Montana Science Teachers Association

MSTA

Dedicated to Quality Education

NEWS JOURNAL

A publication of the Montana Science Teachers Association

March 2014

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 and also state which National Science Standards your activity meets.

John Graves, Editor
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Tentative Submission/Publication Dates
August 15/September
November 15/December
February 15/March
April 15/May

Montana Science Teachers Association
Membership Application

Name _____ Date _____
Last First

Address _____ Phone _(_____)_____

City County State Zip

School/Affiliation _____

School Phone(____)_____

Email_____

Grade Level	Subject	
___K-6	___All sciences	___Physics
___6-9 MS or JH	___Life Science	___Chem
___9-12	___Phys Science	___Other
___College/Univ.	___Earth Science	
___Sup/Admin.	___Biology	

Dues Category	
1 year	$20.00 ____
MSTA/MCTM	$30.00____
MSTA/MEEA	$40.00____
3 years	$50.00____
Life	$150.00___
Student	$5.00_____
Retired	$5.00_____

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In this issue...

MSTA HAS A FACEBOOK PAGE

Check it out and LIKE us

From the President

PRESIDENT'S MESSAGE

Do you remember when you first learned to ride a bike? Was someone there gently holding the bike as you learned how to balance, steer, and pedal the bike? Were they giving you suggestions along the way? Have you ever purchased a new tool or gadget and it is still in the box or tucked away in a cupboard because the old tool or gadget is easier or more comfortable to use? I am thinking of a stand up Kitchen Aide Mixer I bought that sits in the cupboard because it is easier for me to grab the old small hand mixer. Why am I mentioning this? New education tools or ideas won't do you or others any good unless you know how, when, and why to use it as well as having some support along the way. This is the power of presenting and attending the Montana Educator's Conference (MEA); your ability to help facilitate conversation amongst colleagues, share and gain ideas to encourage best practices, and enrich learning for our education community. In 2013, The Montana Science Teachers Association (MSTA), had 75 quality sectionals to offer to teachers in Montana at the MEA conference in Belgrade. We would like to continue the trend of being a leading curriculum group at MEA, in supporting, sharing and engaging in conversation about best practices with other teachers in the state of Montana. ***Please consider presenting at the MEA conference in Missoula on October 16th and***

17th. *The deadline for applications is April 30th, 2014. Here is the link for the application to present:* *http://www.mea-mft.org/educators_conference.aspx*

Here is a neat quote ***"Listen to all, plucking a feather from every passing goose, but follow no one absolutely.*** *- Chinese proverb, (Sparks Quote)*

I truly believe you can learn something from everyone if you take time to listen. Possible mentors and teachers can be found everywhere and anywhere. Everyone you have met today has something they could teach you – a skill, lesson idea, life lesson or personal secret to success. All you have to do is look for it, listen and ask plenty of questions. Most of all, respect the fact that each person (your students, neighbor, colleague etc…) has something of value to offer. If you cannot find one "feather to pluck from someone, you're not looking hard enough. It is your job to take the knowledge you gain and apply to something useful in your classroom or life. By sharing and participating in the annual MEA Conference, you will have many opportunities to "pluck feathers" and let your feathers be plucked. Veteran and new teachers alike can learn valuable things from each other if we present, attend and listen!

I hope you are having a great winter. Thank you for your hard work and dedication while effectively teaching science in Montana!

Sincerely,

Beth Thomas, MSTA President

MEA-MFT Educators' Conference

The MEA-MFT Educators' Conference is dedicated to bringing top-quality professional development to Montana teachers. Each year, teachers from all over Montana come to our conference for inspiration, information, and renewal units.

It's your right to attend the MEA-MFT Educators' Conference! State law calls for closing schools the third Thursday and Friday of every year so Montana teachers can get the professional development they need to obtain renewal units. Our conference is one of your main opportunities to use those two days well.

2014 MEA-MFT Educators' Conference
October 16 & 17, Missoula

Application to present: Have you ever thought about presenting at MEA-MFT's Educators' Conference? Enter your application today. **Deadline:** April 30, 2014.

REGISTER TO PRESENT TODAY:
http://mea-mft.org/educators_conference.aspx

Montana Educators...

