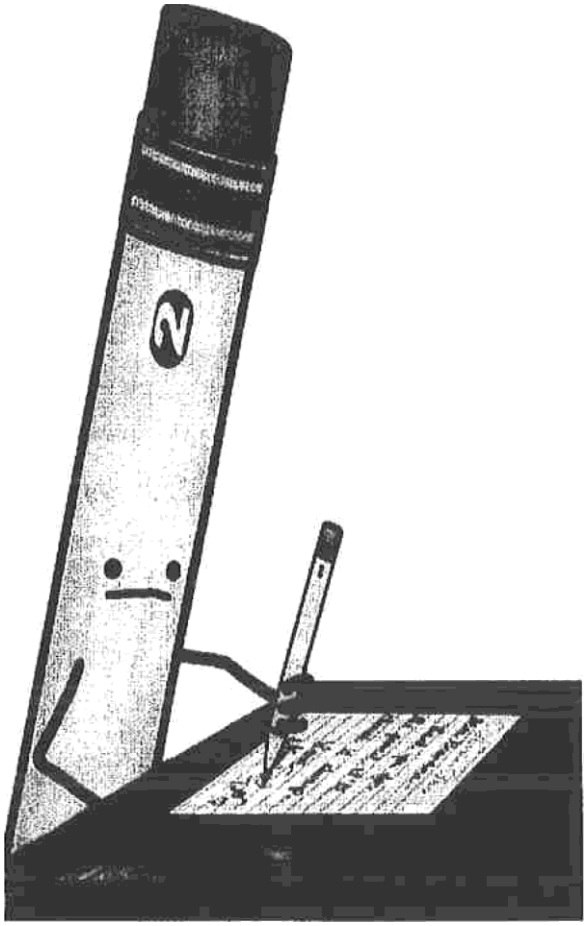
Writing Counts

Brenda Mesa
Birdville ISD
Brenda.Mesa@birdvilleschools.net

Dr. Ann-Marie Trammell
Birdville ISD
Ann-marie.trammell@birdvilleschools.net



CONTENT AND STRATEGY

Prove Its

For Math.

Adapted from *A Gulde to Writing with Depth* by Dr. Joyce Carroll Armstrong pp.2-5.

As Dr. JAC noted in her book "This is a sure-fire way to layer writing, and it's easy." Writing prove-its in math helps a student to justify their thinking. The students begin with a declarative sentence. In math the sentence is the equation followed by the solution, so the students will convince the reader that the solution to the equation is mathematically reasonable. It could also be a statement of proof.

Create a prove-it paragraph with the class first to model the process.

Students will follow-up by creating their own paragraph.

Examples of declarative sentence:

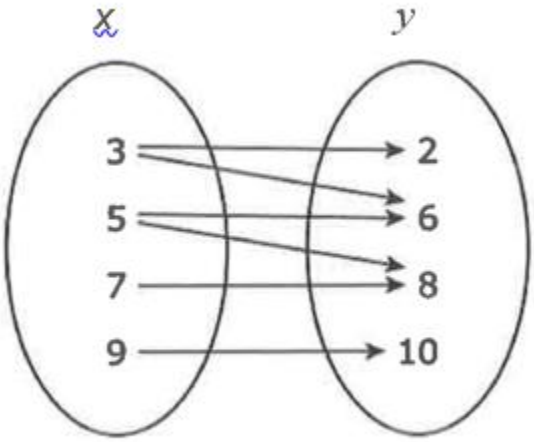
The witch is ugly. (Example from the *A Guide to Writing with Depth* p.3.)

