



Productive Math Struggle

Book Study

PRODUCTIVE MATH STRUGGLE

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Welcome to the book study for *Productive Math Struggle*. We know professional development is important to teachers, but we also recognize that there are a lot of demands on your time. We have deliberately designed this book study to be collaborative so that most weeks the group is splitting the recommended in-class activities among the members of the book study. Each book study participant comes to the group ready to share in-class strategies and activities that she was assigned. That way everyone gets the benefit of all of the learning, strategies, and activities shared in *Productive Math Struggle* without having to personally practice every strategy.

By the end of the book study, as a group you will have:

- Determined what productive math struggle is, what it looks like, and why it is important
- Created a list of productive belief statements with your students to post in your classroom
- Developed a better understanding of your own math identity and how it relates to your productive struggle actions
- Helped your students define their individual math identities and learned about activities that help students explore math identity
- Learned about activities to build a productive math community in your classroom
- Learned about activities to promote a community that understands productive struggle
- Discovered how to determine if a math task is high quality
- Learned about modification strategies to ensure a task is high-quality
- Explored 5 different types of struggle and indicators for each
- Learned about strategies for struggle moves that don't rescue student answers but rescue student thinking
- Studied 10 teacher tips to help students navigate struggle
- Discovered why student and teacher reflection on struggle is important
- Learned about student and teacher activities to reflect on struggle
- Explored strategies to celebrate struggle
- Created a strategy as to how the group, and you personally, will continue to incorporate productive struggle into your classrooms

We've even created a Productive Math Struggle Chart for you so that you have a record of the activities/strategies that you and your colleagues have tried over the course of the book study with notes about what you did, what worked, and what you would change.

Thank you for selecting *Productive Math Struggle* for your book study. And thank you for the hard (and joyful) work you do every day to teach math to our children.

INTRODUCTION: Why Struggle? Why Now?



During Reading

1. **DESCRIBE** a struggle you have had as a student and one you have had as a teacher, noting how each struggle affected you.

2. **WRITE** a definition for productive struggle. You can record this here or on page 6 of your book.

3. **COMPLETE** the Productive Struggle Self-Inventory, located on the companion website as well as at the end of this book study pdf.



As a Group

1. **SHARE** the struggles you have had with math as both a student and as a teacher.

2. **USING** your individual definitions, create a group definition for production struggle.

3. **TAKE** the Productive Struggle Self-Inventory, located on the companion website, as well as at the end of this book study pdf, as a group so you have a group baseline.

Notes

CHAPTER 1: Value Productive Struggle

Synopsis:

- Defines productive struggle and what it looks like
- Establishes why productive struggle matters
- Describes the kind of learning that can take place in a classroom that values productive struggle

During Reading

1. **REFLECT** upon the sentences, *“Math is more than the pursuit of answers. Math is a way of thinking and understanding.”* (page 12). Note what you are currently doing in your classroom to help your students understand that math isn’t just about getting the right answer.

2. Using Figure 1.1, **IDENTIFY** students in your classroom who are exhibiting behaviors associated with unproductive struggle. Keep this list so that you can revisit ways to help move students from unproductive to productive struggle.

STUDENT NAME

BEHAVIOR



Reading Timeline

(here’s how you might divide the reading into manageable segments)

DAY 1: Read pages 8–16

DAY 2: Read pages 16–25

DAY 3: Read pages 26–28

CHAPTER 2: Foster an Identity for Productive Struggle (two sessions)

Synopsis:

- Examines how your mathematical identity affects your students' mathematical identities
- Explores how promoting healthy math identities supports productive math struggle
- Provides activities to familiarize you with your students' math identities



Reading Timeline

(here's how you might divide the reading into manageable segments)

DAY 1: Read pages 29–36
(stop at Knowing Your Student's Mathematical Identities)

DAY 2: Read pages 36–42
(stop at Student Identity Activity 5)

DAY 3: Read pages 42–47

SESSION 2



During Reading

Using figure 2.1, **REFLECT** upon your own math identity as a learner and as a teacher. Using the answers to the questions, write a short paragraph that captures your math identity as a teacher.