Working Wonders for Students

MSTA Information

The URL for the MSTA webpage is

http://montanascience.org

If you have trouble with that address, try
http://www.ivymerriot.com/montanascience/index.html

The page has many new listings and links, be sure to visit it often.

Update your Membership Information on the MSTA webpage

MSTA E-blast Listserv
to sign up, visit the website and follow the E-blast link

Stay informed. Get educated. The Next Generation Science (NGSS) are coming. Check out the NSTA webpage for the latest information regarding the NGSS.
nsta.org

Next Generation Science Standards

NEXT GENERATION SCIENCE STANDARDS
For States, By States

Next Generation Science Standards Now in Development

In a process managed by Achieve, 26 states are leading the development of the Next Generation Science Standards (NGSS). The science education community got a first glimpse of the NGSS draft when it was released during the first public comment period from May 11 through June 1. According to Achieve, the writers are now working to review all of the comments and develop a second draft to be released for public comment in the fall 2012. Achieve has removed the first draft from the web while it undergoes revision.

Science educators are encouraged to continue to become familiar with the NRC Framework—the foundation for the NGSS—to prepare for implementation of the standards when a final version is completed in 2013.

QUESTIONS? E-mail your questions or concerns about the NGSS to ngss@nsta.org.

Do you have a copy of the K-12 Science Framework?
You can download a copy here

http://www.nap.edu/catalog.php?record_id=13165

Opportunities for Teachers and Students

Program or Summer Camp Scholarship Application

Youth in grades 5-12 in spring 2014, or who are entering grades 5-12 in fall 2014 are eligible for scholarships to attend water-related or natural resource-focused programs, competitions, and summer camps. Examples of qualifying programs include team competitions, after school programs, summer camps, conservation leadership schools, or range camps. Scholarships are available for up to $300 and may be applied to registration costs, program-related fees, and travel. Awards are based upon need with special consideration given to youth from rural and underserved areas of the state.
To be eligible for a scholarship, complete this form and return it to Montana Watercourse at least three weeks prior to the event. Confirmation of receipt of application and award granted will be sent within 10 days of receiving the form in our office. Funding for this scholarship program is limited.

- **Return this form to Montana Watercourse at least three weeks prior to event**

Email: mtwatercourse@montana.edu
Mail: Montana Watercourse
PO Box 170570
Bozeman, MT 59717
Fax: 406-994-6660

Questions? Contact us at 406-994- 6671

Ways to Use Twitter in the Classroom

1) **Connect with scientists and classes around the world.** Try following hashtags like #astrobiology or #scienceed to connect with individuals with similar interests.
2) **Schedule a Mystery Skype session with classrooms or scientists.** Follow #mysteryskype or @Skypeclassroom to find educators and scientists interested in connecting with your science class.
3) **Encourage students to participate in the #scistuchat.** This chat runs at 7:00 p.m. MST the second Thursday of every month and covers a variety of science topics. Check out https://sites.google.com/site/scistuchat/ for updated chat topics.
4) **Use Twitter as a backchannel** during presentations, debates, or group projects using a hashtag. This is a great way to engage students in scientific argumentation.
5) **Check for student understanding in 140 characters.** Want to know if your lesson on plate tectonics caught on? Have students tweet before, during, or after a lesson using only 140 characters.

5 Ways to Use Twitter as a Science Educator

1) **Grow your own professional learning network (PLN).** Follow educators who have similar professional interests as you. New ideas shared every second!
2) **Participate in chats** like #SCItlap on Tuesday's from 7:00-8:00 p.m. or #scichat on Tuesday's from 6:30 to 7:30 p.m. Check out bit.ly/officialchatlist for more education chats and times.
3) **Get updated science information in one place.** By following science news handles like @NASA, @ScienceDaily, or @WiredScience you'll stay up-to-date on what's happening in science and ready to share it with your students.
4) **Share your thoughts on teaching.** Tweet out your newest blog post. Teachers love to read what you're doing! Use your handle to share your thoughts on science education with your PLN.
5) **Connect with Montana science teachers**. Once a year at MEA-MFT isn't enough! Use MSTA as your science teacher hub. Be sure to follow @MSTAMT and check out #mstamt to get updated information from MSTA.

Don't have a Twitter account? Sign up today!

Questions? Contact Earth Science Representative Jessica Anderson (@TriSciCurious) at janderson@pchs.dl.k12.mt.us

Have you followed @MSTAMT on Twitter yet?

