

Beaverton School District

Best Practices in Mathematics

Recognizing that the teacher is the most important factor in student achievement, teachers need to know and understand the Mathematics they will be teaching as well as participate in on-going professional development to enhance knowledge of content and pedagogy. To incorporate the following best practices effectively, teachers need to routinely reflect and collaborate on instructional practices, student progress, and know and understand the Mathematics they will be teaching at a deep enough level to be able to explain and apply his/her understanding in a variety of formats.

1. Develop a community of mathematical inquiry

Foster student participation and discourse by providing a safe and equitable culture, where all questions and ideas are respected. Students should accept challenges and persevere through disequilibrium.

2. Provide instruction that adheres to all Oregon state standards

Address standards in contexts that promote problem solving, reasoning, communication, making connections, and designing and analyzing representations.

3. Provide balanced Mathematics instruction

Provide flexible and balanced instruction that is student-centered and teacher-directed; both powerful tools in the teaching and learning of Mathematics. Delivery of instruction should vary according to students' needs with a balance of whole group and small group instruction.

4. Provide differentiated classroom instruction using a variety of instructional methods and interventions

Instruct students at their appropriate rate and level, employing a variety of techniques within the context of the classroom. Provide multiple opportunities for students to problem solve for a variety of purposes and to apply their learning. Provide ongoing support to students who need additional instruction. Teachers need to know their students' strengths and challenges.

5. Teach critical thinking skills explicitly

Teach critical thinking skills that mathematicians use in the problem solving process and model them with students. Strategies include making and confirming conjectures, questioning, visualizing, summarizing, drawing inferences, applying to authentic situations, synthesizing, analyzing, generalizing, evaluating and self reflection.

6. Encourage multiple problem solving strategies

Expose students to a wide variety of strategies to use when solving problems. Students should value multiple strategies and know when to apply and routinely use them. The framework of problem solving consists of determining relevant information, selecting and applying appropriate strategies and/or operations, communicating and justifying thinking, and verifying the reasonableness of the solution.

Beaverton School District Best Practices in Mathematics

7. Provide broad mathematical experiences in all curricular areas

Provide purposeful opportunities for constructing knowledge through a broad range of authentic mathematical experiences across all curricular areas.

8. Provide a math-rich environment

Provide classroom and school with access to a variety of Math materials and appropriate technology to enhance and support student learning. Consider quality, variety, interest, language and multicultural and cross-curricular implications when choosing materials. Provide a math-rich environment that displays student-created work.

9. Develop mathematical literacy

Teach students to read and write for mathematical understanding and communication of their mathematical ideas.

10. Develop mathematical fluency

Develop meaning for a concept or procedure and then provide practice to promote fluency that builds confidence and competence.

11. Set challenging goals and give effective feedback

Set clear and challenging mathematical goals. Provide effective feedback that is timely, understandable, meaningful, accessible to students, and specific to the content being taught. Maintain high expectations for all students at all stages of their mathematical development.

12. Assess to inform instruction and summarize learning

Use a variety of assessment techniques that include quantitative, qualitative, formative, and summative assessments. Maintain consistency with District learning targets. Use calibrated assessment and data analysis to inform instruction. Such efforts should be coordinated, continual, and cumulative.

13. Encourage self-assessment and reflection

Give students opportunities to examine their own as well as other students' work to view evidence of learning and to give constructive feedback.

14. Establish school/family/community partnerships

Establish home/school/community partnerships to collaborate in support of the mathematical development of all students both at home and at school. Know students as individuals (interests, attitudes, home/school/community experiences).

Beaverton School District

Mathematics Best Practices Glossary

Algorithm: A systematic method for carrying out computations, usually consisting of a set of rules or steps.

Assessments: Assessments, or tests, are important tools for measuring academic progress and identifying students who need extra help. There are numerous kinds of assessments available to help educators measure a wide array of skills and knowledge. Understanding what different types of tests measure and how to use the results is imperative in helping all students achieve their full potential.

Curriculum: A series of planned instruction that is coordinated and articulated in a manner designed to result in the achievement by students of specific knowledge and skills and the application of this knowledge.

Differentiation: The teacher employs different strategies designed to meet each student's needs and abilities. It is an organized, yet flexible way of proactively adjusting teaching and learning to meet students where they are and help all students achieve maximum growth as learners (Tomlinson, 1999). Instruction may be differentiated in content/input, process/ sense-making, or product/output according to the students' readiness, interest, or learning style. By content, we mean the material that is being presented. Process activities help students practice or make sense out of the content, while product refers to the outcome of the lesson or unit, such as a test, project, or paper. Readiness refers to prior knowledge and a student's current skill and proficiency with the material presented in the lesson.

Formative assessment: An assessment aligned with instruction that takes place while students are learning.

Intervention: Intensive, focused instruction to meet the needs of students who warrant additional support.

Math facts: All addition, subtraction, multiplication, and division "facts" up through "12", and at least 10 common percentage-decimal-fraction conversions (e.g. $1/2=0.5=50\%$).

Math fact fluency: All elements—number sense, conceptual knowledge, and rote memorization — must be developed together to achieve full math fact fluency.

Mathematical fluency: The ability to use mathematics accurately, efficiently, flexibly, and in appropriate contexts.

Problem solving: Problem solving means engaging in a task for which the solution process is not known in advance. Good problem solvers develop a range of strategies for finding solutions to problems and learn to monitor and adjust the strategies they choose in the process of solving a problem.

Proficient: Defines student learning in terms of the level and depth of knowledge and skills.

Real world- and/or real-life problems: Using situations, problems, or data that directly relate to the lives of our students, which will allow them to be able to make sense and master conceptual understandings of the mathematics.

Beaverton School District Mathematics Best Practices Glossary

Rigor: Engage with the high-level demands of the task, such as using complex thinking and/or exploring and understanding mathematical concepts, procedures, and/or relationships in context. Using complex and non-algorithmic thinking (i.e. there is not a predictable, well-rehearsed approach or pathway explicitly suggested by the task, task instruction, or a worked-out example).

Standards: Standards define what students should know and be able to do, and provide a benchmark for measuring whether a student has mastered a defined set of skills and knowledge. Tests aligned to state standards provide teachers and parents with a valuable measure for identifying student strengths and weaknesses and classroom practices that may need adjustment.

Student-centered instruction: Instruction that provides students with opportunities to learn independently and from one another and coaches them in the skills they need to do so effectively.

Sufficiency: A sufficient collection contains enough evidence to serve as the basis for reliable scoring.

Summative assessment: An assessment given at the end of a unit, course, or period of schooling to evaluate learning.

Teacher-directed instruction: Instruction in which it is the teacher who is primarily communicating the mathematics to the students directly.

Beaverton School District Mathematics Best Practices Bibliography

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