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W.R.I.T.E: Writing's Role in Thoughtful Endeavors

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W.R.I.T.E: Writing's Role in Thoughtful Endeavors

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“Mathematicians actually spend a great deal of time writing. If a mathematician wants to contribute to the greater body of mathematical knowledge, she must be able communicate her ideas in a way which is comprehensible to others.”

Lee, 2014, pg. 1

Why should our students be different from the mathematicians Lee (2014) refers to in the quote above? Learning mathematics requires a confluence of spoken, written and mathematically abstract languages. After all, who thinks entirely in mathematical symbols? No one, except a few mathematical thinkers who are live in the abstract worlds they construct. Thinking about mathematics in the language we speak is one way to learn. Therefore, it is natural to have students write about mathematics to learn the content and deal with the emotions that often arise when studying what many find to be a challenging, abstract subject.

There are many reasons to write as part of learning mathematics. Among them are to get to know your students' mathematical histories, to assess what they already know before launching a unit, to address the affective issues of learning mathematics, to help students prepare for tests, to explore problem solving beyond the use of algorithms and to encourage students to develop metacognitive habits when solving mathematics problems. Such writings are often used as formative assessment.

Implementation Advice

Start small.

Students who have not been asked to write in a mathematics class may be resistant to the idea. Ease them into the process by starting with

short, ungraded writing assignments. Moreover, teachers who have not assigned writing need time to develop the skill of reading and responding to student writing.

Model some writing for students.

Students who have not been asked to write in mathematics classes may not understand what you mean when you ask them to describe their thinking or ideas. Before assigning writing, model the activity using a document camera or a handout to provide examples. Student writing will improve over time when the expectation for their writing is clearly articulated and modeled.

Assign only as much writing as you plan to read and respond.

If student are to value the experience of writing, teachers must read and comment on the ideas students express. Students need teacher feedback on their work in order to learn and grow. The rule of thumb recommended is "Do not assign a new writing assignment until you have read and returned the last one."

Get a lot out of a single piece of writing.

Some of the assignment ideas described in the previous section can serve more than one purpose. For example, the letters students write to a friend in order to develop or review a concept can be given to students in another class. They read and respond to the letters, reviewing the content as well. Coaching students about appropriate kinds of feedback and critiques may be needed to avoid hurt feelings.

Assess student writing carefully.

To maintain an environment where students feel free to write and where teachers can learn from their writing, it is important that students do not feel threatened by the evaluation of their writing. You may correct spelling, grammar and punctuation errors, but these errors should not affect their grades if the writing assignment was

done in class so there was not time to edit. If there is time to edit a writing assignment, presentation can be part of the scored assigned. Make this clear to students when they begin to write, so how the work will be evaluated is clear.

Teachers should emphasize to students the need to express what they feel and have learned in their mathematics class is another place to continue to practice and learn to write effectively. When grading affective writing, in which students express feelings and opinions, it would be inappropriate to judge the content of the work. Simply record the completion of the assignment for this work.

Writing Prompts for Mathematic Class

Organized by different purposes, the following prompt have been used in mathematics classes from grades 6 to 14 to contribute to student learning. Remember the implementation advice presented earlier.

PURPOSE: To get acquainted with students.

- Mathematical Autobiography: Students describe how they feel about their performance and abilities as a mathematics student through their school years.
- First Day Letters: Students write to their teacher describing something interesting about themselves. This may include school experiences, past performance in mathematics classes, goals for the new school year or term, or any other information the student would like to share with the teacher.
- If Math Were an Animal, What Animal Would it be and why? Students can use metaphors to reveal their feelings about mathematics. Often, it is easier for someone to tell the truth if distanced from it in some way, so metaphors may elicit surprising results.

PURPOSE: To find out what students already know.

- Tell Me Everything You Know About...: In lieu of a pretest, students summarize their knowledge of a topic.
- How Do You... And Why do this: Students explain an algorithm, process, or instruction.

PURPOSE: To engage students in the learning process.

- Assign a Project or Report: Students work independently, with a partner, or a group to investigate a mathematical topic.
- Problem Solving Write Up: After solving a problem, or series of problems, the student writes a report describing his/her method of solving the problem(s).
- Investigate and Record Observations: Students perform an investigation, and then record their observations. This can be done in groups and presented to the class.
- Observe Problem Solving: Students observe others (peers, relatives) solve problems and write a report documenting the strategies they observed.