We've been busy tweeting up-to-date news from MSTA using #mstamt.

Now, we're looking for more participation! MSTA would like to start a monthly Twitter chat.

Please fill out this quick survey to let us know what days and times would work best for you!
Survey Link: bit.ly/KK1tqO

Astronomy and Aerospace Day scheduled in Bozeman April 5

Abstract: A free day of astronomy- and aerospace-related events occurs in Bozeman on Saturday, April 5.

Contact: Ryan Hannahoe, rhannahoe@monfortonschool.org

BOZEMAN -- A free afternoon of astronomy- and aerospace-related events for kids and adults will be held in Bozeman on Saturday, April 5, including talks by two Montana State University alumni who now work in space science and engineering: one as a systems engineer for Google[x] and another who is director of the world-famous Adler Planetarium in Chicago. The event takes place at the Museum of the Rockies from 1 p.m. to 4 p.m., and all Astronomy and Aerospace Day 2014 activities are included that afternoon with museum admission. Kids under age 17 and students with a valid college ID have free admission that day.

Exhibits in the main lobby will feature activities, information and give-aways from NASA missions and MSU researchers. Kids' activities will take place throughout the afternoon. The planetarium show is Flight Adventures. Angela Des Jardins, director of Montana Space Grant Consortium, will begin the afternoon presentations at 1 p.m. in the Hager Auditorium. Former Curiosity Rover mobility engineer Jaime Waydo speaks at 1:10pm. Waydo, an MSU alumnus, is currently a Google[x] systems engineer on the chauffeur self-driving car program.

At 3 p.m., MSU alumnus Michelle Larson, who is now president and CEO of the Adler Planetarium**,** presents "*Cosmic Wonder: The only thing bigger than the Universe is human curiosity*." *Her presentation will take place in the Museum of the Rockies' Taylor Planetarium*. An autograph session with both Larson and Waydo takes place from 2 p.m. to 3 p.m. in the Hager Auditorium. Astronomy and Aerospace Day is sponsored by the Museum of the Rockies, Montana Space Grant Consortium, Monforton School Science and Gifted Programs, Space Public Outreach Team, Southwest Montana Astronomical Society, and MSU's Extended University and College of Letters & Sciences. For more information visit http://eu.montana.edu/AstronomyDay/

Writing In Science

Mary J. Leonard
Montana State University

Teachers of science have always recognized that communicating is part of doing science. Now, too, Montana Common Core Standards for English Language Arts (ELA) recognize the need for developing reading and writing skills in science. Indeed, the complete name of the ELA standards includes the phrase: "literacy in history/social studies, **science** and technical subjects in grade-band K-12." ELA thus officially integrated science communication. In turn, the Next Generation Science Standards (NGSS) have identified the ELA standards applicable to each new science standard. To support teachers of science in achieving this important aspect of science literacy, this article identifies some resources for developing students' writing skills in science throughout grades K-12.

A theme in ELA writing standards is using valid reasoning and relevant and sufficient evidence. What better context in which to do this than science? The *Claim-Evidence-Reasoning* framework for writing science explanations (McNeill & Martin, NSTA's *Science and Children*, April/May 2011; Novack, McNeill, & Krajik, NSTA's *Science Scope*, Sept 2009) leads students through constructing scientific arguments from data. The claim is a statement that answers the question under investigation. Evidence is a summary of the data that supports the claim. Reasoning is an explanation of why and how the evidence supports the claim, including other ideas in science. The box below shows an example of the framework used in a 4th grade investigation to answer the question, What causes sound? The framework is equally useful in higher grades (see the Novack et al. article for middle-school examples).

4th Grade Investigation of Sound

Claim: I believe sound is caused by vibrations.

Evidence: When I plucked the guitar strings, they moved back and forth rapidly and I heard a sound. But when I pressed my fingers on the strings, the sound stopped. In another example, when I hit the tuning fork it looked shimmery from moving back and forth very quickly. When I placed the tip in the water, the water moved away from the tuning fork in ripples. When I tightened a rubber band and plucked it, I heard a noise and felt the rubber band moving against my finger.

Reasoning: In each of the examples, I saw an object moving rapidly at the same time I heard sound. When I stopped the movement, the sound also stopped. Thus, sound comes from vibrations.

