
- Gloves
- Paper towels or disinfectant wipes
- Google App (Docs, Slides, etc.) (optional)
- Explore Sources digital copy
- Posters or chart paper
- Markers

Engage

Presenter's Note: Preparation

Before the session starts, prepare a Sticky Bar graph on a whiteboard space or poster. On the x-axis, write a 1–5 numerical scale.

Use the attached **Activity Slides** to guide the learning activity. Begin on **slide 2**. Go over the learning objectives for the session with participants. Then, move to **slide 3** and give each participant a sticky note. Ask participants to write a number on the sticky note representing their level of comfort with teaching a lesson in the 5E format—level one represents little to no understanding, while five represents a near-complete understanding. Then, have participants place their notes on the prepared Sticky Bar graph. The finished graph gives a quick visual assessment of where the group is in their comfort teaching a 5E lesson.

Move to **slide 4** and introduce participants to the "How Does Your Garden Grow? (Middle School Edition)" lesson on which this activity is based. Next, invite participants to take part in a Photo Deconstruction, using the photos on **slide 5**. Ask participants to reflect on what they observe in each photo, the differences they notice, potential causes for these differences, and what healthy flora might have that the unhealthy flora does not. After the discussion, move to **slide 6**. Ask participants to summarize what they know about the images, based on discussion, in one sentence.

Explore

Presenter's Note: Preparation

The testing in this phase requires a soil solution that is best prepared a day or more ahead of time to allow nutrients to leech into the water. Prepare the soil solution by following these steps: 1) Create a soil solution by adding 100 mg of soil and 200 mL of water to a beaker or other container; 2) Use the stirring rod or sticks to blend the mixture (be sure to clean the stirring rod thoroughly or use a different stirring utensil for each soil sample); 3) If you are using test strips that require a color comparison, it might be necessary to filter the water sample before collecting data—depending on how murky the soil makes the water, it is usually clean enough after 2–3 rounds of filtering through a double or triple layer of coffee filters.

Now that the participants have a sense that soil may be important to plant health, move to **slide 7**. First, provide each group with a copy of the attached **Soil Investigation Handout**. Next, depending on the specific directions for the soil test kit you have purchased, review the procedure for soil testing with your students. If your kit requires the use of chemicals, be sure to check the SDS sheets in advance for safety and disposal procedures.

Optional: Shortened Soil Tests

The full version of this lesson for students includes a number of soil tests. For the purposes of this activity, you may consider including a smaller number of tests in the interest of time or the mess other tests could create.

Invite participants to test different soil types to determine the levels of nutrients present. Participants should follow the directions on slide seven, using tablets or phone cameras to document their process.

Once participants have finished this part of the activity, move to **slide 8** for clean-up.

Moving to **slide 9**, pass out a copy of the attached **Window Notes graphic organizer** to each participant. Alternatively, participants can also use Google Apps (e.g., Docs, Slides) to collaboratively fill out the notes in the same manner. Invite them to work in groups and gather information according to the Window Notes strategy about general soil science, soil health, and soil functions. Each participant should record important details in the Window Notes graphic organizer or online, but ask the class to leave the Nutrient Cycle box empty for now. Distribute a digital copy of the attached **Explore Sources** handout (or distribute this Google Docs link, also listed on slide nine) to participants. Note that several of these sources are YouTube videos, which may require headphones or a separate space for listening in order to avoid disturbing working groups.

Optional: Shortened Research Activity

In the interest of time, the Explore Resources sources may be narrowed down to a smaller number of options to explore. Be sure to include at least one video, one article, and two infographics. Include more sources if time allows.

Once participants have completed their Window Notes, move to **slide 10**. Ask for volunteers to help summarize key points and record participants' contributions in the lesson slide itself (or use a whiteboard space) to create an Anchor Chart for each Window Notes box. Incorporate information about soil chemistry into the "Soil Properties" or "Soil Health" boxes. Consider also including pictures or drawings of soil horizons or other helpful images. Consider using the questions below to guide the summary discussion:

- What is soil?
- How do we describe it?
- What criteria factor into soil health?
- What are the benefits of having healthy soil?
- What soil management practices or strategies would improve soil health?

Explain

Move to **slide 11**. Invite participants to work together to complete the "How Does Your Garden Grow?" Breakout via the link on the slide. Participants should read the information on the website and click to interact with pictures and other page elements. This way, they can discover hidden clues to the four keys near the bottom of the page. For clues, participants can input an answer into each key field and click "submit"; fields with incorrect answers then produce hints. For best results, participants should have Flash enabled. A **Breakout Answer Key** is attached for reference.

