

Study Guide

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# NECESSARY CONDITIONS

TEACHING SECONDARY MATH WITH ACADEMIC SAFETY,  
QUALITY TASKS, AND EFFECTIVE FACILITATION

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## How to use this study guide:

Each chapter has a suggested cycle of *Read* → *Discuss* → *Do* → *Debrief*. After reading each chapter, learners are encouraged to discuss each prompt with their colleagues, followed by some suggested actions (pick one or two of the "Do" suggestions), followed again by a debrief of the prior conversations and actions.

Educators can broaden their Professional Learning Communities (PLCs) by joining with colleagues online using #NecessaryConditions or tagging the author, @geoffkrall. In addition to this study guide, there are further resources, including downloadable templates, at [sten.pub/necessaryconditions](http://sten.pub/necessaryconditions).

**READ****Chapter 1: Welcome to Math Class****Discuss**

- What do you want students to know and be able to do when they graduate from your school's mathematics program?
- How will you know if you are achieving that vision?

**Do**

- Conduct empathy interviews with students to better understand how they are experiencing math at your school.
- Read, view, or listen to artifacts about mathematics and mathematicians (suggested starters' list is in Appendix A).

**Debrief**

- Of the three pillars of our pedagogy (Academic Safety, Quality Tasks, and Effective Facilitation), which do you feel you understand well? Which do you need to learn more about?
- Do you have any 'Damiens' in your class or at your school?

**READ****Chapter 2: Math and the Mathematician****Discuss**

- Who is your favorite mathematician and why? (You may wish to reference Appendix B.)
- What habits of mathematicians do your students currently display?
- Describe a lesson you've taught or experienced that you feel best resembles the work of mathematicians.

**Do**

- Ask students what they think about themselves as mathematicians.
- Ask students how they are mathematically smart.
- Find an opportunity to do math with students.
- Investigate playful and useful math tasks.

**Debrief**

- How do your lessons reinforce or disrupt your vision of math?
- When you consider Cédric Villani's quote about "balance," (page 24) how does that reflect your math experience? Your classroom?



**READ****Chapter 3: Math and Academic Safety****Discuss**

- Do your students believe they are welcomed to math? How might you go about finding out?
- How might stereotype threat manifest in math classrooms?
- In what ways do you demonstrate *passive caring*? In what ways do you demonstrate *active caring*?

**Do**

- Conduct an audit of your school's advanced math classes. What patterns do you notice?
- Track your conversations in class (Appendix N).
- Determine if there is interest in clubs specifically for underrepresented demographics in math.
- Facilitate a restorative circle.
- Assign academic status to each student in your class over the course of the week, as described beginning on page 44.

**Debrief**

- Do your school's advanced math classes mirror the demographics of the school?
- How did assigning academic status affect the classroom culture? How did it affect student performance for the rest of that day?
- How well do you know each of your students?

**READ****Chapter 4: Defining Quality Tasks****Discuss**

- When's the last time you were completely enthralled in a math task? Describe the task and how you came to be so engaged.
- What makes a task accessible? How do you know if it's accessible or not?

**Do**

- Consider the slight modifications made on the tasks described on pages 62-65 and how they amped up the challenge. Make a similar, slight modification on a problem and see how your students do.
- Conduct a check for quality on an upcoming task (Appendix D).

**Debrief**

- How did your students do on the ore challenging task?
- What are some next steps in improving the quality of your classroom tasks?

**READ****Chapter 5: Task Models and Designing, Finding, and Adapting Tasks****Discuss**

- Which of the ten task models have you tried before or had training on already? Which might require more exploration?
- Which task model might you have the most comfort in implementing? Which task model would stretch you the most as a teacher?

**Do**

- Find a task using one of the resources or websites in the chapter (see Table 5.4 on page 94).
- Adapt an existing task, possibly from your textbook.
- Design a task based on something you see, hear, or experience.

**Debrief**

- How might we be intentional in finding time in our course calendar to ensure students are being offered high quality tasks consistently?
- What upcoming opportunities do you have to utilize more of these task models?



**READ****Chapter 6: Norms, Structure, and Routines****Discuss**

- What norms are currently at play in your classroom (intentional and unintentional)?
- What norms could we establish across classrooms?
- How do norms help reinforce other aspects of our pedagogy?

**Do**

- Establish and practice a set of norms in your class.
- Conduct a groupwork-monitoring activity as described in the intro section of this chapter.
- Facilitate Broken Circles and debrief the experience.
- Design and utilize a collaboration rubric as shown on Figure 6.5 on page 124.
- Establish group roles.

**Debrief**

- What long-term improvement do you hope to see from your class? What from this chapter might help with that goal?
- How will these long-term facilitation moves make daily lessons better?

**READ****Chapter 7: Facilitation Within a Task****Discuss**

- How do you typically offer differentiation or targeted instruction to a small group of students?
- How do you make your tasks visual?

