

NEWS JOURNAL

A publication of the Montana Science Teachers Association

Fall 2017



In this Issue:

- From the President • Teacher Lessons on the NGSS Practice Asking Questions and Defining Problems

Submitting Articles to the MSTA News Journal

When submitting articles, please adhere to the following criteria:

- Electronic submissions are preferred in Microsoft Word format. These can be attached to your email message.

- If in doubt about format, submit your work in .rtf format.
- If truly in doubt, paste your submission in the body of the email message.
- Lab activities may be mailed. Please cite any references.

Judy Boyle, Editor Tentative Submission/Publication Dates

sagemountaintrail@gmail.com August/September (Fall Issue)

November/December (Winter Issue)

February/March (Early Spring Issue)

April /May (Late Spring Issue)

<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Montana Science Teachers Association Membership Application </div>																			
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Last	First																		
Address _____		Phone (____) _____																	
City _____	County _____	State _____	Zip _____																
School Phone(____) _____		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">Dues Category</th> </tr> </thead> <tbody> <tr> <td>1 year</td> <td style="text-align: right;">\$20.00 _____</td> </tr> <tr> <td>MSTA/MCTM</td> <td style="text-align: right;">\$30.00 _____</td> </tr> <tr> <td>MSTA/MEEA</td> <td style="text-align: right;">\$30.00 _____</td> </tr> <tr> <td>3 years</td> <td style="text-align: right;">\$50.00 _____</td> </tr> <tr> <td>Life</td> <td style="text-align: right;">\$150.00 _____</td> </tr> <tr> <td>Student</td> <td style="text-align: right;">\$5.00 _____</td> </tr> <tr> <td>Retired</td> <td style="text-align: right;">\$5.00 _____</td> </tr> </tbody> </table>		Dues Category		1 year	\$20.00 _____	MSTA/MCTM	\$30.00 _____	MSTA/MEEA	\$30.00 _____	3 years	\$50.00 _____	Life	\$150.00 _____	Student	\$5.00 _____	Retired	\$5.00 _____
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<input type="checkbox"/> 6-9 MS or JH	<input type="checkbox"/> Life Science	<input type="checkbox"/> Chemistry																	
<input type="checkbox"/> 9-12	<input type="checkbox"/> Phys Science	<input type="checkbox"/> Other																	
<input type="checkbox"/> College/Univ.	<input type="checkbox"/> Earth Science	Make checks payable to MSTA Return to: Katie Capp PO Box 514, Belgrade, MT 59714																	
<input type="checkbox"/> Sup/Admin.	<input type="checkbox"/> Biology																		

From President Jessica Anderson



It's a little brisker than normal this week, and fall is here! With the beginning of school now upon us, it's time to start thinking ahead to the MEA-MFT Educators' Conference in Missoula on October 19th and 20th. We look forward to seeing all of you at the conference. We have a wonderful keynote speaker, Courtney Sullivan, from the National Wildlife Federation. She will be presenting on Thursday. We also have our annual luncheon on Friday and we hope to see all of you at these two events. Additionally, Judy Boyle, President-elect of MSTA, has kindly offered to put together our MSTA Newsletter. Please feel free to send her lessons, author a post, or even share a project for which you hope to gain a collaborative partner. You're part of an amazing Professional Network---use it to your advantage!

Have a wonderful year!

Jessica Anderson
MSTA President

From the Editor

With the rollout of the new Montana Science Standards, the News Journal will begin focusing on the Science and Engineering Practices and Crosscutting Concepts. Each News Journal edition will focus on one. In this edition, we focus on the practice Asking Questions and Defining Problems. I hope you enjoy this edition. If you would like to submit an activity or lesson, our next practice will be Using and Developing Models. Please submit your article by December 1, 2017. Send it to me at sagemountaintrail@gmail.com.

We look forward to seeing all of you at the MEA-MFT Conference in October. This is a great opportunity to renew your membership to NSTA so please stop by our table.

Thank you for providing exceptional science education to our Montana children.

