

Teacher Interview Protocol

Thank you for allowing us to observe your classroom. Our collaboration is a meaningful endeavor to support teachers and students as they grow and explore makerspace learning. It's important for you to know that we consider you to be our partners in this process. To begin our discussion, I'd like to ask some overarching questions to frame the discussion, then we'll talk about specific projects (e.g., designing an insect, designing a roller coaster).

SECTION I: Introduction

Q1. Teaching Background

- How long have you been teaching STEM class in this school? Have you taught in other schools, or at other levels in Unit #4? In other districts?
- What is your educational background? (e.g., course of study for your degree-science, technology, mathematics...)

Q2. Previous experiences in PD

- What professional development trainings or workshops related to makerspace activities or coding activities have you been offered and participated in? Have you used any online resources for learning about or developing curriculum for making or coding activities (e.g. Instructables, YouTube)? Please tell me a little about these.
 - Probe: How were/or were they helpful to you? How were/or were you able to integrate the new learning into your lesson plans? Talk about some outcomes of integrating this new learning. What new ideas did you use? How helpful were these new strategies to you, as the teacher, and to your students?

Q3. Classroom background

- Tell me about the dynamics of the classroom that you are teaching. By dynamics I mean... (give about 3 examples e.g., their seating, student characteristic, grouping)
- Describe the project (e.g., using lesson plan)
 - Probe: What was/were the goals you had, specifically, how did the goals and objectives documented in your lesson plans align with the activity you were doing? Was this project from your idea or curriculum provided by the school?
- Let's talk about the takeaways from this project. What skills and abilities did students display while working on the project? What did students achieve? How do you know? Please give me specific examples of some of their accomplishments and their challenges.
 - Probe: Thinking back to your goals and objectives, how well did students grasp the concepts and strategies supported by the activity? On a continuum from "accomplished/learned little as evidenced by... to gained some new skills as evidenced by..., to demonstrated thorough knowledge as evidenced by...,

please give me a rough number of (or % of) students in each category on the continuum.

SECTION II: Metacognition strategies

Our research is focused on the ways in which teachers facilitate student ability to think about their own learning. Before we begin let's review our definitions of persistence, intentionality, and metacognition. I'm curious about how you incorporate persistence, intentionality, and metacognition into your lesson plans and your classroom activities.

Q1. PERSISTENCE

Let's start with persistence. We know that learning through failure is a big part of maker activities. We want to know how you teach students the concept that "failure" is an integral part of learning. Can you describe situations where your students learned through failure?

- Possible probes:
 - Also, struggled with this process? (example)
 - Please give me any examples of how you do that? How do you facilitate students understand the process of learning through failure? How do you know when you are successful in helping them learn persistence?
 - In what ways did you see the students persist when they experienced failure?

Q2. INTENTIONALITY

Another way that teachers facilitate students learning persistence is by seem to help students learn how to learn is by supporting them in setting goals and in making explicit choices about their projects - in being intentional about their projects. Can you tell me a bit about how you facilitate intentionality?

- Possible probes:
 - Also, struggled with this process? (example)
 - What strategies do you use to demonstrate intentionality to students in working on a project?
 - How do you recognize instances of student intentionality?
 - How do you accommodate the needs of learners who are unable to grasp the concept of intentionality? What steps do you take to break down the meaning into more tangible ideas and hands-on examples?
 - Since this activity included making/designing, I'm wondering about the aspects of intentionality that are specific to making/designing. How did you see students expressing intentionality that was unique to making/designing?

SECTION III: Students with disabilities using Metacognition strategies

*If they say they don't have any students with disabilities, ask about students with IEPs or students who generally struggle

Q1. Student's successes

I would like to know more about how students with disabilities use these metacognitive strategies in their learning. What does it look like in terms of persistence or intentionality for them? If they are successful using/learning these strategies,,

- Possible probes:
 - What does persistence look like?
 - What do intentional activities look like?
 - What are early signs/or are there signs that students are aware they are thinking about thinking?
 - Children with challenges often excel in hands-on activities because they are working with tangible objects that hold their attention and allow them to persist. What types of activities/if any have you noted as being of special interest or an area of success for these learners?

Q2. Student's challenges

If they struggled with using/learning these strategies,, Describe the challenges that students with disabilities experience.

- Possible probes:
 - What challenges do you see in their ability to persist? Please give me examples.
 - What challenges do you see in their ability to exercise intentionality? How are students accommodated and taught in alternative ways to begin to think about thinking and using metacognitive strategies?
 - What kind of supports and accommodations do you provide during the activities?
 - What kind of strategies have you used to include struggling learners?

SECTION IV: Wrap-up

- What do you want to learn more about from participating in this research? What are your personal goals and desired outcomes from participation?
- That was the last question I have for you today. Is there anything else you'd like to add before we wrap up?†

Thank you very much!

Interview Cue Sheet

1. Persistence

Definition:

- Overcoming frustration when design does not work as intended
- Learning through failure

Teaching Strategy Example:

- Modeling how to learn from failure through “think-aloud” or “self-question” strategies (e.g., what do you do when you’re frustrated?)
- Present example scenarios where final designs occurred after many failures

Student Behavior Example:

- Students can restart the project
- Students can perform strategic troubleshooting
- Students seek help from teacher or peers
- Students observe peers work
- Students can alter approach

2. Intentionality

Definition:

- Students make explicit choices about what components/methods they use and explain their rationale (Brahms & Wardrip, 2014)

Teaching Strategy Example:

- Teaching students to create short-term and long-term goals for their projects; breaking out goals into actionable objectives; and observing outcomes;
- Incorporate students active checking to determine if they are on their path
- Provide feedback to students about design choices (e.g., can you identify problems which led to poor outcomes?)
- Teach students to track or list the steps they take to achieve the goal, and they can identify what has been learned either by artifact production and the ability to speak about the process they used, or by brief written steps they took, or by orally explaining how they worked to solve problems and finish the project

Student Behavior Example:

- Students can draw a plan
- Students can edit a plan
- Students can review the goals
- Students can break into smaller steps

3. Iterative Design

Definition:

- Students plan incremental steps in their design, explore materials, and test/retest their design (Gutwill et al., 2015)
- Progressive comparison of multiple experiences

Teaching Strategy Example:

- Provide students with scaffolds for changing one variable at a time during iteration and supports makers in testing the impacts of these changes
- Creates opportunities for students to provide feedback on the design of others

Student Behavior Example:

- Apply with other materials or tools
- Re-use, re-mix existing design