$2x+8 = 16, x=4$

x is greater than 4 is a solution to $2x+8 > 16$

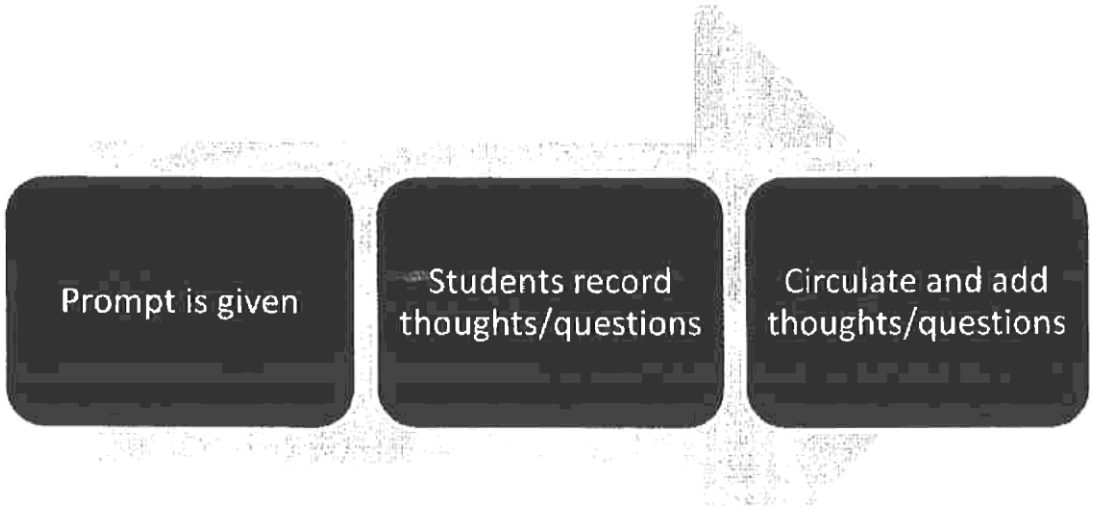
Prove It Problems

1. This representation does **not** show *y* as a function of *x.*



2. Sadie used a container shaped like a cylinder to catch rainwater. The container has a diameter of 3.5 feet and a height of 5 feet. The volume of water the cylinder can hold is 48 cubic feet.

Chalk Talk



Purpose:

- To give all students an equal opportunity to express their viewpoint and thinking.
- To ask learners to consider ideas, questions or problems silently by responding to both the prompt and the thoughts of others.

Process:

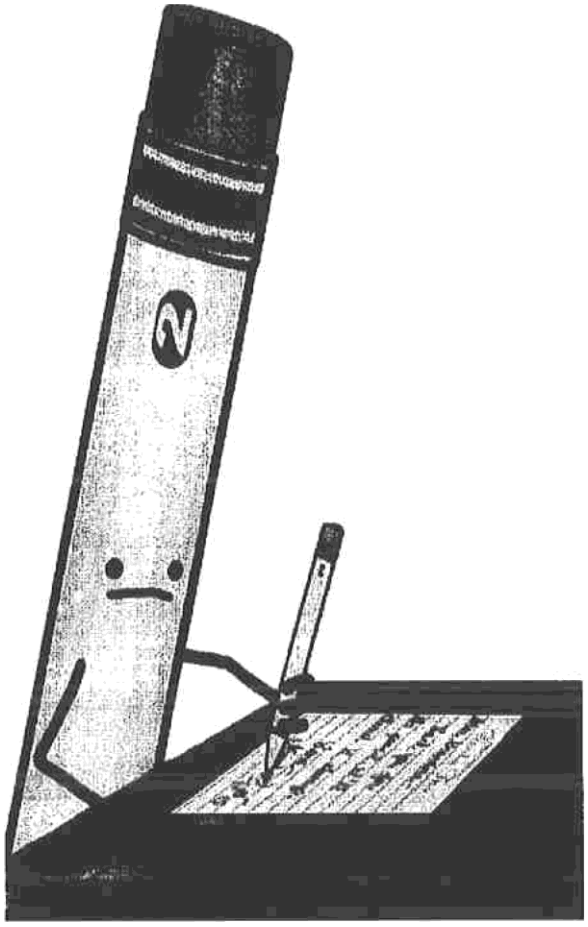
- Students form groups of 4 or 5.
- Posters are hung around the room with questions on them. Each group goes to stand in front of a poster.
- Students are given 3-4 minutes to read the question and respond. Give students these prompts- What ideas come to mind when you consider this idea, question, or problem? Ask students to consider the concept, given information, and any questions that they might have.
- Students then rotate to the next poster. They are given 3-4 minutes to read and respond. Students can respond with original thoughts or to these prompts: What connections can you make to others' responses? : What questions arise as you think about the ideas and consider the responses and comments of others?
- Continue rotation to all posters. When students are back at their original poster, they respond to any of their peer's comments.
- After rotations, students go back to their seats and reflect on their process of learning. Students then share with their group.

Appropriate Usage:

- Prompts can be single words or phrases or could be questions to generate a richer level of interaction and discussion
- Can be used with a round table or in front of a chalkboard, the movement is key to the process.
- Keep the Chalk Talk papers visible over the next few weeks to revisit the ideas.