Optional: Breakout Codes

If necessary, the attached **Breakout Codes handout** can be used by participants to record their answers and how they found them. This handout is not necessary for evaluation, as participants are also prompted by the breakout web page to show you their completed Google form.

They may also add to other sections of their Window Notes as necessary. Then, as a group, create a final Anchor Chart for nutrient cycles. Use **slide 12** or a whiteboard space to record participants' ideas. Then, ask participants to make connections between the Explore and Explain phases of the lesson.

Move to **slide 13**. Invite participants to use the Three Post-It Notes strategy in small groups or individually. Participants should write a single word and then a short phrase summarizing what they learned in the breakout (have participants complete only the Word and Phrase notes at this time). Allow one set of two Post-It notes per group, if working in groups. If participants cannot narrow their ideas down to a single example, ask that they limit their responses to one sticky per person (that is, a group of three could have up to three words and up to three phrases).

Create the Nutrient Cycles chart and complete the above process to update the previous anchor charts as necessary. Then, ask participants to synthesize their knowledge in order to complete the last Post-It note.

Possible Responses: Three Sticky Notes

Participants' final sticky notes should draw a relationship between nutrient cycles and soil health (for example, how cycles support healthy soil, or how unhealthy soil might disrupt cycles), how soil management practices support or supplement natural nutrient cycles, and the impact of soil management practices on soil health.

Rather than continuing through the Extend and Evaluate phases of the "How Does Your Garden Grow?" lesson, move to **slide 14** to give participants a chance to look over what Extend and Evaluate activities would follow for their grade levels. Note that, since NGSS (which our OAS-S are based on) treats all MS standards the same, each track could be taught in any of the three grades. Answer any questions participants have.

Now, move to **slide 15**. Ask each participant to draw a 3–5 panel comic to illustrate a general overview of how they would divide up a science lesson, from beginning to end. Once participants have finished, Ask for volunteers to share their panels. Use volunteers' ideas to help form a broad idea of the group's classroom structures.

Presenter's Note: Preparation

Before the Magnetic Statements activity, use five pieces of chart paper or five whiteboard spaces to post the five Es (Engage, Explore, Explain, Extend, and Evaluate) in different parts of the room.

Move to **slide 16** and draw participants' attention to the 5Es posted around the room. Using the Magnetic Statements strategy, invite them to stand next to the E they feel is the *least* important. Once groups have formed, ask participants to discuss their rationales with their group members. Then, have each group share their reasoning with the full group. After this brief discussion, ask participants to reflect on whether a lesson would be effective if an E were missing.

Possible Responses: 5 E's

During the discussion, participants should come to the conclusion that all E's are necessary in some form or another. If participants bring up the learning cycle model that preceded 5E, consider responding by saying certain elements and purposes of the 5 E's are embedded in the phases that make up that previous model.

Optional Slides

Slides 17–19 can be used if participants ranked themselves mostly as 4–5 on the Sticky Bar graph. If you do not choose to use these slides, they can be hidden by right-clicking each slide and selecting "Hide Slide." If you choose to use these slides, the following notes summarize the slides' content, but more in-depth information can be found in the slides' notes. **Slide 17** shows the contrast between 5E and the traditional model of teaching science, which is to tell the students the content they need to know, often through lecture, and have students apply their understanding book work or pen-and-paper activities. As many teachers learned this way when they were students, many classrooms continue to operate this way. Continue to **slide 18** to share information about Piaget' Adaptation learning theory, and invite participants to consider and discuss how adaptation might align with the 5E model. **Slide 19** Shows Piaget's theory and the 5E model side-by-side. Ask participants whether IVP aligns with learning theory or Piaget's work, and why or why not. Participants should conclude that they do not align. The remaining slide animations help to illustrate how students can be guided through each model.

Move to **slide 20** and ask volunteers to share how their comic panels are aligned, or not aligned, with the 5E model. Then, pass out a copy of the attached 5E Lesson Roles. Move to **slide 21** and ask participants to evaluate how the Engage, Explore, and Explain phases of the "How Does Your Garden Grow?" lesson align with the model.

After a brief discussion, move to **slide 22** to revisit the Sticky Bars activity from the Engage phase. Hand each participant a new sticky note and invite them to write a number from one to five that illustrates their comfort level with teaching lessons in a 5E format. Have them place their sticky notes on the same bar graph from before (or create a new space) for a quick visual assessment of the group's progress.

Extend

Move to **slide 23.** Introduce the attached **Authentic Lesson Reflection Tool** and **Lesson Design Proof Rubric** and pass out a copy of each handout to each participant.

