



# **What is productive struggle and what does it look like in the classroom?**

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## **What is success in mathematics?**

What does it mean to be good in math class?

What does it mean to be a good teacher of mathematics?



**Which of these images resonates most with you when you think of productive struggle?**





How would YOU define productive struggle?





## Some Definitions of Productive Struggle

**“...productive struggle—effortful practice that goes beyond passive reading, listening, or watching—that builds useful, lasting understanding and skill.”**

Heibert, J. & Grouws, D. (2007) *The Effects of Classroom Mathematics Teaching on Students' Learning*

**“...students grapple with the issues and are able to come up with a solution themselves, developing persistence and resilience in pursuing and attaining the learning goal or understanding.”**

Jackson, R., & Lambert, C. *How to Support Struggling Students*



*“Productive struggle = responsive  
teaching”*

Matt Larson (2015 NCSM Keynote)





*“Effective mathematics teaching uses students’ struggles as valuable opportunities to deepen their understanding of mathematics. Students come to realize that they are capable of doing well in mathematics with effort and perseverance in reasoning, sense making, and problem solving.”*

*Principles to Actions (2014)*



## Games Teach Productive Struggle

Students fail when they play games. Why don't they give up?

Students **EXPECT** to fail when playing a game, so it doesn't make them feel bad. They know that struggle and failure are part of the process.

<https://pbs.twimg.com/media/CQ5AUr2U8AMBWm.png>





## Robert Kaplinsky – CMC South Ignite Session 2015





*“As students engage with a task, they must be mindful about the strategy they employ and assess whether it is productive. When they find they are at a dead end, they must be willing to abandon one strategy for another.*

*When students labor and struggle, but continue to try to make sense of a problem, they are engaging in productive struggle.”*

*Marian Pasquale, “Productive Struggle in Mathematics”  
(2015)*



Here is a task for you.

*Source: Open Middle*



Did you experience productive struggle?

During what part of this task did you experience productive struggle?

Where do you think your students would experience productive struggle?

What would you do to support students with their productive struggle during this task?





## Bet Lines

After his party, Caden had  $\frac{1}{4}$  of his cake left.

His dog ate  $\frac{2}{3}$  of what was left.

Write an expression that would illustrate this situation.

How much of the whole cake did his dog eat?



## How to Support Productive Struggle

The mathematics students are exposed to will have an effect on students' beliefs...

students will decide whether the mathematics you give them is something they can make sense of...

and how long they should have to work.





## How to support productive struggle

Find tasks the students will be interested in.

Make sure each student will be able to have an entry point.

Find tasks that students believe are worth solving.

Provide time!



## How to support productive struggle

### Growth vs. Fixed Mindset

Acknowledge students for their perseverance and effort in reasoning and sense making

Provide students with specific feedback on their progress (advice, evaluation, and praise are NOT feedback)

Support the students in considering what they know and what they need to figure out.

*Principles to Actions, 2014*





## How to support productive struggle

Be transparent with your students and let them know that you are going to give them tasks that they are going to struggle with.

Ban certain phrases in your classroom.

“This is hard.” “I can’t do this.”

“I am confused.”



## How to support productive struggle

Educate the parents of your students about growth mindset and productive struggle.

Teach your students how to support others in their productive struggle.

Implement talk moves in your classroom that will allow students to move forward.





## How to support productive struggle

Create a classroom climate where it is okay to make mistakes.

“In this class, mistakes are expected, respected, inspected, and corrected.”

“Something wonderful happens when I make a mistake, I LEARN!”



## Support productive struggle in learning mathematics

### Teacher and student actions

What are teachers doing?	What are students doing?
<p>Anticipating what students might struggle with during a lesson and being prepared to support them productively through the struggle.</p> <p>Giving students time to struggle with tasks, and asking questions that scaffold students' thinking without stepping in to do the work for them.</p> <p>Helping students realize that confusion and errors are a natural part of learning, by facilitating discussions on mistakes, misconceptions, and struggles.</p> <p>Praising students for their efforts in making sense of mathematical ideas and perseverance in reasoning through problems.</p>	<p>Struggling at times with mathematics tasks but knowing that breakthroughs often emerge from confusion and struggle.</p> <p>Asking questions that are related to the sources of their struggles and will help them make progress in understanding and solving tasks.</p> <p>Persevering in solving problems and realizing that is acceptable to say, "I don't know how to proceed here," but it is not acceptable to give up.</p> <p>Helping one another without telling their classmates what the answer is or how to solve the problem.</p>





## 8 Teaching Habits that **Block** Productive Struggle in Math Students

1. Calling on students who know the right answer.
2. Praising students for their smarts.
3. Creating bulletin boards to display high achievement.
4. Focusing on teaching procedures and formulas.
5. Making student responses right or wrong.
6. Giving easier work to struggling students.
7. Following a strict schedule for covering new material.
8. Making students feel okay about not being a “math person”.



## 8 Habits of Math Teachers Who Value Productive Struggle

1. Call on students who may NOT have the correct answer.
2. Praise students for perseverance in problem solving, not for being smart.
3. Display work that shows creative problem solving, not the highest scores.
4. Provide non-routine problems that can't be solved with a memorized formula.
5. Give students informative feedback.
6. Don't give easier work to struggling students.
7. Allow students time to ask questions and tinker with ideas.
8. Encourage having a growth mindset.





## How can teachers plan for productive struggle?

1. Set goals and select appropriate tasks.
2. Prepare ahead of time for possible struggles and misconceptions the students might have.
3. Prepare ahead of time questions NOT to ask.
4. Focusing vs. Funneling questions.



*Carol Dweck says...*

*“If parents want to give their children a gift, the best thing they can do is to teach their children to love challenges, be intrigued by mistakes, enjoy effort, and keep on learning.*

*That way, their children don’t have to be slaves of praise. They will have a lifelong way to build and repair their own confidence.”*



**Task: Problem Scenario**



**Two groups of friends are sharing chocolate bars. Each group wants to share the chocolate bars fairly so that every person gets the same amount and no chocolate remains.**

**In the first group of friends, four students receive three chocolate bars. How much chocolate did each person get? In the second group of friends, eight students are given six chocolate bars. How much chocolate did each person get? Which group of students got more chocolate?**

Achieve the Core



A vibrant field of red poppies in full bloom, with green stems and leaves visible. The flowers are densely packed and extend into the background, creating a sense of depth. A white rectangular box is centered in the upper half of the image, containing the text "Any questions?".

Any questions?





**Thank you for  
attending my session  
today! Enjoy the rest  
of the conference.**

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