A versatile writing technique for kindergarten through high school and even university students is *Talking Drawings* (McConnell, *Journal of Reading*, 1992; Paquette, Fello, & Jalongo, *Early Childhood Education Journal*, August 2007). Talking Drawings contribute in at least two ways to developing students' science writing skills: they allow students to communicate understandings of concepts even if they don't know scientific vocabulary, and they develop drawing skills important for communicating scientific

observations and results. Besides, they're fun! In this technique, students first represent what they know about a concept or topic in a picture (a form of pre-assessment, too). Students then share and discuss their drawings with a partner. Instruction on the topic ensues, after which students create another drawing, this time with written labels or descriptions (useful for formative assessment). Discussion among students then allows them to compare and contrast their drawings, both pre- and post-instructional drawings of a single student, and the drawings of multiple students.

LEGO Directions (Peters, *Science Scope*, April/May 2006) require students to write detailed descriptions, a skill necessary for communicating scientific procedures and findings. In this technique, Investigator A builds a LEGO structure and writes directions for how to build it (diagrams may be included). Investigator A gives the instructions to Investigator B, who tries to build the same structure using the directions alone, without looking at the built structure. Investigators compare their completed structures, discuss what was clear and unclear about the directions, then swap roles and repeat. Be aware: this activity may provide "teachable moments" about respectful and productive disagreement!

A number of other techniques add variety and fun to writing in science. An article in the Dec 2006 issue of *Science Scope* (by Turner & Brommel) offers 14 strategies to use with students, including:

- Writing hypothetical letters between scientists
- After observing a demonstration, write steps to recreate it
- Identify and list the critical attributes of an object (what makes the object what it is)
- Collaboratively write science stories after learning a topic
- Write a detailed summary of the chain of evidence for a crime
- Write directions to a place using natural features for navigation (and try them out!)
- Analyze the label of a product and write a description of the product from that
- Write a proposal for a science project, paper, or research study

NSTA has many more resources to get your students writing in science – check them out! Now, what would Darwin have written to Mendel …?

Lesson Ideas

Climate Change in the Classroom

"I was insulted as a high school student prepared to enter the world. I need to hear both sides of the story," exclaimed 17-year old Kip Barhaugh. The Choteau student was frustrated with the school board's decision to cancel a presentation on climate change. "Our generation caused the problem," stated Nobel Peace Prize winner Steve Running of the University of Montana "and I want to talk to high schools because they are the generation that will solve the problem." But some conservative members from the community complained that Dr. Running's program would be one-sided because there was no one to offer an opposing view.

This is not surprising when you consider that many Americans do not understand the difference between weather and climate. Many more do not identify the burning of fossil fuels as the primary cause of global warming. But are they responsible? Lobby groups spend millions of dollars every year to protect their short-term economic interests by keeping the public confused. Some political leaders add to the uncertainty. Not long ago, during a congressional hearing, Senator James Inhofe asked: "Could it be that man-made global warming is the greatest hoax ever perpetrated on the American people? It sure sounds like it." And popular media figures such as Rush Limbaugh add fuel to the fire by telling listeners: "more carbon dioxide in the atmosphere is not likely to significantly contribute to the greenhouse effect. It's just all part of the hoax."

For years and years, science educators have largely kept religious-based creationism and intelligent design out of biology class. But it turns out that evolution isn't the only scientific theory under attack. It took decades to overcome the doubt that the tobacco industry cast on the link between cancer and cigarettes. Now it's happening to climate science. And it's not a coincidence that one of the leading climate change skeptics, Fred Singer, used to work for the cigarette companies.

Fortunately, I believe the public at large wants to know the truth- especially our students. But the politically charged atmosphere surrounding climate change often discourages educators from teaching anything that involves

uncertainty. Indeed, doubters use the "uncertainty" of climate science as a blunt instrument against the whole theory of global warming. For after all, as the skeptics exaggerate, "if scientists don't know everything, they know nothing."
Clearly, climate scientists need to do a better job of explaining uncertainty to the public and responding to the criticism of naysayers. Now, more than ever, Americans need to understand that scientific uncertainty is not the same as ignorance. The public needs to know that science is a particular way of knowing about the world and that uncertainty is part of the method for measuring what is unknown.

