Productive Struggle Reflection Survey

Rate the frequency of each statement in your classroom.

1. I anticipate what students might struggle with during a lesson and I prepare to support them.
   1 2 3 4 5 6 7 8 9 10
   Never Always

2. I give students time to struggle with tasks and ask questions that scaffold thinking without doing the work for them.
   1 2 3 4 5 6 7 8 9 10
   Never Always

3. I help students realize that confusion and errors are a natural part of learning. We talk about mistakes, misconceptions, and struggles.
   1 2 3 4 5 6 7 8 9 10
   Never Always

4. I praise students for their efforts more frequently than the correct answers.
   1 2 3 4 5 6 7 8 9 10
   Never Always

5. My students struggle at times but they know breakthroughs come from struggle.
   1 2 3 4 5 6 7 8 9 10
   Never Always

6. My students ask questions that are related to their struggles to help them understand.
   1 2 3 4 5 6 7 8 9 10
   Never Always

7. My students persevere in solving problems. They don’t give up.
   1 2 3 4 5 6 7 8 9 10
   Never Always

8. My students help one another without telling their classmates what the answer is or how to solve it.
   1 2 3 4 5 6 7 8 9 10
   Never Always
arise. Thinking about these in advance allows teachers to plan ways to support students productively without removing the opportunities for students to develop deeper understanding of the mathematics.

Mathematics classrooms that embrace productive struggle necessitate rethinking on the part of both students and teachers. Students must rethink what it means to be a successful learner of mathematics, and teachers must rethink what it means to be an effective teacher of mathematics. Figure 20 summarizes one such effort to redefine success in the mathematics classroom (Smith 2000), including expectations for students in regard to what it means to know and do mathematics, and actions for teachers with respect to what they can do to support students’ learning, including acknowledging and using struggles as opportunities to learn.

<table>
<thead>
<tr>
<th>Expectations for students</th>
<th>Teacher actions to support students</th>
<th>Classroom-based indicators of success</th>
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<tbody>
<tr>
<td>Most tasks that promote reasoning and problem solving take time to solve, and frustration may occur, but perseverance in the face of initial difficulty is important.</td>
<td>Use tasks that promote reasoning and problem solving; explicitly encourage students to persevere; find ways to support students without removing all the challenges in a task.</td>
<td>Students are engaged in the tasks and do not give up. The teacher supports students when they are “stuck” but does so in a way that keeps the thinking and reasoning at a high level.</td>
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<td>Correct solutions are important, but so is being able to explain and discuss how one thought about and solved particular tasks.</td>
<td>Ask students to explain and justify how they solved a task. Value the quality of the explanation as much as the final solution.</td>
<td>Students explain how they solved a task and provide mathematical justifications for their reasoning.</td>
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<td>Everyone has a responsibility and an obligation to make sense of mathematics by asking questions of peers and the teacher when he or she does not understand.</td>
<td>Give students the opportunity to discuss and determine the validity and appropriateness of strategies and solutions.</td>
<td>Students question and critique the reasoning of their peers and reflect on their own understanding.</td>
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<td>Diagrams, sketches, and hands-on materials are important tools to use in making sense of tasks.</td>
<td>Give students access to tools that will support their thinking processes.</td>
<td>Students are able to use tools to solve tasks that they cannot solve without them.</td>
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<td>Communicating about one’s thinking during a task makes it possible for others to help that person make progress on the task.</td>
<td>Ask students to explain their thinking and pose questions that are based on students’ reasoning, rather than on the way that the teacher is thinking about the task.</td>
<td>Students explain their thinking about a task to their peers and the teacher. The teacher asks probing questions based on the students’ thinking.</td>
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</table>

Fig. 20. Redefining student and teacher success. Adapted from Smith (2000, p. 382).
Illustration

Figure 21 illustrates how two teachers, Ms. Flahive and Ms. Ramirez, present a real-world task related to fractions to two classes of fifth-grade students. In both classrooms, some students are immediately at a loss, upset, and vocal about their feeling that they don’t know what to do. The two teachers respond to their students’ discomfort in different ways.

Ms. Flahive and Ms. Ramirez teach fifth grade and plan their lessons collaboratively. Their current instructional unit focuses on fractions. They have selected the Shopping Trip task shown below because they think it will be accessible to their students yet provoke some struggle and challenge, since a solution pathway is not straightforward. The mathematics goal for students is to draw on and apply their understanding of how to build non-unit fractions from unit fractions and to use visual representations to solve a multi-step word problem:

**Shopping Trip Task**

Joseph went to the mall with his friends to spend the money that he had received for his birthday. When he got home, he had $24 remaining. He had spent $3/5 of his birthday money at the mall on video games and food. How much money did he spend? How much money had he received for his birthday?

When Ms. Flahive and Ms. Ramirez present the problem in their classrooms, both teachers see students struggling to get started. Some students in both classrooms immediately raise their hands, saying, “I don’t get it,” or “I don’t know what to do.”

Ms. Flahive is very directive in her response to her students. She tells them to draw a rectangle and shows them how to divide it into fifths to represent what Joseph had spent and what he had left. She then guides her students step by step until they have labeled each one-fifth of the rectangle as worth $12, as shown below. Finally, she tells the students to use the information in the diagram to figure out the answers to the questions.

Ms. Ramirez approaches her students’ struggles very differently. After she sees them struggling, she has them stop working on the problem and asks all the students to write down two things that they know about the problem and one thing that they wish they knew because it would help them make progress in solving the problem. Then Ms. Ramirez initiates a short class discussion in which several ideas are offered for what to do next. Suggestions include drawing a tape diagram or number line showing fifths, or just picking a number, such as $50 and proceeding through trial and error. Ms. Ramirez encourages the students to consider the various ideas that have been shared as they continue working on the task.

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Fig. 21. Two teachers’ responses to students’ struggles to solve a multi-step word problem involving fractions
Creating an Environment

Help students realize struggle will take time. They may not be successful – especially in the early stages of solving a problem.

Help students identify what they can do when they are stuck.

Foster a growth mindset.
We will be doing an activity called IMAGES.

You can use a similar activity with your students to have them express their feelings and to help set the norms and model the desired behaviors for your classes.

*Quick preview and please stand by your picture*
Finding a Metaphor

Which picture is your favorite metaphor for struggle?

What is the metaphor?
Participants' Definitions of Productive Struggle

- Working on difficult and engaging tasks to move the learning forward with limited but guided questioning from the teacher.
- Encompasses – resilience, problem-solving, challenging students, be okay with failing
- Student-led learning, with teacher guidance
- Continuous learning
- Continual progression
- Challenge
  - Task worthwhile
  - Multiple points of entry
  - Appropriate for all levels
- Perseverance
- Work hard
- Taking a risk to communicate through perseverance; the motivation to bridge the comfort zone with the unknown
- Letting students work through their own ideas with a sense of progress towards solving a problem
- Assuming the student is given a challenging but appropriate task, by accessing prior knowledge each student works hard, perseveres and makes meaningful progress
- Stimulates students to work hard and persevere with teacher as facilitator to accomplish a specific understanding