Judy Boyle
MSTA President-elect



The Three Hole Bottle Demonstration

By Natalie Davis-McGrath MSTA Earth Science

Contact: natdavis@livingston.k12.mt.us

Asking Questions and Defining Problems: The Three Hole Bottle Demonstration

Background:

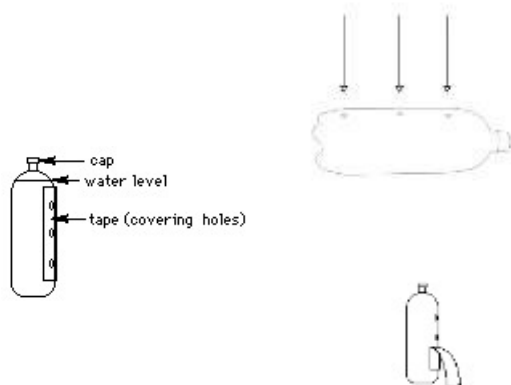
One of my favorite lessons to start off my Earth Science class is The Three Hole Bottle Demonstration. This lesson is a discrepant event that leaves students wondering, questioning and thinking about how, many forces of nature, are affecting this demo's equilibrium. When the class is finished they will demonstrate that they are able to form a hypothesis, make predictions, have a scientific discussion and most importantly adapt their thinking to the actual results. I wait until the demo is finished before explaining the science behind what students are seeing. This allows them to come up with very creative ideas as to what they are witnessing.

I acquired this lesson from a former colleague and therefore cannot site my original source. There are currently many adaptations to this lesson and it can easily fit any curriculum or age group. I personally use this lesson after I review the scientific method, however it could be used at others time in my Earth Science curriculum. My students answer questions and sketch diagrams in their science notebook. If you prefer a guided worksheet for your students there are many options you could find on the web or feel free to create one using my suggested outline below.

Materials Needed: An empty 2 liter bottle, duct tape, water, a drain, Bunsen burner, a glass stirring rod, heat resistant gloves.

Preparation:

1. Put on your gloves and use a Bunsen Burner to heat up the end of a stirring rod
2. Turn the empty 2 Liter bottle onto its side
3. Using the hot end of the stirring rod, melt a row of three evenly spaced holes into the bottle, from the cap to the bottom
4. Cover the holes with a single piece of duct tape
5. Fill the bottle with water and replace the cap



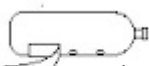
Begin the Lesson (will require one 50 min period):

Part One: The Vertical Bottle

1. In your student's notebook, have everyone sketch an initial diagram of what they see.
2. Have student record a prediction about what will happen when you remove the tape from only the top hole. After they write what they think will happen (water stays in, water comes out, bottle explodes...all valid ideas) they need to write an explanation as to why, scientifically, this prediction may be supported. At this point I begin a class discussion. Do not indicate whose ideas are correct or incorrect at this point. If your group is not talkative, you could divide them into groups then share their ideas out loud.

3. I now have each student write a hypothesis as to what they predict will occur and share some examples with the class. This is a good way to refine the way in which student write hypotheses.
4. I usually have one volunteer, who is convinced the water will stay in the bottle, come sit in a chair and allow me to pull down the tape while the bottle is on top of their head.
5. Once you are ready slowly pull down the duct tape and expose only the top hole. The water will stay inside. You can have a student push a pencil into the hole to show everyone that it is not a trick.
6. Students should refine their hypotheses if necessary.
7. Now I continue the process, asking student to sketch, predict, explain and hypothesize what will occur when tape is removed from the second and then the third hole. Continue your discussion but I still wouldn't indicate what is actually happening. Water will come out when the tape is removed from the second hole and again when you remove the tape from the third hole.

Part Two: The Horizontal Bottle



1. The second part of the demo you must hold the bottle horizontal to the floor with the holes and tape facing down. Be sure to hold the bottle as still as possible and have a student help you remove the tape.
2. In their notebooks, students should sketch, make a prediction, explain their ideas and hypothesize what will happen when the tape is removed from the first hole. After you discuss all ideas with the class begin the demo.
3. Remove the tape from the first hole. Water will stay in the bottle.
4. Students should refine their hypotheses if necessary.
5. Continue in the same fashion as above, asking student to sketch, predict, explain and hypothesize what will occur when tape is removed from the second and then the third hole. Continue your discussion but I still wouldn't indicate what is actually happening. Water will stay inside the bottle when the tape is removed from the second hole and again when you remove the tape from the third hole (this usually causes the student to reconsider their beliefs from the first part of the demo).