**Do**

- Utilize a task-posing routine such as Know/Need-to-Know, estimation, or Notice and Wonder.
- Identify and implement a workshop as described beginning on page 135.
- Identify and implement a share out strategy as described beginning on page 142.
- Use one of the “quick moves” identified beginning on page 145.

**Debrief**

- How can you incorporate more visualization of a task, even for more computational based content?
- In addition to the strategies described in this chapter, what teaching strategies have you facilitated to encourage discourse and deep mathematical thinking?
- How will these short-term facilitation moves reinforce your long-term goals for your class?

**READ****Chapter 8: Planning the Lesson****Discuss**

- How do well-planned lessons allow for more flexible facilitation?
- Describe a time when you've had to change course in the middle of a lesson. How did your understanding of the content affect that change?
- What does a typical warm-up and exit ticket look like in your class?

**Do**

- Use the lesson plan template provided in Appendix G1 to plan an upcoming lesson.
- Plan through each of the moments of a lesson as referenced in Figure 8.2 on page 159.
- Review and implement some of the differentiation strategies beginning on page 170.

**Debrief**

- How did a different kind of lesson plan - one that included explicit calls for building academic safety - affect the lesson?
- How did you have students present their solutions and strategies? What was your reasoning behind it?
- How did/will the exit ticket affect your next lesson?

**READ****Chapter 9: Problem Solving and Pedagogy****Discuss**

- Describe a time you've been stuck in the weeds of a problem (math or non-math). What helped you get unstuck?
- What are three strategies that you would recommend students try if they're stuck? Are students aware of these strategies?
- How much time do you typically spend making sense of a math problem *before* diving in?

**Do**

- Give students a challenging problem; how long do they persist before seeking help or giving up?
- Implement the strategy of "one question" described starting on page 176.
- Implement one of the tasks described in this chapter (*Leo the Rabbit*, *Wooden Legs*, *Noah's Ark*).

**Debrief**

- How does your classroom environment (specifically academic safety) encourage a problem-solving centric classroom?
- How might your classroom replicate the problem-solving experience of Andrew Wiles?

**READ****Chapter 10: Assessment****Discuss**

- How does your grading system reflect (or not reflect) your values as a teacher?
- What are, say, four to six habits of mathematicians you wish to instill in your students this year? (Consider meaningful outcomes as described starting on page 189.)
- What are your students' mathematical strengths?

**Do**

- Find, create, or adapt a high-quality rubric (use Figure 10.3 on page 193, or Figure 10.5 on page 196 as an example).
- Have students collect artifacts for a math portfolio.
- Assess students on something not directly math-content related, according to a rubric.
- Teach the use of a rubric as described starting on page 198.
- Conduct an analysis of student work as described in Table 10.3 on page 203.

**Debrief**

- How does a change in instruction require a change in assessment?
- How do you hope to change assessment practices going forward?
- How will you know if your shifts in assessment practices are having an impact?

**READ****Chapter 11: The Physical Environment****Discuss**

- How do you work best? In what type of physical environment?
- Describe your best collaborative space. What does it look like? What does it sound like?

**Do**

- Tour your colleagues' classrooms (including and especially non-math teachers).
- Conduct a quick check on your classroom: how does it enhance or hinder collaborative learning, deep concentration, and discussion?
- Ask your building specialist what the budget is for classroom furniture.
- Have students give Desmos a try.
- Post conspicuous amounts of student work.

**Debrief**

- What did you see in colleagues' classrooms that you'd like to steal?
- How can you use your classroom space to boost academic status and academic safety?
- How can we leverage technology for the betterment of long-term math understanding?

**READ****Chapter 12: Structuring the Year****Discuss**

- What does the first week of school say about your class and about the discipline of math?
- How will you know if it's been a successful school year?
- How might routines make your facilitation smoother?

**Do**

- After identifying a handful of quality tasks, find a day on the school calendar to implement them (Figure 12.2, page 235).
- Develop power standards, essential questions, authentic applications, and performance assessments (Table 12.1, page 234) for your next two units.
- Make positive phone calls (page 242) a regular routine.

**Debrief**

- How will you hold yourself accountable to our pedagogy throughout the year?
- What data did you find that point towards aspects of our pedagogy?
- Describe the ideal state of your classroom. What are students doing? What are *you* doing?

**READ****Chapter 13: Aligning the System, Crafting the Story****Discuss**

- What story about math do you want to tell?
- How will you go about telling that story?
- What are your students' mathematical stories?

**Do**

- Write a short mathematical autobiography.
- Deploy the math mindset and attitudes surveys in Appendices L and M.
- Utilize a peer observation tool (Appendix N).
- Conduct a lunch panel with students and a colleague or two (page 248).

**Debrief**

- How might a common planning form among colleagues improve our work?
- How might you reach out to support new and novice teachers?
- What is your mathematical story? How do you hope it will end?