Into the Classroom (Prior to Group Meeting)

1. Have your students complete the math survey questions in figure 2.2. **NOTE** any common themes.

3. **SELECT** one of the student identity activities 1–3 and 5–7 to complete prior to the next group meeting. Ideally all six activities will be covered.

4. **DISCUSS** how you would like your students' identities to grow over time.



Into the Classroom (After Group Meeting)

Do the Student Identity Activity you selected and **RECORD** your notes on what you did, what worked, and what you would change on the Productive Math Struggle Chart at the end of this book study.

CHAPTER 3: Build Community for Productive Struggle



Synopsis:

- Explains why community is critical to productive struggle
- Discusses how to develop and sustain a mathematical community
- Provides activities to build a math community and to create a shared understanding of productive struggle



Reading Timeline

(here's how you might divide the reading into manageable segments)

DAY 1: Read pages 48–56 (stop at Activities)

DAY 2: Read about your selected Community Activity (located on pages 56–66)

DAY 3: Read about your selected Community of Struggle Activity (located on pages 66–72)



During Reading

1. **THINK** about the norms you have established for a productive community in your classroom. Are your students aware of these norms? Do they understand what these norms look like during a lesson? If not, think about what you might do to help them better understand these norms. Some ideas are listed on page 54.

2. **CONSIDER** what you need to execute your selected Community Activity and Community of Struggle Activity, and note materials needed, time required, ways to get students engaged, and problems you might encounter and how you plan to overcome them.

CHAPTER 4: Plan for a Lesson With Productive Struggle (two sessions)



Synopsis:

- Examines how to rethink planning to provoke productive struggle
- Explains the features of high-quality math tasks
- Provides strategies on how to modify tasks to increase opportunities for productive struggle

SESSION 1



During Reading

1. Use figure 4.5 (page 79) to **EVALUATE** some of the tasks that you are currently using in your classroom to determine which tasks are high quality.

2. **REVIEW** the tasks you determined are high quality to determine tasks that promote conceptual understanding, procedural fluency, and application.



Reading Timeline

(here's how you might divide the reading into manageable segments)

DAY 1: Read pages 73–80

DAY 2: Read pages 81–86 (stop at Modification Strategy 1)

DAY 3: Read about the two Modification Strategies you selected (located on pages 86–100) and pages 100–104 (stop at Instructional Models, Routines . . .)



Into the Classroom (Before Group Meeting)

1. After you have read about your selected Modification Strategies and have read pages 100–104, meet with your partner(s) assigned to the same modification strategies to do the tasks and anticipate what students might do. **RECORD** your notes about possible student strategies and misconceptions, as well as your questions in response to those strategies and errors on your Productive Math Struggle Chart (Modifications section).
2. **MODIFY** a task. Use it in your classroom. Record your notes on your Productive Math Struggle Chart (Modifications section).



As a Group

1. **SHARE** tasks that you determined were high quality. Share strategies you used to modify tasks to increase their quality.

2. Half the group shares the modification strategies they used, reporting on student engagement, misconceptions, teacher response, and ideas for improvement. **RECORD** your notes on your Productive Math Struggle Chart (Modifications section).

Notes

CHAPTER 4: Plan for a Lesson With Productive Struggle (two sessions)



Reading Timeline

DAY 1: Read pages 104–110

SESSION 2



During Reading

REFLECT on how group size and composition contribute to or detract from a student's productive struggle.



As a Group

1. Remaining teams **SHARE** the modification strategies they introduced into their classroom, reporting on student strategies, misconceptions, teacher response, and ideas for improvement. Record your notes on your Productive Math Struggle Chart (Modifications section).
2. **SELECT** a Struggle Move from chapter 5 (pages 119–137) to introduce into your classroom prior to the next group meeting. Ideally all five moves will be covered.



Into the Classroom (After Group Meeting)

SELECT at least one Modification Strategy presented by your colleagues to try in your instruction. Let your colleagues' experiences with the selected strategy guide you in your successful execution.