Part Three: Explanation

1. This could vary greatly depending upon what students mentioned during your classroom discussion and your grade level. You could discuss any of the following topics: Scientific method, surface tension, pressure, volume, atmospheric pressure, gravitational force, how the bottle is not a vacuum or relate this to real world examples.

This demo is a great way to encourage students to think about science. I enjoy not explaining the science involved during each step because it is wonderful to see student transform some of their beliefs about science. Feel free to email me if you'd care for further details about this lesson or about other Earth Science Lessons.

Using Phenomenon and the Science and Engineering Practice of Asking Questions and Defining Problems

John Graves

The 3 Dimensions of NGSS and the Montana Science Standards (science & engineering practices, crosscutting concepts and disciplinary core ideas) need to be used together to help students make sense of the world around them. One powerful way to engage students in the dimensions is by creating storylines of science principles focused around a phenomenon. Here's a simple example:

Ask students what will happen if a paperclip is placed in a cup of water. Encourage them to record their predictions in a science notebook. Next give them cups, water and paperclips and allow them to explore what happens. If no one does it on their own, set up your cup of water with a paperclip floating on the surface. You can accomplish this by carefully sliding the paperclip in from the side, bending one piece of the paperclip up as a handle, placing another clip on top and gently lowering the balanced clip to the surface of the water or placing the paperclip on a small piece of paper floating on the surface and then gently pushing the paper down, leaving the paperclip floating. Don't give these ideas to students...they need to discover the techniques themselves.



Allow the students to see the phenomenon...the floating paperclip. Ask students to generate questions about the phenomenon by writing questions in their notebooks. Use prompts like:

Who? *the teacher did it or I did it*

What? *floated a paperclip on water*

Where? *in the water, in the classroom*

Why? *to see if it could be done, to model what water skippers do, to demonstrate surface tension How? by carefully putting the paperclip on the surface of the water...and more*

Once students have generated a list of questions, allow them time to explore and answer their own questions. Some they will be able to answer on their own, others such as surface tension, adhesion, cohesion, the polarity of water, will come through more direct instruction, reading and exploration.

The second part of the Science & Engineering Practice of Asking Questions is Defining Problems. Have students define a problem based on the phenomenon of the floating paperclip. They might wonder about water skippers on the surface of a pond or why water beads or why water seems to stick to itself. As with all Practices and Crosscutting Concepts, students should move seamlessly from one to another. For example, questions may quickly lead to Planning & Carrying Out Investigations, Constructing Explanations and Designing Solutions or finding Patterns or Cause & Effect.

While teaching Practices and Concepts in isolation may be necessary to initially introduce them to students, as soon as possible, be sure to connect the dimensions since all have equal importance when learning science.

Using Current and Past Events to Illustrate to Students the Importance of Scientific Inquiry
By Shannon Jones

Today’s students operate in a technologic world, where current events are viewed more as being old and inconsequential after it is no longer marked as a “favorite” by friends, or deleted from their text messages. To integrate the importance of current events to students in science, as well as any other subject, is a significant reminder that events can shape our view and lead to new realizations both for the teachers and the students.

One event that can be brought up with students are the multiple incidences with viruses in the last thirty years. For example, the cases of Methicillin-resistant *Staphylococcus aureus* listed in

Incidents of MRSA	
Year	Hospital Cases Reported
1993	1,900
1995	38,100
1997	69,800
1999	108,600
2001	175,000
2003	248,300
2005	368,600
2007	737,200
2009	294,880

an assigned science textbook published for middle school students: Often proving the students with minimal information can result in them becoming more curious than apathetic about this chronological events. For example:

“MRSA: Methicillin-resistant *Staphylococcus aureus*; is spread by close contact between individuals, specifically in hospitals; resistant to most antibiotics that can be used against it.”

Once example way to move the brains of the students after they are given minimal information is to provide them with a simple question with a complicated answer. For example:

“Have the cases of MRSA increased or decreased since it was first discovered?”

After they participate in a lesson on the operation of viruses, having the students engage in seeing the real statistics over time aids them in questioning the future. This is a question that can be debated both before the data is shown, and then requestioned as a “why”:

“Why have the cases of MRSA increased and decreased since it was first discovered?”

This will leave it open for students to experience the fact that simply because events occurred in the past, it does not mean that the event, scientific or historical, will not impact the future.

Teaching in this method, using current and past events, can engage students to a greater degree as an illustration of scientific discovery and inquiry.

