



"Without these specialized literacies, students may be relegated to the position of reading and writing about what others are doing rather than participating in the activities of creation, inquiry, expression and problem-solving." Draper, R. (2010). (Re)imagining content-area literacy instruction.

Literacy – the ability to read, write, speak, listen, and think effectively – enables one to learn and to communicate clearly. All students need to have strong literacy skills so that they can understand academic content, communicate in a credible way, participate in their community, and negotiate the world. The standards movement requires all students to understand content at deeper, more complex levels than have been previously advocated. For students to construct meaning and derive usefulness from what they learn, they need to be able to retain important information, understand topics and concepts deeply, and actively apply knowledge. Reading, writing, speaking and listening play a crucial role in the ability to **"learn for understanding"**

Mathematical proficiency requires conceptual understanding, procedural fluency, problem solving, communication and reasoning. Proficiency in mathematics relies on literacy as students build their knowledge and understanding, reason mathematically and make connections across topics. Literacy is embedded in the AERO Mathematical Practices Standards. A focus on the need to consider "the 'why' and 'how' of mathematics" highlights an emphasis on sense-making, which is supported through reading, discussion, writing and reasoning about the mathematics .

Literacy in Mathematics is essential for the development of students' mathematical literacy. *"Mathematical literacy is an individual's capacity to reason mathematically and to formulate, employ and interpret mathematics to solve problems in a variety of real-world contexts. It includes concepts, procedures, facts and tools to describe, explain and predict phenomena"* (OECD, 2021).

Mathematical literacy involves more than executing procedures. It implies a knowledge base and the competence and confidence to apply the knowledge in the practical world. A mathematically literate person can estimate, interpret data, solve day-to-day problems, reason in numerical, graphical, and geometric situations, and communicate using mathematics.

The literate demands in mathematics are extensive. The ability to develop understanding and communicate mathematics requires students to be able to understand and correctly use notation, subject-specific language, conventions, and representations. Mathematical language requires careful consideration, as many mathematical terms have alternative meanings to the same terms used in everyday context. Mathematics also requires students to translate worded problems into mathematical symbols, carry out calculations and then interpret answers in the context of the original problem. As a result, students must communicate their answer using correct mathematical language, both as numbers and in sentence-form that makes sense in relation to context of the problem. Improving students' literacy in Mathematics helps students in building connections between terminology, concepts, skills and representations, which contribute to the development of Mathematical literacy.

What strategies can support integrating literacy development and thinking practices into the content instruction of mathematics? “Teachers apprentice students by giving them opportunities to engage in rigorous disciplinary literacy activity and providing scaffolding through inquiry, direct instruction, models, and coaching” (Resnik, 2010). This is accomplished by teaching to the **big ideas** of mathematics and providing an abundance of opportunities for student to engage in the **mathematical practices**.

Effective teachers of mathematics engage in these high leverage teaching practices to provide opportunities and support students as they build their mathematical understanding.

1. **Establish mathematics goals to focus learning**, situating those goals within learning progressions and using them to guide instructional decisions. (See February newsletter)
2. **Implement tasks that promote reasoning and problem solving** and allow multiple entry points and varied solution strategies. They provide ample opportunities for discussing strategies and reasoning used in solving the problems.
3. **Facilitate meaningful mathematical discourse** among students to build shared understanding of mathematical ideas. They provide ample time for students to analyze and compare different approaches to strategies and solutions.
4. **Use and connect mathematical representations** to deepen student understanding of mathematics concepts and procedures and to use these representations as tools for problem solving.
5. **Pose purposeful questions** to assess and advance students’ reasoning and sense making about important mathematical ideas and relationships.
6. **Build procedural fluency from conceptual understanding** so that students become skillful in using procedures flexibly to solve contextual and mathematical problems.
7. **Support productive struggle in learning mathematics** by providing opportunities and supports for students to grapple with mathematical ideas and relationships.
8. **Elicit and use evidence of student thinking** to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

Literacy is inherent in the AERO Mathematics Standards where students are:

- developing the ability to **read and understand** mathematical language and representations;
- using mathematical language and representations **to communicate** problems and solutions;
- **debating** possible solutions to problems; and
- **using** mathematics in a range of contexts.

The central goal of disciplinary literacy instruction is to help learners achieve insider access in the math community so that they are active learners rather than passive observers.

- How do you ensure diverse learners are able to meet the complex demands of unpacking **worded** problems in Mathematics?
- How do you support students in **writing and talking** about their mathematical thinking?
- In what ways do you encourage students to engage in meaningful **discussions** about their strategies and solutions to problems?

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References

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