Overview of Analyzing Student Work

Every day, teachers adjust and adapt instructional decisions in response to the work that they see students do in their classrooms. Analyzing student work is integral to planning, delivering instruction, and assessment. Understanding the complexity of student work and designing effective ways to analyze student **artifacts** is a powerful component of making important shifts in your classroom practice. This analysis can happen in two distinct ways: *inside* the classroom during the actual teaching or *outside* the classroom as teachers examine student work developed during the lesson.

The Purpose of Analyzing Student Work Inside the Classroom

Inside the classroom, teachers must quickly analyze student work to make instructional decisions. An example of this is when they facilitate learning and orchestrate discussions through meaningful tasks—they *anticipate* student responses to the task, *monitor* students' work as they solve the task, *select* and *sequence* some of the students' solutions to share, and then *connect* the students' solutions to learning goals (Smith & Stein, 2011). The important task of analyzing students' work happens during the *monitor, select*, and *sequence* stages of task facilitation. In this case, teachers analyze the students' solutions, looking for use of representations, connections to procedures, and understanding of mathematics concepts as they connect to the learning goal. The teacher's analysis of student work in this context is public and offers an opportunity to invite all students to join in the discussion with the goal of advancing student learning.

The Purpose of Analyzing Student Work Outside the Classroom

Teachers examine students' work to gain insights about what a student knows and to connect that insight to the way in which the topic was (or could be) taught. Analyzing student work can help improve instructional decision-making and target students' learning needs. While teachers' analysis of student work is often done in isolation (Little, Gearhart, Curry, & Kaftka, 2003), they experience benefits when the analysis is conducted in learning communities because they develop shared meaning about mathematics content and can connect particular kinds of student work to teaching practices (Kazemi & Franke, 2004). When teachers gather and reflect on student work, they offer and receive multiple interpretations of the work, which, in turn, invites sense making about students' thinking and deepens teachers' content knowledge (Colton & Langer, 2005).

This vision for student work requires substantial effort within a team or school. A review of schools successfully using student work to improve learning found three important schoolwide actions (Little et al., 2003):

- *Bring teachers together to focus on student learning and teaching practice.* When teachers brought evidence from their classrooms, they were able to make explicit connections about their students' work and the instructional practices that moved learning forward.
- *Get student work on the table and into the conversation.* Teachers looked at their own student work with more depth and analysis when it became part of the regular expected teacher conversations.
- *Structure the conversation.* Teachers developed protocols for sharing and analyzing student work.

Benefits of Analyzing Student Work

While the actions previously listed require an investment of time, this investment pays off! As teachers analyze student work, they make interesting and thoughtful connections between teaching practices and student learning. Both teachers and students benefit from increased attention to the work students create. Through purposeful analysis, they reap many benefits, including the following:

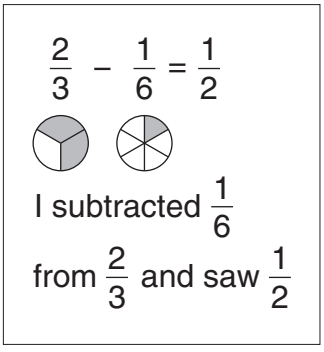
- *Intentional teaching.* Analyzing student work before a unit can yield excellent insights to use in designing lessons that build on students' strengths and address students' limited conceptions.
- *Deepened content knowledge.* Interpreting student strategies, alternative approaches, or errors may lead to insights and strengthen teachers' own content and pedagogical content knowledge.

- *A focus on Mathematical Practices.* Analyzing the proficiencies evident in student work helps clarify how students exhibit the Mathematical Practices. As you review student work, search for evidence of multiple representations, the selection of tools, the ability to provide a mathematical argument, and/or the exhibition of perseverance.
- *Efficient use of instructional time.* By taking time to analyze student work through prompts or problems, teachers can target their instruction to incorporate the identified strengths and weaknesses of the students.

Analyzing Student Work Protocol

Working with colleagues to analyze student work can be enhanced by using a professional learning protocol that invites inquiry, ignites purposeful instructional decision-making, and elicits reflection. Participating in conversations using the strategic norms from a protocol has numerous benefits, including opportunities to create shared understanding of content and teaching practices, to develop and test new ideas, and to establish goals for continuous improvement (Carr, Herman, & Harris, 2005; Crespo, 2002; Crockett, 2002; Little et al., 2003). Therefore, we offer a five-step collaborative student work analysis protocol for sharing and analyzing student work.

1. ***Select student work***. The kind and quality of student work that is shared is important because the work must be meaty enough to engage teachers in discussions about students' mathematical understanding. In this step, participants collaboratively decide on a common task and the student work that will be collected from that task. If teaching different grade levels or courses, teachers can decide to collect student work that connects to a Mathematical Practice or content standards that progress across grade levels (i.e., vertical alignment). Sources for student work include written work from a task, brief interviews, or exit tasks. Using technology, student work can be gathered using interactive whiteboards (e.g., Show Me [www.showme.com] or Explain Everything [www.explaineverything.com]) or through an online formative assessment program (e.g., www.Goformative.com), which can be given to individual students or a whole class.
2. ***Observe.*** During this step, participants observe, without judgment, what they notice about the students' work. At this time, teachers refrain from jumping in to remedy misconceptions or offer evaluative feedback. They observe and record the students' strengths before identifying misconceptions. Analyzing the proficiencies evident in student work helps clarify the Mathematical Practices and supports teachers in being more intentional about developing these proficiencies in students. Teachers search for evidence of students' use of multiple representations as well as their tool selection, mathematical arguments, and/or exhibited perseverance. All participants ensure that the observations are non-evaluative. For example, teachers analyzed the following student work:



Strengths	Potential Misconceptions
• Student's procedures are correct. • Student included plan for solving. • Student drew a representation.	• Student's explanation does not show knowledge of equivalent fractions. • Student's representation does not match the procedures.

1. ***Analyze and discuss.*** In this step, questions are posed to offer explanations and interpretations of the student work. These ideas are also recorded before discussing.

Analysis:
Does the student remember how to do this this from doing the same problem?
Is the student able to mentally subtract fractions?
Did the student get lucky?
Is more evidence needed to determine true understanding?

   Once the analysis questions are offered, each idea is explored and discussed. At this time, the student's teacher clarifies and offers additional information about the student, classroom context, or task.

2. ***Determine and implement next instructional steps***. After analyzing the work, teachers offer ideas for next instructional steps. This is a critical point in the protocol because participants are called to action as a result of deep conversations, uncovering student thinking by analyzing students' work. In this step, the focus shifts back to the teaching practices that will move learning forward. The discoveries about student thinking might encourage teachers to gather additional information (e.g., articles, books, resources), seek support from a coach, interview the student for additional information, and/or implement a new instructional task. For example, the analysis might have revealed misconceptions that require the teacher to move back to teaching at the concrete level.

3. ***Share results.*** In this step, teachers share the results of the student work analysis, including new insights into the student's understanding and adjustments to instruction. Teachers might share student work analysis results with school leadership as part of their documentation for effective teaching, with parents to communicate learning goals, or with other teachers to develop innovative teaching strategies.

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