Assessment:

- Look for relevance in the students' contributions.
- Ask broad questions to not stunt the thoughts generated by students.



REFLECTIONS

Reflections and Debrief Questions

Wendy Ward Hoffer in *Minds on Mathematics* emphasizes how important reflection is while learning. She quotes *How People Learn,* the National Research Council (2000), "In one study [Aleven and Koedinger 2002], for example, students who were directed to engage in self-explanation as they solved mathematics problems developed deeper conceptual understanding than did students who solved those same problems but did not engage in self-explanation."

Janet Emig in *Writing as a Mode of Learning* (1977), states in her thesis, "Writing serves learning uniquely because writing as process-and-product possesses a duster of attributes that correspond uniquely to certain powerful learning strategies." She discusses how
distinguished cognitive theorists and psychologists such as Lev Vygotsky, Jerome Bruner, and A. R. Luria point out how language and especially writing incorporates the higher
cognitive functions of analysis and synthesis. Writing enables a student to slow down their thinking and grapple with their own understanding of a concept through a type of inner- conversation. It also provides a window for teachers to look through in order to see how their students' thinking.

Students must be afforded the time to write in all subjects. Planned reflection and debrief questions will make available opportunities for them to write and engage in self- explanation. Reflection/debrief questions facilitate the process for students to individually think through a problem while their teacher assesses their understanding.

Reflection Questions

What patterns have you noticed? Explain.

What part of the problem was the most difficult and

why? How can you solve the problem in another way?

How do you know your solution is correct?

How has your thinking solidified or

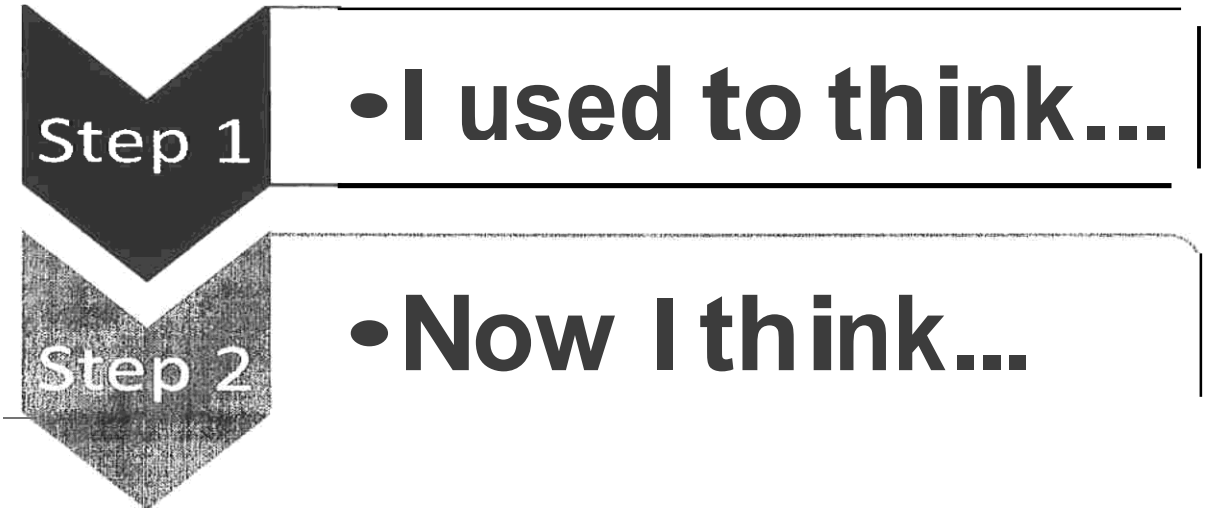
changed?

How did your background knowledge help you with this problem?

What did you learn from your writing?

What did you learn from discussion with your classmates?

I Used to Think but Now I Think



Purpose:

- Helps students reflect on their thinking about a topic or issue and explore how and why that thinking has changed
    - By examining an explaining how and why their thinking has changed, students develop their reasoning abilities and recognize cause-and-effect relationships
    - Students develop metacognitive skills, the ability to identify and talk about one's thinking

Process:

- Explain to students that the purpose of this activity is to help them reflect on their thinking about the topic and to identify how their ideas have changed over time. For instance:
- *When we began this study of _____, you all had some initial ideas about it and what it was all about. In just a few sentences, I want to write what it is that you used to think about _____. Take a minute to think back and then write down your response to "I used to think…"*
- *Now, I want you to think about how your ideas about _____ have changed as a result of what we've been studying/doing/discussing. Again in just a few sentences write down what you now think about _____. Start your sentences with, "But now, I think"*
- Have students share and explain their shifts in thinking. Initially it is good to do this as a whole group so that you can probe students' thinking and push them to explain. Once students become accustomed to explaining their thinking, students can share with one another in small groups or pairs.