Notes

CHAPTER 5: Support the Productive Struggle During the Lesson



Synopsis:

- Examines and provides indicators for various types of struggles
- Shares classifications of teacher responses to struggle
- Provides strategies to responding to student struggle and teacher tips for how best to support product struggle



Reading Timeline

(here's how you might divide the reading into manageable segments)

DAY 1: Read pages 111–119 (stop at Struggle Move 1)

DAY 2: Read about the Struggle Move you selected (located on pages 119–137)

DAY 3: Read pages 137–146



During Reading

1. Using Figure 5.1 (page 114), **DETERMINE** how the students in your classroom are currently struggling. Take notes using figure 5.2 (page 116), also located on the companion website and at the end of this book study pdf.

2. **REFLECT** on how you are currently supporting struggle, which teacher tips (pages 137–146) you are currently using in your classroom, and which tips you would like to try.



Into the Classroom (Before Group Meeting)

Try the Struggle Move you selected and note what you did, what worked, and what you would change. **RECORD** your thoughts on your Productive Math Struggle Chart.



As a Group

1. **SHARE** the Struggle Move you used in your classroom and discuss what you did, what worked, and what you would change. Record your thoughts on your Productive Math Struggle Chart.
2. **SELECT** two Student Activities from chapter 6 (pages 151–164) to try in your classroom before the next group meeting. Select each activity from a different group—Independent Writing & Drawing, Collaborative Reflections, or Evaluative Reflection Activities.

3. **DISCUSS** other Struggle Moves you have used or thought of as you think about how you can support student struggle without taking over for them.



Into the Classroom (After Group Meeting)

1. Try at least one Struggle Move, reported on by a colleague, and note what you did, what worked, and what you would change. **RECORD** your thoughts on your Productive Math Struggle Chart.
2. Try one or two of the teacher tips and note what you did, what worked, and what you would change. **RECORD** your thoughts on your Productive Math Struggle Chart.

Notes

CHAPTER 6: Reflect on Productive Struggle



Synopsis:

- Explains the value of reflecting on struggle
- Shares strategies and activities for student reflection on struggle
- Provides strategies and activities for teacher reflection about struggle



During Reading

1. **THINK** about how often students should reflect on struggle and how you can incorporate these reflections into your classroom routine. See pages 164–165 for guidance.

2. **REFLECT** upon how you currently celebrate productive struggle in your classroom.



Reading Timeline

(here's how you might divide the reading into manageable segments)

DAY 1: Read pages 147–151 and about the two Student Activities you selected (located on pages 151–164)

DAY 2: Read pages 164–172



Into the Classroom (Before Group Meeting)

Try the two Student Activities you selected and note what you did, what worked, and what you would change. **RECORD** your thoughts on your Productive Math Struggle Chart.



As A Group

1. **SHARE** the Student Activities you tried in your classroom and discuss what you did, what worked, and what you would change. Record your thoughts on your Productive Math Struggle Chart.

2. **SHARE** ideas about how you celebrate productive struggle in your classroom and brainstorm other ways you might celebrate in the future.



Into the Classroom (After Group Meeting)

1. Try at least one Student Activity, reported on by a colleague, and note what you did, what worked, and what you would change. **RECORD** your thoughts on your Productive Math Struggle Chart.
2. **TRY** one of the Teacher Reflection Options (pages 166–168).

CHAPTER 7: Closing Thoughts About Struggle



During Reading

1. **WRITE** a new definition for productive struggle. You can record this here or on page 175 of your book. How does it differ from the definition you wrote several weeks ago?

2. **COMPLETE** the Productive Struggle Self-Inventory located on the companion website as well as at the end of this book study pdf. How do your responses differ from when you first filled out the self-inventory?



As a Group

1. **WRITE** a new group definition for productive struggle. How does it differ from the definition the group wrote at the beginning of the book study?



As a Group (continued)

2. **TAKE** the Productive Struggle Self-Inventory located on the companion website, as well as at the end of this book study pdf, as a group. How do your responses differ from when the group first filled out the inventory?

3. **DETERMINE** a goal for how the group will continue to commit to productive struggle in your classrooms.



Into the Classroom

DETERMINE how you will incorporate your goals for productive struggle into your classroom.

