NOVAK EDUCATION

HOW TO UNIVERSALLY DESIGN MATHEMATICS LESSONS

Strategies for Inclusive and Engaging Mathematics Instruction

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Adapted from the UDL Guidelines

Strategies for implementing UDL principles in mathematics instruction

Use this guide to create inclusive experiences that support all learners in building conceptual understanding and mathematical reasoning.

Welcoming Interests and Identities **Engagement** 	Perception **Representation** 	Interaction **Action and Expression** 
• Encourage students to self-differentiate their learning by using different strategies and models to solve problems. Provide structured options for students to demonstrate understanding through concrete manipulatives, visual representations, and abstract equations, following the Concrete-Representational-Abstract progression. • Create math tasks rooted in real-world scenarios and student interests so all students have opportunities to apply mathematical reasoning to authentic challenges. • Design "low floor-high ceiling" tasks that allow access for all learners while providing pathways for challenge. These rich tasks should have multiple entry points and solution methods, enabling successful engagement at various levels of mathematical understanding. • Integrate culturally responsive mathematics by incorporating examples, texts, and problem contexts that reflect your students' backgrounds and experiences.	• Create learning experiences that combine visual, auditory, and kinesthetic inputs. Use videos, interactive graphics, and manipulative materials to support diverse learners. • Ensure all digital resources and educational technologies are designed with universal accessibility features (e.g., captions, alt-text, screen-reader compatibility) to support all learners • Encourage the use of text-to-speech for application problems and other text-based content to support reading comprehension, allowing students to focus on the mathematical concepts being assessed. • Record mini-lessons with explicit modeling of mathematical procedures and concepts. Share structured notes with worked examples that students can reference for independent practice, supporting distributed review over time. • Utilize manipulatives, pictures, number paths, number lines, and graphs to visually represent mathematical ideas.	• Integrate online digital tools like Desmos, Khan Academy, GeoGebra, etc. that allow students to explore mathematical concepts interactively while providing immediate feedback to guide learning. • Promote the use of assistive devices (e.g., speech-to-text software, adaptive calculators) to support all learners.

Sustaining Effort and Persistence Engagement 	Language and Symbols Representation 	Expression and Communication Action and Expression 
• Consistently display lesson goals and success criteria so students always know what the goal of the lesson is. • Structure opportunities for mathematical discourse through explicit teaching of productive talk moves. Provide sentence frames, question prompts, and protocols for students to discuss mathematical reasoning and justify their thinking. • Allow for cooperative group work and group self-assessment using student-created rubrics. • Encourage students to ask questions for further clarification once they have “entered a problem.” • Provide daily constructive feedback to all learners • Cultivate a classroom culture that values the problem-solving process over simply arriving at the correct answer. This encourages students to persevere, reflect on their reasoning, and see challenges as opportunities for growth.	• Explicitly teach mathematical vocabulary and notation with consistent definitions and examples. Use the Frayer model and other graphic organizers to help students connect new terms to prior knowledge and real-world applications. • Co-create word banks, word walls, and other anchor charts with students to reinforce meaning. • Co-create examples and non-examples of vocabulary terms with students. • Provide learners with language models and structures (such as sentence frames) to support “accountable talk” conversations. • Provide access to translation tools for English language learners.	• Design tasks and assessments that allow students to demonstrate their understanding through various media (i.e., encourage digital storytelling, blogs, podcasts, or video explanations as alternative ways for students to communicate their thinking). • Incorporate purposeful mathematical games with clear learning objectives. Build in structured debriefing protocols, exit tickets, or game recording sheets that hold students accountable for articulating the mathematical concepts they've practiced. • Integrate the Standards for Mathematical Practice into all tasks to reinforce authentic mathematical reasoning.

Emotional Capacity Engagement 	Building Knowledge Representation 	Strategy Development Action and Expression 
• Use exam wrappers for students to reflect on their learning • Provide solution keys that focus on mathematical accuracy rather than prescribed solution paths. Teach students how to compare their own approaches to sample solutions to deepen understanding and identify errors in their reasoning. • Ask targeted questions to encourage self-monitoring and reflection during problem-solving. • Include brain breaks, “high-ceiling, low floor” tasks and support strategies such as working with a partner to help students stay engaged and persist through rigorous math tasks. • Create a culture that values mistakes and assist students in recognizing their mistakes and how to learn from them. Model error analysis and teach students to examine their own errors for patterns that reveal misconceptions or procedural misunderstandings.	• Begin with warm-up activities and application problems to activate what students already know. • Incorporate consistent instructional routines to launch lessons (i.e., "number talks" and Esti-Mysteries) to develop number sense and algebraic reasoning while fostering mathematical discourse. • Teach specific visualization strategies that help students move from concrete to mental representations. Model how to create and use visual models to solve problems before expecting students to apply these strategies independently. • Focus on high-leverage concepts at each grade level and provide a variety of scaffolds—conceptual, sociocultural, and linguistic—to support all learners in accessing rigorous math content.	• Empower students to set personal learning goals and self-assess their progress, fostering intrinsic motivation and ownership of their learning journey. • Use checklists, scoring rubrics, and annotated examples of student work to clarify expectations. • Implement frequent formative assessments to help students reflect on their progress. • Incorporate metacognitive strategies such as reflective journals or portfolios that allow students to document, analyze, and evaluate their problem-solving processes, fostering self-awareness and continuous improvement in mathematical reasoning.

Emotional Capacity Engagement 	Building Knowledge (Continued) Representation 	Strategy Development Action and Expression 
	• Leverage inquiry-based approaches in mathematical discourse and problem-solving while maintaining the explicit instruction necessary for all students to access content. Design carefully sequenced learning progressions that manage cognitive load and support executive functioning, incorporating worked examples and scaffolded models with gradual release to student practice to ensure deep understanding and meaningful application of new concepts. • Regularly model think-aloud strategies to demonstrate problem-solving processes, analyze errors, and address misconceptions. • Employ flexible grouping for targeted instruction as an intervention strategy.	