Powerful Mathematics Practices

$(x+3)^2=4$

$slope=\dfrac{\Delta y}{\Delta x}$

Teacher Behaviors	Student Behaviors	Artifacts
Planning for and Ensuring a Balanced Approach to Mathematics		
The teacher: • Provides instruction, tasks and assessments that present non-routine, abstract or real-world scenarios and promote a balance of factual, procedural and conceptual knowledge	**The students:** • Explore and discuss multiple strategies to solve a given problem, reflect upon which method is most efficient and explain why certain procedures work • Critique each other's strategies	**Assignments and assessments:** • Show that students use precise mathematical language in their written products, like math notebooks, to explain how they solved authentic problems or tasks • Include summative and formative assessments that examine students' ability to use factual knowledge, understand mathematical concepts and reason and apply math procedures
Engaging Students in Assignments That Matter		
The teacher: • Engages students in meaningful, complex assignments that require problem solving, reasoning and mathematical modeling • Frames assignments by articulating learning goals and criteria for success • Provides feedback that advances students' learning without telling them step by step how to complete an assignment	**The students:** • Participate in productive discussions with their peers and help each other build reasoning skills and a shared understanding of mathematical concepts	**Classroom assignments:** • Challenge students to complete authentic assignments and provide written explanations for their work
Utilizing Questioning and Feedback for Deeper Understanding		
The teacher: • Asks questions that assess students' mathematical understanding and advance their comprehension of mathematical concepts • Gives each student time to formulate a response to a question • Gives students opportunities to share ideas with each other in groups	**The students:** • Build upon questions asked by the teacher or their peers to take ownership of their learning and deepen their understanding of mathematical concepts	**Posted learning targets:** • Include strategic, pre-determined focus and feedback questions

productive struggle
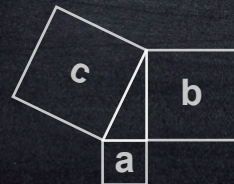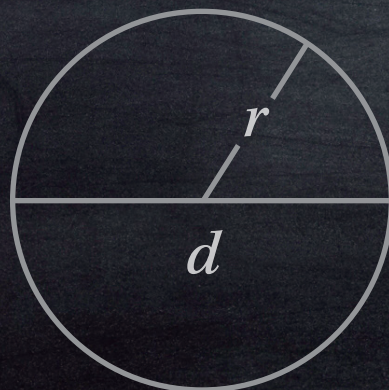
$A^2 + B^2 = C^2$

tools

strategies

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Powerful Mathematics Practices

formative assessment   *reasoning*

Teacher Behaviors	Student Behaviors	Artifacts
Using Formative Assessment Data		
The teacher:	**The students:**	**Classroom documents:**
• Plans for frequent use of short- and medium-cycle formative assessments • Uses data to re-engage students in learning both minute to minute and day by day	• Reflect on the purpose of the lesson and their mathematical understandings and misconceptions and work with the teacher to create a plan to advance their learning	• Provide evidence that students engage in short- and medium-cycle formative assessments • Demonstrate that teachers reflect on unit and lesson plans and adjust and adapt those plans to re-engage students
Fostering a Classroom Environment That Supports Student Ownership of Learning		
The teacher:	**The students:**	**Lesson plans:**
• Fosters a classroom environment in which students openly share ideas, confidently justify their problem-solving approaches using precise mathematical language, critique each other's reasoning and provide each other with meaningful feedback	• Embrace productive struggle and persevere in completing challenging assignments that require reasoning and problem solving	• Show that teachers intentionally structure lessons to promote the sharing of ideas
Reflecting on Teaching Practice		
The teacher:		**Planning documents:**
• Collaborates with colleagues in person or virtually to reflect on evidence of student learning and adapt instruction to meet students' needs		• Show that teachers have a rationale for revising their lesson and unit plans • Include agendas and minutes from reflective practice meetings with other teachers

conceptual understanding   *mathematical modeling*

$$A = \pi r^2$$

analyze

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