

TO: AOLME Project Leaders

DATE: January 18, 2019

FROM: HRI AOLME Evaluation Team

RE: Formative evaluation feedback on
Level 1 Sessions 1 and 2

As part of HRI's formative evaluation in Year Two, we reviewed and provided feedback on Level 1 and Level 2 student materials. The project subsequently revised the Level 1 curriculum. In Year Three, we are providing a follow-up review of the Level 1 student materials. This memo provides formative evaluation feedback on Level 1 Session 1 and Session 2.

Our Year Three review focuses on the curriculum's alignment with conceptual frameworks for effective instruction and equity, as well as its potential to be adopted by other users (e.g. teachers) in the future. The frameworks for effective instruction and equity are shown in Figures 1 and 2. Throughout the memo, we reference elements of the frameworks, typically in parentheses following a recommendation.

Framework for Evaluation: Elements of Effective Instruction

1. Motivation
2. Eliciting students' prior knowledge
3. Intellectual engagement with relevant examples, applications, and models
4. Use of logic and reasoning to make, defend, critique, and evaluate claims
5. Sense-making

(adapted from Banilower et al. 2010)

Figure 1

Frameworks for Evaluation: Equity

Four dimensions for addressing equity (Gutiérrez 2009)

1. Access: resources available to students for learning disciplinary content and practices
2. Identity: appropriate attention to students' personal identities and cultural backgrounds and to the "balance between self and others"
3. Achievement: results that students achieve
4. Power: social transformation including, at the classroom level, whose voices and ideas are acknowledged and acted upon

Equitable classroom practices (Moschkovich 2013)

1. Cultural context: ensuring that classroom activities are connected to students' local communities
2. Social organization: practices that facilitate students' participation in the classroom, including attention to similarities and differences between definitions of appropriate participation at school and in students' homes
3. Cognitive resources: enabling students to use their prior knowledge and experience, including language, as resources for learning

Figure 2

The structure of the feedback for each reviewed session is as follows: an overview outlines strengths of the session and general ideas for further enhancing the materials. We then give activity-specific suggestions for increasing the alignment between the materials and the conceptual frameworks. Our intention was to make it easy to navigate between our suggestions and the materials, even though this arrangement led to repetition of some suggestions.

Session 1

Overview

Session 1 includes opportunities for students to discuss their prior knowledge and use their cognitive resources and for intellectual engagement with mathematics and computer programming concepts, with varying levels of cognitive demand. Although students have opportunities for sense making throughout the session, editing some discussion and journal prompts could help to target the session goals more specifically. In addition, you might consider including motivation for learning about computer components and Raspberry Pi earlier in the sequence of activities and increasing opportunities for using logic and reasoning to make, defend, critique, and evaluate claims.

Session 1 also includes substantial attention to student access, identity, and social organization. Additional prompts (as in Ramirez & Celedón-Pattichis, 1998)¹ could help students connect their



¹ Ramirez, N. G., & Celedón-Pattichis, S. (2012). Second language development and implications for the mathematics classroom. *Beyond good teaching: Advancing mathematics education for ELLs*, 19-37.

experiences in AOLME to computer science terminology, as is done for “command” in Activity 1.3. You might also consider ways to increase attention to achievement, power, and cultural context.

The Session 1 facilitator guidance lists content goals and interaction goals. You could further support facilitators in meeting session goals by suggesting strategies for facilitating specific activities. Also, adding guidance for students and facilitators on enacting the student roles might be helpful to participants.

Suggested Revisions From Detailed Review

1.1 Components of a Computer & the Raspberry Pi

- a. The materials assign students roles to enact during the activity, but there is no specific guidance for how to enact roles present in materials (social organization). 
 - Consider specifying tasks each role is responsible for during the Components of a Computer & the Raspberry Pi activities.
- b. Note: on the student card, consider revising “wins who gets the most cards” to “the winner is the person who gets the most cards.” 

1.2 Computer Components and Data Flow




- a. The materials direct students to ensure all students participate in the computer assembly, but no specific guidance about how to do so is present in the materials (access).
 - Consider suggesting specific strategies in the facilitator materials for engaging all students in the computer assembly.