Notes

PRODUCTIVE MATH STRUGGLE CHART

Building a Math Community

Activity/Strategy

What I Did

What Worked

What I Would Change

What I Will Try to Do Regularly

PRODUCTIVE MATH STRUGGLE CHART

Exploring Student Math Identities

Activity/Strategy

What I Did

What Worked

What I Would Change

What I Will Try to Do Regularly

PRODUCTIVE MATH STRUGGLE CHART

Promoting a Community That Understands Struggle

Activity/Strategy

What I Did

What Worked

What I Would Change

What I Will Try to Do Regularly

PRODUCTIVE MATH STRUGGLE CHART

Rescuing Student Thinking With Struggle Moves

Activity/Strategy

What I Did

What Worked

What I Would Change

What I Will Try to Do Regularly

PRODUCTIVE MATH STRUGGLE CHART

Celebrating Productive Struggle

Activity/Strategy

What I Did

What Worked

What I Would Change

What I Will Try to Do Regularly

PRODUCTIVE MATH STRUGGLE CHART

Modifying Tasks to Increase Their Quality

Strategy

Possible Student Strategies for Completing the Task

Possible Student Misconceptions

Planned Questions/Responses to Student Thinking

Ideas for Modifying the Task in the Future

PRODUCTIVE MATH STRUGGLE CHART

Modifying Tasks to Increase Their Quality

Strategy

Possible Student Strategies for Completing the Task

Possible Student Misconceptions

Planned Questions/Responses to Student Thinking

Ideas for Modifying the Task in Differently in the Future

PRODUCTIVE STRUGGLE SELF-INVENTORY

Where are you with productive struggle? Take a moment to rate yourself on the teacher survey below.

Rate each question from 1 to 10, with 1 being never and 10 being always.

I am aware of my math identity.

1	2	3	4	5	6	7	8	9	10
Never									Always

I am aware of my students' math identities.

1	2	3	4	5	6	7	8	9	10
Never									Always

I actively and consistently reinforce math community.

1	2	3	4	5	6	7	8	9	10
Never									Always

I select high-quality mathematics tasks.

1	2	3	4	5	6	7	8	9	10
Never									Always

I modify tasks to provoke struggle.

1	2	3	4	5	6	7	8	9	10
Never									Always

I modify tasks to make them easier for students to work with.

1	2	3	4	5	6	7	8	9	10
Never									Always

I complete the math task before I use it with my students.

1	2	3	4	5	6	7	8	9	10
Never									Always

I anticipate what students will do and think about questions to ask them in response.

1	2	3	4	5	6	7	8	9	10
Never									Always

I pause in the middle of group work to discuss progress and challenges.

1	2	3	4	5	6	7	8	9	10
Never									Always

My students ask questions or refer to resources when they are struggling.

1	2	3	4	5	6	7	8	9	10
Never									Always

We reflect on struggles and strategies for overcoming them during class discussions.

1	2	3	4	5	6	7	8	9	10
Never									Always

I reflect on my students' struggles and the strategies they use to overcome them.

1	2	3	4	5	6	7	8	9	10
Never									Always

PRODUCTIVE STRUGGLE CLASSROOM WALKTHROUGH TOOL

Indicators may not be present due to length of visit.

- High-quality task is the centerpiece of the lesson.
- Lesson is focused on understanding the math rather than simply finding a solution.
- The classroom environment shows evidence of resources that support student struggle.

- Students have access to instructional resources and mathematics tools.
- Students are purposefully engaged in the task.
- Students attempt to overcome challenges.
- Students ask questions about the task or how they might proceed.
- Students support one another without taking over.

- Teacher circulates to monitor student thinking, progress, and struggle.
- Teacher pauses engagement to discuss strategies, representations, or questions.
- Student solutions are discussed and explored when the task is debriefed.
- Debriefing discussion highlights challenges and strategies used for overcoming them.
- Students reflect on struggle at the end of the lesson.

Feedback:

PRODUCTIVE MATH STRUGGLE CHART

TYPE OF STRUGGLE	STUDENT/GROUP	NOTES/COMMENTS
Unable to get started		
Unable to use a process		
Unable to calculate		
Unable to stay with task		
Unable to explain		

Date: _____ Lesson Topic: _____