That's how K- 12 educators can help. The ability to assess and utilize scientific knowledge largely depends on the education that people receive from kindergarten through high school. Many students, however, experience little or no exposure to climate change science (as well as evolutionary theory). It can be difficult for teachers to determine exactly what topics they will include- and leave out- of their curriculum, but given the high stakes, it's time to put climate change science front and center. Plainly put, K-12 students have the right to know what climate scientists know. And it's our job to see that they do.

-Jim Rogers, Salish Kootenai College
MSTA Region 1 Director

P.S. I'm interested in hearing from you regarding how potentially controversial topics such as climate change and evolution may be covered or not taught in your school.

Be sure to sign up for the MSTA E-blast

5 E Lesson Ideas

The following lessons follow the 5 E Lesson Plan model which include the stages of engage, explore, explain, elaborate and evaluate. For more on the 5 E model, see these resources:

http://bscs.org/sites/default/files/_legacy/BSCS_5E_Instructional_Model-Executive_Summary_0.pdf

http://faculty.mwsu.edu/west/maryann.coe/coe/inquire/inquiry.htm

http://enhancinged.wgbh.org/research/eeeee.html

The Solar System
A Study of the Size and Scale of the Sun and Planets

By Heather Brauner

After this lesson, students will be able to:

- Demonstrate knowledge of the solar system by arranging spherical objects of different sizes in an order that represents the eight planets and the sun.
- Design a poster that shows the vastness of the solar system, by comparing one planet to another, the earth to the sun, the sun to other stars, etc.

Prior Knowledge:

Your students should be at least somewhat familiar with the concepts of volume and mass. A quick review of the difference between these two terms may be necessary. Stress that mass does not mean the same thing as weight, and just because something has a really big volume does not mean it is going to be heavy. Students also need to know that the planets revolve around the sun, which is at the center of our solar system. This fact will be re-emphasized during the lesson.

Materials:

- Various spherical objects from around the house:
  - Balls in different sizes (beach ball, basketball, playground ball, baseball, tennis ball, rubber ball, ping-pong ball)
  - Citrus fruit in different sizes (grapefruit, orange, mandarin)
  - Glass marble
  - Inflated balloon (try to make the balloon as full and round as you can)
  - Small pebble
- Paper strips with solar system facts written on them (print out **this PDF** and cut apart before class)
- White board with markers (or use a chalkboard, projector, etc.)
- Computer lab (one computer needed for each pair of students)
- Index cards (enough for each student to have several)
- Poster board (one piece or half piece for each pair of students)
- Markers (for making posters)

Lesson Model: 5Es

ENGAGE: Before the lesson, gather household items such as a ping-pong ball, tennis ball, inflated balloon, grapefruit, glass marble, small pebble, etc. You should have around 10 items, with a large range between the smallest to largest. Use any round or spherical item you have on hand (that is safe for students to handle). Put the round objects on a table and have students sort them from largest to smallest. What about heaviest to lightest? Ask questions like: Which object is the heaviest? Is that object also the biggest? How many times bigger is the largest object than the smallest object? How do you know? *Note*: for a large classroom, put the students in groups of 3-4 and give each group a container with around 10 objects of different sizes.

EXPLORE: Tell the class that the sorting they just did is similar to how a scientist would classify the planets. We can sort the eight planets from biggest to smallest, from nearest to farthest from the sun, and by how much they weigh. Write the names of the eight planets on the board, telling students they are in order from smallest to largest (write: Mercury, Mars, Venus, Earth, Uranus, Neptune, Saturn, Jupiter). Have students remain in their groups and work together to choose an object to represent each planet and the sun. What could you use to represent Mercury? How about Jupiter? Students can also draw a representation of how big they think a planet would be, or find another round object in the classroom (a globe, an eraser from a pencil, etc.) Hint: Start small. Tell the students that if earth, which is not the smallest planet, was as big as this dot (.) then the sun would be about the size of a tennis ball. Give advice if needed, but let students work out the puzzle for themselves as much as possible. When finished, each group should have nine objects that represent the solar system, lined up in whatever order they choose (for example largest to smallest).