Appropriate Usage:

- Should be used whenever students' initial thoughts, opinions, or beliefs are likely to have changed as a result of instruction

Works Cited

Bennett, Samantha. *That Workshop Book: New Systems and Structures for Classrooms That Read, Write, and Think.* Portsmouth, NH: Heinemann, 2007. Print.

Burns, Marilyn. *Writing in Math Class: A Resource for Grades 2-8.* Sausalito, CA: Math Solutions Publications, 1995. Print.

Carleton, Lindsay, and Robert J. Marzano. *Vocabulary Games for the Classroom.* Bloomington, IN: Marzano Research Laboratory, 2010. Print.

Carroll, Joyce Armstrong. *Dr. Jac's Guide to Writing with Depth.* Spring, TX: Absey, 2002.Print.

Daniels, Harvey, Steven Zemelrnan, and Nancy Steineke. *Content-area Writing: Every Teacher's Guide.* Portsmouth, NH: Heinemann, 2007. Print.

Daniels, Harvey. *Subjects Matter: Exceeding Standards through Powerful Content-area Reading.* Portsmouth, NH: Heinemann, 2004. Print.

Emig, Janet. "Writing as a Mode of Learning." *Acts of Teaching: How to Teach Writing.* By Joyce Armstrong Carroll and Edward E. Wilson. Englewood, CO: Teacher Ideas, 2007. 427+. Print.

Fisher, Douglas, and Nancy Frey. *Word Wise and Content Rich, Grades 7-12: Five Essential Steps to Teaching Academic Vocabulary.* Portsmouth, NH: Heinemann, 2008. Print.

Hoffer, Wendy Ward. *Minds on Mathematics: Using Math Workshop to Develop Deep Understanding in Grades 4-8.* Portsmouth, NH: Heinemann, 2012. Print.

Marzano, Robert J. *Building Background Knowledge for Academic Achievement: Research on What Works in Schools.* Alexandria, VA: Association for Supervision and Curriculum Development, 2004. Print.

McCoy, Ann C., Joann Barnett, and Emily Combs. *High-yield Routines for Grades K-8.* N.p.: n.p., n.d. Print.

National Council of Teachers of Mathematics. *Principles to Actions.* Reston, VA: National Council of Teachers of Mathematics. 2014. Print.

Ritchhart, Ron, Mark Church, and Karin Morrison. *Making Thinking Visible: How to Promote Engagement, Understanding, and Independence for All Learners.* San Francisco, CA: Jossey-Bass, 2011. Print.

Smith, Margaret, and Mary Kay Stein. *5 Practices for Orchestrating Productive Mathematics Discussions.* Reston, VA: The National Council of Teachers of Mathematics, 2011. Print.

Vygotsky, L. S. *Thought and Language.* Cambridge: M.I.T., Massachusetts Institute of Technology, 1962. Print.

Zemelman, Steven, Harvey Daniels, and Arthur A. Hyde. *Best Practice: Bringing Standards to Life in America's Classrooms.* Portsmouth, NH: Heinemann, 2012. Print.

K-12 Mathematics Process Standards

1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and
techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

NCTM Process Standards

Problem Solving

- Build new mathematical knowledge through problem solving
- Solve problems that arise in mathematics and in other contexts
- Apply and adapt a variety of appropriate strategies to solve problems
- Monitor and reflect on the process of mathematical problem solving

Reasoning and Proof

- Recognize reasoning and proof as fundamental aspects of mathematics
- Make and investigate mathematical conjectures
- Develop and evaluate mathematical arguments and proofs
- Select and use various types of reasoning and methods of proof

Communication

- Organize and consolidate their mathematical thinking through communication
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others
- Analyze and evaluate the mathematical thinking and strategies of others
- Use the language of mathematics to express mathematical ideas precisely

Connections

- Recognize and use connections among mathematical ideas
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole
- Recognize and apply mathematics in contexts outside of mathematics

Representation

- Create and use representations to organize, record, and communicate mathematical ideas
- Select, apply, and translate among mathematical representations to solve problem
- Use representations to model and interpret physical, social, and mathematical phenomena