PURPOSE: To address the affective aspect of learning.

- Keep a Journal: Students record observations and feelings about learning: Writing on assigned topics or topics of their own choosing.
- Write to Students at the Next or Previous Level: Students write to older or younger peers to get and/or give advice on the topics or how to succeed in the class.
- Interview an Adult Who Has an Interesting Career: Find out how mathematics or mathematical problem solving is used in careers and what mathematics is required.

PURPOSE: Help students prepare for assessment.

- Write Three Good Questions For a Test: Students review the material in the unit and sort out key ideas.
- Describe Your Study Plan: Students describe to the teacher how they plan to study, what they need to work on most, how much time they plan to dedicate to studying, and anything else they plan to do when preparing for an exam.
- Write a Summary of Topics on the Test: Students, alone or in groups, prepare a summary of all or part of the unit for the class.
- Respond to Fictitious Student's Work: Students read and "grade" teacher-prepared work in preparation for their assessment on the same topic.

PURPOSE: To assess more than computational skills.

- Explain how or why: Students are asked on an assessment to explain, in words, how or why a procedure works.
- Find the Error in This Work: On an assessment students find, correct, and explain procedural or conceptual errors in a problem that has been incorrectly completed.

PURPOSE: To encourage student to reflect.

- What Have You Learned, or Relearned: Students reflect on the learning process and content.
- What Have You Learned About Yourself: This processing encourages students to take responsibility for their own learning.
- What Will You Do Differently For the Next Test: This also promotes responsibility for learning and helps students set goals for themselves.
- Reflect on the Experience of Working in a Group: Students write something positive about each member of their group and/or

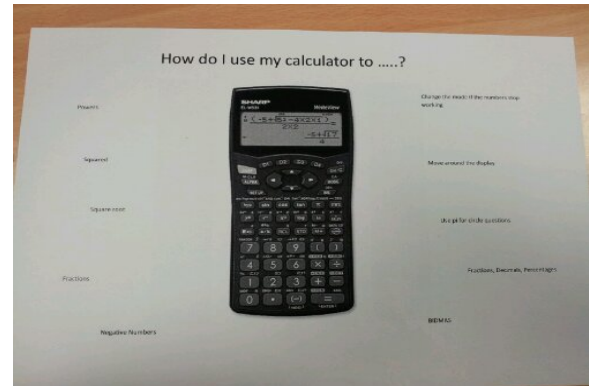
what they plan to do differently next time to help the group function better.

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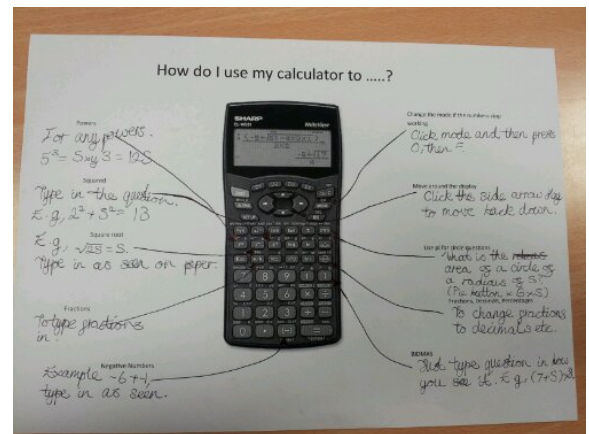
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*Maths Sandpit** site author, a math specialist in Innovation, Technology, and Community projects, on twitter as @ms_kmp, used Google images to find a clear picture of the calculators used in school. The calculator image is centered in the middle of a page and surrounded with common calculator topics/problems:



We discussed how to use the calculator with each problem. The best students labeled the buttons, gave instructions on how to use them and even asked me for simple examples for each case. This is an example of a pupil's sheet:



*<http://mathssandpit.co.uk/blog/?paged=19>



For a great infographic using Lego to demonstrate the data handling process, see 51. Infographic 2: Lego data sort at <http://mathssandpit.co.uk/blog/?p=344>

This column thanks to Bethany Hadley who recommends the **Trigonometry Snapdragon** <bethany.hadley@sigourneyschools.com>