EXPLAIN: Fold the paper strips in half, then put them in a hat, jar, or other container. Hold the jar above students' eye level and have them grab a strip. Have students go up one at a time to the whiteboard and use colored markers to write their fact about the solar system. Once all the facts have been written, break students into pairs. Tell them to discuss with their partner whether the objects they chose with their group are a good representation of the planets or not. What did they get wrong? How would they fix it? Come back as a class and have a volunteer from each pair share what they found out. Write the observations on the board. Remember that the planets are actually huge—in this lesson we are just trying to compare how big they are relative to each other and the sun.

ELABORATE: Now that students know something about how the planets compare to each other, have them research more about our solar system. Have students break into pairs or work with the same partner they did before. Each pair must choose to research one thing from this list: 1) How far apart are each of the planets from the sun? 2) How far is Mars from Earth? 3) How big is the sun? 4) How big is the sun compared to other stars in our solar system? 5) Why is a planet's mass different than its weight? You can allow several pairs to pick the same question, as long as each of the five questions are being researched. As the teacher, you may have students focus on other topics as well, such as dwarf planets, the temperature of each planet, etc.

Tell students to write down interesting facts they find on index cards, so they can share them with the class during the next section of the lesson. At the bottom of the card have them write the website's name, in case they want to go back later and forget where they found it.

EVALUATE: Back in the classroom, have students work with their partner to design a poster about the solar system. They can use their index cards to help them remember the interesting facts they learned. What is the name of their poster going to be? What is it about? Help students choose to focus on one aspect of the solar system like comparing two planets, such as Mars and Earth, or comparing Jupiter to the sun. Students could also focus on one aspect of all eight planets, such as their size or distance from the sun. When students have finished their posters, have them present to the class. After presenting, hang up each poster around the classroom to remind the students about what they learned. You can have students fill out a self-evaluation sheet on their own performance, or grade them on teamwork skills, participation, and understanding of the concepts, based on the poster they made.

**This is an actual lesson that I did this year. It was found at http://www.hometrainingtools.com/solar-system-size-lesson-plan/a/1812/

Types of Forces
By Teresa Corley

Learning goal: Students will identify six types of forces and will be able to provide examples for each type of force.

Time frame: 1 week of instruction. Two block periods and one 45 minute class period.

Engage: Students will observe a suspended golf ball in glass cylinder featured at the center of the classroom. Students should have a chance to look at it, propose ideas about why they think the golf ball is suspended. Students can create a sketch of it to put in their notebooks and can participate in small group and a class discussion about the forces that are acting on the golf ball.

The secret of the floating golf ball is that the ball floats on saturated salt water solution in the lower portion of the cylinder and the top is then filled carefully with plain water. The effect is that the ball is floating in the middle of the column.

The mysterious "floating golf ball" can be set up using the following:

A large graduated cylinder wide enough for a golf ball to fit inside it. Tall cylinders make a more impressive demonstration. Enough saturated saltwater solution to fill about ½ of the cylinder.

Make sure the saltwater solution has had at least a few hours to settle, so that any excess salt has settled out of solution. Fill the column ½ full with the salt water. Place the ball into the cylinder. Tilt the cylinder and gently pour plain water over the ball. It is like making a density column. Use a brightly colored golf ball because it looks nice in the column.

Explore: Each lab table has materials on it that have something to do with one of the six types of forces that students need to know. This works well for my classroom because I have six lab tables and generally have around 22-24 students in each class.
Students will have about 10 minutes at each table to play with the items at each table. They move in their groups from table to table, trying things out, making notes about what they may observe and writing questions they may have about the materials provided.

Create six force boxes. The contents are up to your imagination and what you have in your stock room.

#1 = Applied Force: Balloons, toy cars, marbles and ruler with a groove in it, bubbles and a wand, modeling clay. This group of items can be almost anything that student manipulate, because almost all forces are applied forces in some way.

#2 = Spring Force: small Slinkies, any toy with a spring, a variety of different size springs. I use the springs that came with a Hook's Law kit. I make sure to include a pen and anything that holds a small battery.

#3 = Gravitational Force: Pulley, ring stand and different masses. A ramp and different size items to roll down the ramp. Paper cups, string, and squares very light fabric, index cards.

#4 – Tension Force: string and wire, wooden craft sticks, bungee cord, rubber bands.

#5 – Air Resistance Force: syringe, little plastic person attached to parachute, feathers, pieces of paper, straws.