Then, go to **slide 24** and distribute a copy of the attached **How Does Your Garden Grow? Explain Phase**. Ask teachers to use these tools to assess the authenticity of the Explain phase of both "How Does Your Garden Grow?" lessons.

Optional: Extended Lesson Assessment

If time allows, consider handing out the full versions of both LEARN lessons and asking participants to evaluate the authenticity of all five phases in one or both lessons.

Presenter's Note: Flipgrid Integration

Create a Flipgrid for participants to share their ideas and plans. This can be done with phones, tablets, laptops, or other internet-enabled devices.

Ask participants to assess the middle school version of this lesson by following the Bitly link on **slide 25**. Allow time for participants to brainstorm other ways they could increase the lesson's authenticity. Ask how they might use a digital breakout in their classrooms. Additionally, ask which of their own lessons they could modify for authenticity. To scaffold, discuss with the class the Breakout activity as an example of a chance meant to increase the authenticity of the lesson. The original lesson's order of activities was also changed to better align with the 5E model. Have participants share their ideas with the Flipgrid link you created.

Evaluate

Hand out the attached Instructional Strategy Note Sheet. Using the Strategy Harvest instructional strategy, ask participants to fill out each row, detailing how each strategy was used and how participants might use the strategies in their own classrooms.

Follow-up Activities

This activity is geared toward introducing science teachers to the Authenticity Framework, with a secondary focus on the use of digital breakouts. For a follow-up activity to How Does Authenticity Grow?, consider "What's a 5E?" which introduces science teachers to the 5E Instructional Model via another student lesson called "What's a GMO?"

Research Rationale

Authentic lessons allow opportunities for collaboration, which leads to the exploration of multiple perspectives and various points of view to be heard during a lesson. "Authentic learning environments need to provide collaborative learning where, for example, more able partners can assist with scaffolding and coaching, and where teachers provide appropriate learning support" (Herrington, J., 2014; e.g., Collins et al., 1989; Greenfield, 1984). Herrington, J. et al., describe the four components in an authentic lesson as follows: 1) students should seek to solve a real-life problem to which they would attach emotional commitment as well as a cognitive interest; 2) the problem should be sufficiently open-ended so that there are a variety of strategies for its solution; 3) the problem-solving strategies and "solutions" developed should encourage students to change their actions, beliefs, or attitudes; and 4) the problem should have a real audience beyond the classroom. Authentic tasks are more worthy of the investment of time and effort in higher education than de-contextualized exercises and tasks (Herrington & Herrington, 2006).It is unreasonable to expect students to develop necessary 21st-century skills in a traditional classroom because, typically, lessons designed in these environments do not create opportunities for students to practice high levels of critical thinking, collaboration, or problem-solving, nor do they allow practice in connecting new information to experiences outside the classroom setting. By using instructional strategies that promote authentic and inquiry-based teaching, students can gain more autonomy and meet high expectations for learning. When comparing traditional teaching approaches, such as note-taking with lectures or book work, to more active learning, such as the use of LEARN instructional strategies within a 5E lesson, the lessons that promote active learning have been shown to increase student achievement on assessments as much as 55% (Freeman et al., 2014). The 5E instructional model provides a research-based learning cycle lesson format in five phases (Engagement, Exploration, Explanation, Extension, and Evaluation). These phases allow students to engage in learning new content through meaningful learning experiences. These meaningful learning experiences provide opportunities for students to construct knowledge through exploration and they support higher-order thinking through discourse, discussion, and explanations, deepening understanding through extension, and elaboration of learning and assessing understanding through relevant and meaningful evaluations.

Resources

- Flipgrid. (n.d.). Microsoft. https://info.flipgrid.com/
- K20 Center. (n.d.). 4-2-1. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f506663d
- K20 Center. (n.d.) Anchor charts. Strategies. https://learn.k20center.ou.edu/strategy/64f2b35101a470dda36d44421900af08
- K20 Center. (n.d.). How does your garden grow? Lessons. https://learn.k20center.ou.edu/lesson/b5aef944bb8300a7bdb6f1a67f02fc49
- K20 Center. (n.d.). Magnetic statements. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f50761bf
- K20 Center. (n.d.). Sticky bars. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505ee0f
- K20 Center. (n.d.). Strategy harvest. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f5062662
- K20 Center. (n.d.). Photo or picture deconstruction. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f5065b32
- K20 Center. (n.d.). Three sticky notes. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f506d92f
- K20 Center. (n.d.). Window notes. Strategies. https://learn.k20center.ou.edu/strategy/fc74060730ea745c8c4f356aa2015ac0