


# Building a Productive Academic Mindset: A Model from Mathematics Class

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## Presenters

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## Quick Outline

- Essential Math for College and Careers, EMC<sup>2</sup>
- Teacher Practices that promote productive struggle
- Translating practices to your classroom
- Q&A


*"Success in mathematics opens opportunities for students. A wealth of research literature exists on how mathematics instructors can facilitate rich, meaningful learning experiences and on what instructors can do to improve teaching and learning at the undergraduate level: Effective teaching and deep learning require student engagement with content both inside and outside the classroom." -- MAA*



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## Essential Math for College and Careers, EMC<sup>2</sup>


- A course designed by VT educators (high school teachers and VSC college professors) to strengthen conceptual understanding and student skills.
- Goal is to have students ready for college-level precalculus or equivalent courses.
- First pilot courses will be during the 2019-2020 academic year.



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## Essential Math for College and Careers, EMC<sup>2</sup>

Student Practices Emphasized	Teacher Practices Emphasized
<ol style="list-style-type: none"> <li>1. Make sense of problems and persevere in solving them.</li> <li>2. Reason abstractly and quantitatively.</li> <li>3. Construct viable arguments and critique the reasoning of others.</li> <li>4. Model with mathematics.</li> <li>5. Use appropriate tools strategically.</li> <li>6. Attend to precision.</li> <li>7. Look for and make use of structure.</li> <li>8. Look for and express regularity in repeated reasoning.</li> </ol>	<ol style="list-style-type: none"> <li>1. Establish mathematics goals to focus learning.</li> <li>2. Implement tasks that promote reasoning and problem solving.</li> <li>3. Use and connect mathematical representations.</li> <li>4. Facilitate meaningful mathematical discourse.</li> <li>5. Pose purposeful questions.</li> <li>6. Build procedural fluency from conceptual understanding.</li> <li>7. Support productive struggle in learning mathematics.</li> <li>8. Elicit and use evidence of student thinking.</li> </ol>




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## 5 Principles from Dan Finkel



- Start with a Question (3:37)
- Students need time to struggle (5:09)
- You are not the answer key (6:53)
- Say yes to your students' ideas (9:13)
- Play! (12:59)



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## An example for you to try together...



- Start with a question
- Bucky the Badger
- This is known as “the hook”; a task to get students engaged.
- How many push-ups did Bucky do?



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## Act Two... give students (you) time to struggle



- Work in a small group to try to solve the Bucky mystery of how many push-ups Bucky did?
- Write down an answer that you're sure is too high.
- Write down an answer that you're sure is too low.
- What information, if any, do you need to solve the problem?



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## Act Three ... you are not the answer key



Spoiler alert... neither is this video!



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## Your Turn

Again, in small groups

- Choose a content area topic you'd like to think about the delivery.
- What is your goal for that topic? What will students need to “accomplish” to be successful? How will they show you they understand that content topic?
- What question or task can you start this mini-unit with? What's your hook?



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## Student Skills

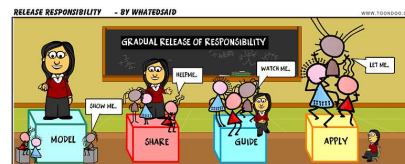
- Are there specific student skills you want to review?
- Highlight behavior that you saw in the struggle and group work.
- Share student approaches; not just the ones you like but other approaches as well.
- Follow-up with homework that is related to the content goal
- Let (encourage) students challenge each other and justify their own solutions and thinking.



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## Gradual Release

Gradual release is another essential element of the EMC<sup>2</sup> course. This is the practice of initially having more teacher led discussion and gradually (as the semester proceeds) turn that lesson lead over to the students.



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## Questions??

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-- MAA



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## Literature Resources more resources on handout

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## Thank You!

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