#6 – Friction Force: sandpaper, wax paper, hot wheels cars, blocks of wood, masses of different sizes.

Explain: At this point talk about what was in the boxes and ask what students thought about as they explored the materials. Discuss the general definition of force, name the boxes and discuss how the things in the box may help define the specific type of force.

Elaborate: Students will work in a group of 3-4 at one of the six force stations and using the materials in the box develop an experiment to investigate the nature of force represented by the box. The experiment should include some type of measurement and results can be reported in a table and/or graph. Extra materials can be provided at students' request. This may include a stopwatch, meter stick, tape, glue, string, etc . . .It will depend on each groups experimental design. Students should propose a question that they hope to answer.

Examples:
Does mass affect the friction of a block as it slides across a table?

Can I build a tension bridge to hold 1 kg?

Will the steepness of a ramp affect the speed of a car as it rolls down a ramp?

How does the size of a parachute affect the time it takes to fall to the ground?

Will mass affect the stretch of a spring?

Evaluate:

Students should present their investigation and results to the class. Discuss results as a class.

Create a sorting foldable in their science notebook. Use a six pocket foldable (one for each type of force) over two pages of science notebook. Give each student a set of

pictures depicting the six types of forces that they studied. Have students sort the pictures by placing them into the appropriate pockets.

Make sure each student has 18-24 pictures of forces. You can cut forces out from a page of pictures you have created beforehand or give students uncut pictures and have students separate them as they sort.

Use small rectangles of construction to create pockets. Glue sides and bottom and affix to the page creating a pocket. Use a different color for each type of force. Students should label the pocket and place each picture into a pocket.

After the students have completed the task discuss each picture and why it demonstrates the force.

5E Learning Cycle Activity for Introduction to Thermodynamics by Heather Disney

ENGAGE: I do the following demo by Kevin D. McMahon: http://www.csun.edu/~kdm78513/coursework/695/discrepant%20event/endothermicrx.html

Materials: block of wood, 250 mL beaker, ammonium thiocyanate (s), barium hydroxide hydrate(s), water in squirt bottle, stir rod, scoopula, pH paper

Procedure:

"• Add about a teaspoon or two of water to the top of the block of wood. Set the 250 mL beaker in the water.

• Add a teaspoon of each reagent to the beaker and stir for about twenty or thirty seconds until a slurry begins to form.

• While continuing to stir ask the students above what they observe. They will likely mention that a liquid was formed (with some disappointment because they were hoping that it would explode).

• At this point you can mention that this is evidence of a chemical reaction. You can then mention that something else might be happening. While allowing the beaker to stand in the water (which is now beginning to freeze the beaker to the wood—although the student won't be able to see this happening) tear off a piece of pH paper and dampen it with water. Hand it to a student. Then return to the beaker and gentle check to see if it has frozen to the wood. Don't allow student to know what you're doing!

• Lift the wood beaker combination by the wood while gently supporting the beaker. The student will not know that the beaker is frozen to the wood. Bring it over to the student with the pH paper and ask them to place the paper over the mouth of the beaker. It will turn dark blue.

• Students may be surprised about the change in color of the pH paper. You can discuss that in a minute. Ask a student to hold on to the beaker. They will likely say something about how cold it is.

Ask them to hold onto the beaker firmly then let go of the wood base. The class will be surprised when the base sticks to the bottom of the beaker."

EXPLORE: Students do a coffee cup calorimetry lab combining various liquids and solids, based loosely on the following source by Erin Bjornsson:
http://www.education.com/science-fair/article/chemical-reations-absorb-release-energy/

Materials: Styrofoam cups, thermometers, cardboard lids with small holes in center.

Possible liquids: water, vinegar, hydrogen peroxide, acetone (in hood), hydrochloric acid?

Possible solids: Epsom salt, baking soda, steel wool, dry yeast, ice, Styrofoam piece, NaOH pellets?

Procedure:

- Students can combine any solids with liquids to see which reactions are endothermic or exothermic.
- Students need to determine what solutions are safe to pour down sink.
- Students need to determine how much of each liquid and solid to use, how much time to wait for reaction to occur, how to determine exothermic/endothermic, what other measurements should be recorded, variables (independent, dependent, and confounding), and how to accurately compile results.