1.3 Linux: Directory Navigation and Basic Commands




- a. The materials assign students roles to enact during the activity, but there is no specific guidance in the materials about how to enact roles (social organization).
 - Consider specifying responsibilities for each role during the Navigation and Basic Commands activities.
- b. The prompt asking students to debrief what they learned at the session is general and may not elicit the intended content-related takeaways (sense making).
 - Consider using prompts that more specifically target the session content goals.
 - Consider using sentence frames or sentence starters designed to facilitate students’ writing about the session content goals (as in Ramirez & Celedón-Pattichis, 1998).

1.3.1 Linux Commands to Navigate the File System

- a. The terms “directory,” “local file,” and “root directory” are not explicitly defined or demonstrated and may confuse students (access). 

- Consider including a discussion question similar to the one asked about “command” for each of these terms.
- Consider discussing distinctions between the meanings of terms used in computer programming and their meanings in everyday life (as in Ramirez & Celedón-Pattichis, 1998). 
- b. Students are told they want to work with the Linux terminal when working with a large number of files, but it is not clear why (motivation). 
 - Consider including a discussion or activity designed to demonstrate why working with the Linux terminal is useful when working with a large number of files.

1.3.2 Linux Commands to Work with Directories

- a. Students are asked to explore the function of commands, but the student materials state what the commands do.
 - Consider removing information from the cards about what the commands do and having students write an explanation for each command. 

Session 2

Overview

Session 2 addresses most aspects of the effective instruction framework. It includes motivation for learning the targeted concepts; opportunities for intellectual engagement with mathematics and computer programming content; opportunities for using logic and reasoning to make, defend, critique, and evaluate claims; and general reflection questions with the potential for sense making. You might consider ways to increase the cognitive demand of some activities, revise reflection questions to more specifically target the session content goals, and deepen opportunities for using logic and reasoning to make, defend, critique, and evaluate claims.

Session 2 also includes substantial attention to student access, identity, and social organization. Including Spanish versions of the Jupyter-based portions of the program could further enhance student access. You might also consider ways to increase attention to achievement, power, and cultural context within Session 2.

Suggested Revisions From Detailed Review

2.1 Exploring Programming with Python

- a. The Jupyter windows are heavy in text and contain challenging vocabulary that is not explicitly defined, for example, “concatenation” (access).
 - Consider reducing the amount of text in the Jupyter windows.
 - Consider alerting facilitators to potentially challenging vocabulary and providing guidance about how to address student questions or confusion.

- b. For Task 4, it is not clear what students should type into Jupyter and which window they should use (access).
 - Consider clarifying the directions and limiting the number of interactive windows.
- c. The materials assign students roles to enact during the activity, but there is no specific guidance in the materials for how to enact roles (social organization).
 - Consider specifying responsibilities for each role during the Exploring Programming with Python activities.
- d. Students have the opportunity to make claims when they are asked why the cell color changes and why some cells have “In []” but others don’t, but there is no prompt for students to defend their ideas (use of logic and reasoning to make, defend, critique, and evaluate claims).
 - Consider including prompts for students to support or challenge ideas with evidence.
- e. The materials direct facilitators to have students debrief what they learned and write notes in their journals, but no explicit prompts or content goals are given (sense making).
 - Consider providing prompts that more specifically target the session content goals
 - Consider using sentence frames or starters designed to encourage students to write about the session content goals

2.2 Programming Number Operations with Python

- a. Students have opportunities to program linear equations, but the tasks are largely procedural (intellectual engagement).
 - Consider removing some structured guidance so that students have greater opportunity to think critically and creatively about how to program the numbers game
- b. The materials ask students to consider how they can use variables and operations to guess a number, but are not asked to justify their ideas (use of logic and reasoning to make, defend, critique, and evaluate claims).
 - Consider including prompts for students to support or challenge ideas with evidence.
- c. The materials direct facilitators to have students predict what lines of code will do, but there is no prompt to evaluate their claims after testing them (use of logic and reasoning to make, defend, critique, and evaluate claims).
 - Consider including prompts for students to evaluate their predictions after testing them.
- d. The prompt “How do you think Math helps programming with Python?” is very general and may not elicit desired session takeaways (sense making).
 - Consider using prompts that more specifically target the session content goals.
 - Consider using sentence frames or sentence starters designed to encourage students to write about the session content goals.

- e. This section includes little attention to equity.
 - Consider adding facilitator guidance related to equity for this section.

2.3 Creating Your Number Guessing Game with Python

- a. The journal prompt is very general and may not elicit desired session take aways (sense making).
 - Consider using prompts that more specifically target the session content goals.
 - Consider using sentence frames or sentence starters designed to encourage students to write about the session content goals.