

JOURNALING IN MATH



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Journaling in Math

What is it?

Journaling involves having students record their thoughts, understandings, and explanations of mathematical ideas or concepts. Writing about mathematics helps students articulate their thinking, and provides useful information for teachers about learning difficulties, incorrect assumptions, and students' progress in communicating about mathematics.

Writing or drawing is a way of engaging students in the material and helping them construct meaning. The journals should be used to record short, informal, exploratory thoughts or ideas. It shouldn't be graded or edited. Its purpose is for students to explore and note what they are thinking about and what they are learning.

Why is it important?

Communication is one of the National Council of Teachers of Mathematics (NCTM) Strands of Standards, and the Council encourages the use of communication as a very powerful tool to foster the learning of mathematics.

"Communicating about mathematical ideas is a way for students to articulate, clarify, organise, and consolidate their thinking. Students, like adults, exchange thoughts and ideas in many ways-orally; with gestures; and with pictures, objects, and symbols. By listening carefully to others, students can become aware of alternative perspectives and strategies. By writing and talking with others, they learn to use more precise mathematical language and, gradually, conventional symbols to express their mathematical ideas.

Communication makes mathematical thinking observable and therefore facilitates further development of that thought. It encourages students to reflect on their own knowledge and their own ways of solving problems. Throughout the early years, students should have daily opportunities to talk and write about mathematics. They

should become increasingly effective in communicating what they understand through their own notation and language as well as in conventional ways."

NCTM Standards for School Mathematics: Communication

When should it be taught?

Journaling can be used as a short, three to five-minute activity before, during, after, or throughout instruction.

What does it look like?

Comparing Fractions with Unlike Numerators Using Journaling

Comparing Fractions with Unlike Denominators Using Journaling

Finding Equivalent Fractions and Simplest Form

The NCTM standards advocate two students talking and listening as forms of communication in math class, because these skills are usually more advanced than their abilities to read and write. In grades three to five, students should use all forms of communication as a tool for understanding and generating solutions. Their writing should include mathematical vocabulary, along with everyday language, to explain concepts, take notes, or to explain an answer. Students should be able to describe problem-solving strategies and their reasoning.

According to NCTM, middle-grades mathematics teachers should strive to establish a communication-rich classroom in which students are encouraged to share their ideas and ask questions. To encourage this kind of sharing, teachers need to set expectations and establish an atmosphere of trust and respect. The focus in such classrooms is to explain, question, debate, and make sense of math together.

In high school, there should be substantial growth in students' abilities to express themselves clearly, structure logical chains of thought, listen to the ideas of others, and think about their audience when they write or speak. Consequently, students in grades 9-12 should be able to communicate in oral and written exposition, generating

explanations, formulating questions, and writing arguments. Students should use correct and appropriate mathematical language and symbols when making their points using spreadsheets, diagrams, or other forms of representing knowledge.

One way to introduce the idea of thinking about thinking, or metacognition, is to have students describe what they were thinking when doing a familiar activity such as choosing what to eat for lunch. You may want to start by having students describe their thinking in words, before describing their thinking in writing. Have them step through the process, explaining what they thought at each point, and what factors they took into consideration. For example, "I knew they served pizza at school today, and I don't like pizza, so I made my lunch. I checked to see if there was any peanut butter and there wasn't, so I made a turkey sandwich with tomato. I looked for mustard and didn't find any, so I added mayonnaise."

Discuss examples that clearly show thinking processes, as well as examples that do not clearly state thinking processes, such as, "I wanted pizza so I bought it." Compare the amount of detail in different descriptions of thinking, and encourage students to identify the sentences or paragraphs that are valuable in describing thinking.

When introducing journaling, start by asking open-ended questions to encourage students to write about how they feel or their opinions about math.

For example:

- I learned that...
- I was surprised that...
- I was happy about...
- I wish I knew more about...

As they become familiar with journaling, ask students to write about math processes that they already know, as a way to review math content.

For example:

- Explain how to add two numbers.

- Explain how improper fractions can change to mixed numbers and remain the same amount.
- Explain how to use a ruler to measure an object.

Then ask students to explain their understanding of new math concepts.

For example:

- What is the most important thing to know about place value?
- What have you learned about decimals today?
- How could you use percentages while shopping?

Encourage students to use diagrams or drawings to explain their thinking, if appropriate, and have them write about problem-solving experiences, including the guesses they made and how they found their answers.

To help students reflect on their learning, teachers can ask students to write commentaries about what they learned in a lesson or a series of lessons and what remains unclear to them. To encourage clear writing, students can write a letter to a younger student explaining a difficult concept. Working in pairs also helps students develop communication skills. This approach is often very effective with students in the middle grades because they can try out their ideas in the relative privacy of a small group before sharing them with the class.

Journaling can be used to:

- Access prior knowledge: Use before a lesson, and have students write what they know about a topic.
- To focus students: Use to focus students on the topic being taught if they seem confused. For example, "Write a few questions about the math problem you're working on."
- Brainstorm ideas: Have students write about all the words, phrases, or ideas they can think of, related to the topic.

- Ask questions: Have students write questions about the topic or problems they are having in understanding.
- Focus a cooperative learning group: Have students explain in writing how they worked together to solve a problem or discover an answer.
- Show progress in thinking: Have students choose a past journal entry and revise it, using information they now know.
- Reinforce new information: Have students explain what they learned or they write a definition of the new math concept taught.
- Make an observation: Have students write about what they found out, discovered, or saw.
- Justify thinking: Have students write what they think and why, or provide a statement and have students tell if it is true or not, justifying their opinion.
- Apply what was learned: Have students write about how they will use the information, or how it's connected to the real world.
- Dialogue: Students and teachers (or other students) have a dialogue via written journal entries.

As an extension of journaling, teachers can begin having students write formally about a skill or concept, illustrate it, and include examples. This could then be "graded" or evaluated, going through the steps in the writing process. The final product could be a student-created "textbook," which could be used by the students to teach peers, or younger students.

How can you make it happen?

Each student should have a notebook or writing material that is kept in a designated place in the classroom. You may want to have students write the date or title of a journal entry at the start of each journaling session, so that you can find the entries when you are looking in their journals. Develop a classroom routine of distributing and collecting the journals, such as assigning a student who is responsible for the journals each week. Provide an adequate amount of time for students to gather their thoughts and write them down. Try using a timer and start with a few minutes of writing time, working up to

several minutes. Give students instructions for what to do if they finish writing early. One idea to encourage students to write for the entire journaling time, is to tell them to write anything, or rewrite what they have written, just to keep their pencils moving. Tell them about how long you will give them to write, and how much writing is generally expected. Students should be seated in a location that makes it easy to write.

Enforce a "no talking" rule during journaling time. Teachers might want to spend the journaling time writing in their own journals, to model this practice for students. Provide feedback in the form of a written conversation, questions, notes in the margin, or some notation that lets students know that you are reading their entries.

How can you measure success?

Student journals can be used to assess mathematical thinking and understanding of math concepts. Progress in articulating their thinking should be seen over time.

Source:



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