EXPLAIN: I teach students about enthalpy and stoichiometry; then they do a practice sheet using ΔH and stoichiometry to find heat transferred in reactions.

EXTEND: Relate to calories: This leads to a new investigation…

Class makes bomb calorimeters to determine if almonds, peanuts, or cashews contain the most energy. → http://www.education.com/science-fair/article/how-much-potential-energy-do-different/ by Erin Bjornsson

Or

Class makes bomb calorimeters to determine the number of calories of a small mass of food. → http://www.ehow.com/how_4893595_make-simple-calorimeter.html by Adam Cloe

EVALUATE: Can quiz on the enthalpy and stoichiometry. Use a rubric to evaluate calorie lab and presentation

Teacher Award Opportunities

For information on awards, visit nsta.org

NSTA Awards

Award	Who can apply	Brief description
Robert H. Carleton Award–Dow	NSTA member	$5000/citation/all expense paid trip
Ciba Middle/HS Teaching Awards	middle/high school science teachers	$2000 prize/$500 expenses
Ciba Middle/HS Principal Awards	middle/high school principals	$2000 prize/$500 expenses
DCAT Making a Difference Award	grades 6-12 science teachers	$2500 prize to school/flight & 2 nights-principal and teacher
Delta Ed/Frey-Neo/CPO Science Award	preK-12 science teachers	$1500 prize/$500 expenses
Distinguished Informal Science Award	NSTA member	citation/3 nights hotel/$500
Distinguished Service to Science Education Award	NSTA member	citation/3 nights hotel/$500
Distinguished Teaching Award	NSTA member	citation/3 nights hotel/$500
Faraday Science Communicator Award	not a science teacher/ but an individual or organization which promotes science	$2500 expenses
Fellow Award	NSTA member	citation & pin
Legacy Award	NSTA member	$500 expenses-family member/ 2 nights lodging
Maitland P. Simmons-Memorial Award for New Teachers	NSTA member	$1000 expenses/certificate
Wendell G. Mohling Outstanding Aerospace Educator Award	K–12 science teachers	$3000 prize/$2000 expenses
SeaWorld/Busch Gardens Environmental Educator of the Year	K-12 science teachers	$5000/all expense paid trip Deadline: November 28
Shell Oil Company	K-12 science teachers	$10,000 prize/all expense paid trip/ finalists all expense paid trip
Sylvia Shugrue Award	elementary science teachers	$1000 prize/$500 expenses/citation
Vernier Technology Awards	K-12 science teachers	$1000 prize/$1000 products/$1000 expenses
Zula International Awards	preK–2 science teachers with memberships in either NSTA, CESI, NAEYP, or NHSA	$400 prize/$1000 expenses

All award deadlines are November 30, except for Shell Oil Company which is October 15 and SeaWorld/Busch Gardens which is November 28.

Nomination for MSTA Recognition Awards

If you know of a science teacher, university person, administrator or organization in Montana who deserves recognition for contributing to science education in Montana and beyond, please consider nominating them for an MSTA Award in one of the following areas:

Elementary	Earth Science	Chemistry
University member	Middle School Science	Biology
Distinguished Service	Physics	Administrator
Organization or Group		

Criteria for selection is based in part, but not limited to, the following: longevity or service, contribution to topic area, participation in MSTA and/or NSTA, presentation of workshops, improvement of fellow teachers and community service.

Nomination Form

Name_____ Award Area_____

Address_____

Current Position _____

Name and address of the person making the nomination:

_____

Email address: _____

Attach a 500 word or less statement of why you are making the nomination. This statement may include the nominee's resume, educational background, teaching positions, awards and honors, leadership positions and professional activities.
Nominations may be emailed.

Send to

Beth Thomas
601 Carol DriveGreat Falls, MT 59405
beth_thomas@gfps.k12.mt.us

Mark Your Calendars

March 20-21 MEEA Conference, Butte
www.montanaeea.org

March 28-29: Science Expo, MSU-Billings
http://www.billingsclinic.com/scienceexpo

April 3-6 NSTA National Conference, Boston, MA

April 17-20: NCTM National Conference, Denver, CO

April 30: Final day to submit application to present at 2014 MSTA Conference (MEA-MFT)
http://mea-mft.org/educators_conference.aspx

MSTA Officers

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