MATHEMATICS TEACHING PRACTICE 2:

Implement tasks that promote reasoning and problem solving

Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

Strategy and Process for Students with Disabilities	Digital Learning Experience
Analyzing mathematical tasks to provide challenging but accessible cognitive complexity • Use a structured process for task analysis. • For each task, ensure the mathematical content, practice and relevance are considered. For more information on analyzing mathematical tasks, explore the Mathematics Assignment Review Protocol. This protocol was designed by the Kentucky Department of Education (KDE) and The New Teacher Project (TNTP) to answer the question, "Does this task give students the opportunity to meaningfully engage in worthwhile grade-appropriate content?" It addresses standard alignment, cognitive complexity and student engagement with both content and math practices.	High-quality tasks that promote reasoning and problem solving should still be provided in a digital setting. Essentially, the tasks designed and implemented remain the same, but the delivery and feedback process must shift to make virtual teaching and learning as rich as in-person instruction. Considerations: • Which components of this task can be translated to a digital setting without sacrificing the cognitive complexity or level of engagement? • What tools will students need? Can these tools be provided virtually?
Creating a culture of learning • Create opportunities for students to discuss and explore positive messages and norms about mathematics. • Respond positively to student effort. • Model using positive norms language within the classroom. • Provide opportunities for students to learn from their mistakes. In Setting Up Positive Norms in Math Class (2017), Jo Boaler offers 7 messages to share with students to encourage creating a positive culture of learning. Positive norms: • Everyone can learn math to the highest levels. • Mistakes are valuable. • Questions are really important. • Math is about creativity and making sense. • Math is about connections and communicating. • Math class is about learning not performing.	Creating a positive classroom culture and community remains essential in digital settings. During synchronous and asynchronous learning experiences, create time and space to convey positive messages about mathematics. Responses and reactions to student effort and attitude are powerful communications to the group. Digital considerations: • Have I built time in my digital or virtual lesson to intentionally discuss and explore positive messages about mathematics? • Do students have opportunities to learn from their mistakes without fear of negative consequences? • How might in-person practices translate to a digital learning setting? Considerations: • Include positive norms on slide decks and assignments. • Use the positive norms language in conversation and in written feedback.

• Depth is more important than speed. These positive norms should become a natural part of the classroom culture and community in math class. Before students can adopt these beliefs as their own, they need repeated exposure to these norms and messages that support this mindset.	• Promote student discourse by encouraging students to share messages that reflect these positive norms.
Implementing thinking routines • Focus on how students engage with the mathematics using the Standards for Mathematical Practice. • Choose a specific thinking routine that supports students engaging in mathematical tasks. • Use the routines frequently to develop mathematical reasoning. Examples of thinking routines include Number Talks and I Notice, I Wonder. To explore other thinking routines, see Project Zero's collection of routines.	Digital Considerations: • Use virtual tools to convert paper-and-pencil activities for virtual use. • Pose a Number Talk image or computation in a virtual platform and ask students to reply to one or more classmates' thinking using virtual tools. • Use virtual reaction buttons in place of "quiet signals." • Use breakout rooms to allow students to share and justify their thinking, then collect responses verbally in the whole group or via submission using a virtual tool.
Implementing low-floor/high-ceiling tasks • Select the task. • Allow time for personal response such as thinking or writing before collaboration. • Use collaborative learning structures during the task like partners or small groups. • Provide scaffolded questions as needed. • Provide access to a variety of tools for problem-solving, including concrete tools, grids or other graphic organizers, anchor charts, processes and math journals or other appropriate resources. • Provide ample time for students to engage in the task. • Provide opportunity for students to share thinking with others outside their small groups. Youcubed has examples of low-floor/high-ceiling tasks.	When translating low-floor/high-ceiling tasks to a digital experience, consider tools and processes that can maintain the cognitive complexity and level of engagement of the traditional experience. Digital tools for consideration: • Breakout rooms. • Shared live documents for evidence, thinking and solution collection. • Virtual manipulatives or interactive whiteboard. • Use the comment feature on virtual platforms. • View live documents during thinking to monitor student progress and find opportunities to offer feedback. • Insert an "I'm Stuck" button that links to scaffolded questions to help students get "unstuck."

Contact your special education regional cooperative for more information on using virtual tools and additional resources.

Reflection Questions

1. Have I selected a task that has multiple entry points to meet the needs of a wide range of present levels of learning in this group of students?
2. How might I communicate high expectations to all students by presenting tasks with high cognitive demand?
3. How might I scaffold this task just in time for students who need extra support or Specially Designed Instruction? Are there specific supports or accommodations that need to be incorporated for students' needs (e.g. explicit instruction using a specific math tool such as a graphic organizer or manipulative)?
4. What are some ways I can clearly connect this task to the learning goal?
5. How might I incorporate metacognitive strategies to support students in monitoring their progress toward the learning goal during this task?

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