FROM TOM CUBBAGE, NSTA District 15 (Montana, Idaho, Wyoming) District Director

New Science Standards Resources: NGSS, Three Dimensional Learning, Cross Cutting Concepts, and Science and Engineering Concepts. Nation Science Teachers Association
Virtual Conference

Exploring Three-Dimensional Instruction

http://learningcenter.nsta.org/products/online_courses/VC_170211.asp

[x](#) The NGSS Hub at NSTA <http://ngss.nsta.org/>

Everything you wanted to know and resources to take and use from the developers of the NGSS <http://www.nextgenscience.org/teachers>
From PBS and other Media companies; teaching NGSS through media sources K-12, contains resources K-5, 6-8, 9-12.

<http://www.nextgenscience.org/teachers> Nasa's
Jet Propulsion lab NGSS resources

<http://www.jpl.nasa.gov/edu/teach/resources/engineering-in-the-classroom.php>

EQUIP reviewed NGSS lessons at Teachers Try Science

<http://www.teacherstryscience.org/ngsslanding>

Student Opportunities

For a number of years, the NCWIT (National Center for Women and Information Technology) has given national awards to high school girls. The **NCWIT Award for Aspirations in Computing** is for young women with aspirations and achievements in technology and computing.

This year will be the sixth year that there also will be a MONTANA contest for Montana girls. The time to submit applications is **Sept. 1 through November 6** and the application is found at <http://www.aspirations.org/participate/high-school>

There are many qualified high school girls that would apply if they just had a little push from a leader like you. Any interested female high school student would need to fill in the on-line application, and get a parent and a school official to approve it to be entered into both the national and Montana contests. We have had winners from high schools in Absarokee, Anaconda, Arlee, Beaverhead County, Bozeman, Cascade, Cut Bank, Helena Capital, Helena High, Jefferson High, Libby, Missoula Big Sky, Missoula, Hellgate, Missoula Sentinel, Noxon, Park County, Simms and Whitefish High School. We hope your school will be represented on the winners list this year. But girls have to apply.

We are looking forward to recognizing Montana's talent, and hope that you would encourage the young women that you know to apply. Sometimes all they need is a little encouragement and you are the person to provide that.

Thank you,
Steve Harper and Ted Wendt
Computer Science
Carroll College 447-4466
sharper@carroll.edu

Montana Science Olympiad Coaches and Fellow Olympians!

On behalf of the Montana Science Olympiad I am very excited to announce that the 33rd Montana Science Olympiad will be held **November 21, 2017**, on the MSU-Bozeman campus! Please feel free to browse through a list of Official Events in Division B and C on our website: <http://www.montana.edu/ehhd/smrc/mtso/index.html> (Select Events on the left-hand side.) All events are now finalized.

***We are calling this the "2018" MTSO" to be consistent with the year shown in the event rules, because this state competition leads to the National Science Olympiad in May 2018. The 2017-2018 Rule Manuals from the National Science Olympiad are available for **FREE** download starting on September 5th! In this manner, all teams get access to the rules at the same time. The link is: <https://store.soinc.org/us/page/welcome>

The required fees for the 2017-2018 state tournament Varsity teams will be the same as the previous year: \$325 for teams of 11-15 students and \$275 for teams with 10 students or less. Some exciting news is that we have dropped the price of JV team registration to \$200. To register, please fill out a School Membership Form **electronically** at http://www.montana.edu/ehhd/smrc/mtso/school_teams.html. In order to compete, all Membership Forms are due by **Friday, October 13, 2017** and all fees are due by **Friday, November 3, 2017**. Please check the MTSO website soon for the Avogadro registration updates!

Please don't hesitate to contact us with questions or concerns. (See the contact information below and note the email address.) We are looking forward to seeing all of you on November 21st.

Best,

LeeAnn Swain
Montana Science Olympiad Manager
[406-994-7476](tel:406-994-7476);

Michelle Akin,
P.E., SMRC Asst Dir, 994-6768

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It's time to make plans to attend the 2017 MSTA Conference in conjunction with the MEA-MFT Educator's Conference in Missoula October 19 & 20.

Heaps of GREAT session for teachers of science...check out the conference schedule when you register.

Register here: http://www.mea-mft.org/educators_conference.aspx

MSTA Regions

