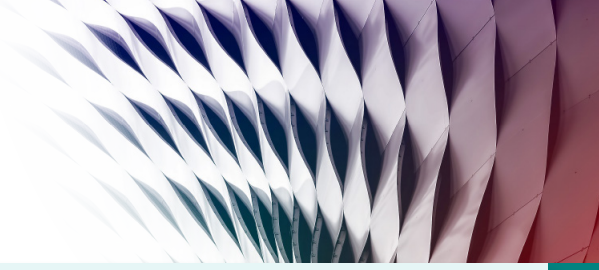
Disciplinary Literacy in Mathematics



Text Types in Mathematics

Texts in mathematics can be complex and abstract with symbols, formulas, notations and descriptions of concepts and procedures. These texts, which may integrate graphs, pictures, diagrams and symbolic representations, include math textbooks, worksheets and word problems, which may integrate graphs, pictures, diagrams and symbolic representations. Additionally, mathematical arguments include constructing proofs, making conjectures, generalizing patterns, and justifying solutions.

> "At its core, disciplinary literacy in math is about the process of fluently translating between written and spoken language and the language of mathematics. Developing these skills opens opportunities for individuals to gain new knowledge through problem-solving and logical reasoning."
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> (Oregon's Adolescent Literacy Framework, page 125)

To ensure students have the knowledge and skills they need to succeed in mathematics, it is critical to explicitly teach mathematics-specific literacy practices, several of which are featured in the next section.

Explicitly Teaching Literacy Practices in Mathematics Classrooms

PRACTICE: Teach students to understand and use the language of mathematics by making connections to their understanding of the world.

Teachers can support students' understanding and proficiency in mathematics first by helping them connect their knowledge of the world around them with mathematical concepts; then, teachers can help students apply specialized mathematical vocabulary used to convey these concepts, including through equations, graphs and geometric representations.

EXAMPLE: *An 8th grade mathematics teacher guides students through a project to help plan their school's new community garden. The school seeks to maximize space for garden plots and make room for composting bins. The teacher asks students to make predictions based on their practical experiences with volume, encouraging them to form conjectures about how much space plants need to grow. The teacher then helps students connect their knowledge to mathematical concepts related to volume and surface area and use precise mathematical vocabulary to describe these concepts as a rationale in a garden design proposal.*

PRACTICE: Teach students strategies to read complex mathematical texts.

Explicit instruction in math-specific reading strategies—such as math talks, using evidence to support claims, annotating texts, and rephrasing or summarizing—helps students develop a deeper understanding of mathematical concepts.

EXAMPLE: *A high school mathematics teacher leads her students through writing mathematical arguments about a choice of car for a family of five to take on a long-distance road trip, considering fuel efficiency and interior capacity. Then, students carefully read and critique each other's arguments for mathematical soundness, articulating to each other what about the arguments is clear and convincing and where the arguments could be improved. The teacher supports students' critiques by providing sentence frames.*

PRACTICE: Teach students to write like mathematicians.

Writing in mathematics supports student thinking and exploration of ideas; teachers can support their students by providing explicit instruction of mathematical writing, including writing clear, precise and detailed descriptions and using visual and symbolic representations.

EXAMPLE: *In an 8th grade mathematics class, the teacher provides data showing phone storage space in gigabytes (x-axis) and the average number of apps that can be stored. Students find a line of best fit to model the relationship between storage space and average number of apps. Using this linear model, they predict the average number of apps for storage space amounts not in the original data. The teacher then guides students in collaboratively writing an explanation of their process for finding the model and making predictions, using appropriate mathematical language and reasoning.*

PRACTICE: Support structured opportunities for mathematical dialogue.

All students of mathematics should be supported in developing logical reasoning, collaborative problem-solving, critical evaluation of mathematical claims, and the ability to refine their thinking through evidence-based feedback.

EXAMPLE: *A high school mathematics teacher presents an authentic scenario about population growth in a nearby town. Students must determine whether the growth can be modeled with a linear function, an exponential function or neither. Students work in groups to analyze the scenario, construct logical arguments and present their reasoning. The teacher then facilitates a class discussion in which students compare and critique each other's arguments, drawing on features of the scenario and their proposed models, and collaboratively draw conclusions about the most appropriate model.*

Questions for teachers reflecting on and discussing their practice:

- What are the texts relevant to mathematics in the grades or subjects you teach?
- What makes those texts tricky for students to read and what skills do students need to successfully comprehend them?

Learn more about disciplinary literacy in mathematics in Oregon's Adolescent Literacy Framework, pages 114-124.