Standards-Based Grading in a Physics First Classroom

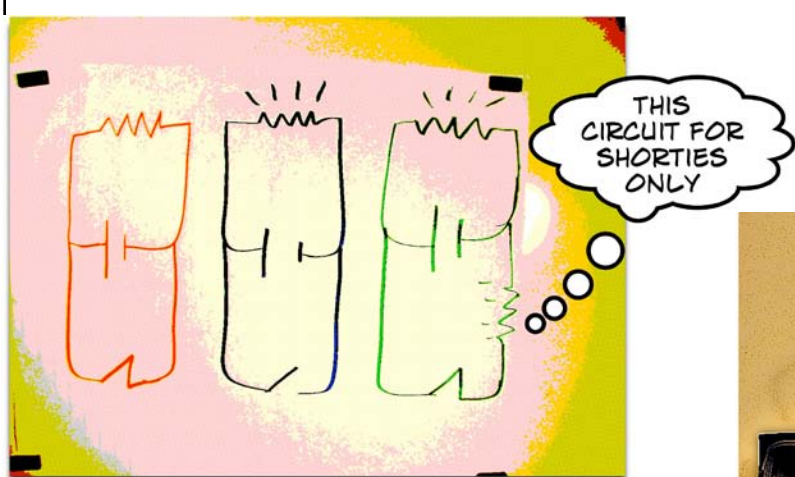
Katie Schottmueller, Ferguson-Florissant

Five years ago I attended a professional development workshop entitled "How to Grade for Learning and Using Standards for Reporting" with another 9th grade physics teacher from my school. Over two days, the presenter discussed the benefits of using a grading system for which a student's grade is a direct reflection of what they know, not how long it took them to learn and not how much "work" they turned in. We were convinced that using this system of grading that focused on learning was the right thing to do for our students.

It was a bit scary, going away from the traditional way of grading to something with which we had no experience. After some discussion, we decided to jump in with both feet and fully implement standards-based grading during the following school year. We figured that if it was a complete disaster, we could always go back. The first year was not the easiest and certainly not the most efficient, but we learned from our mistakes, made improvements, and things have gotten better every year. First year efficiency issues aside, we quickly discovered that the standards-based grading system was a huge asset to our classrooms.

Taking the plunge into a standards-based grading system is the best thing I've done in my classroom; it continuously makes me a better teacher and my students better learners. I am always aware of exactly what each of my students knows and does not know which allows me to cater my instruction to their needs to support their growth as learners. My students are also always aware of what they know and do not know which allows them to focus on gaining and retaining understanding; this keeps their focus on learning and improving rather than on "getting points."

To implement the Physics First curriculum into my standards-based grading classroom I simply used the Physics First labs, lessons, and activities to teach the standards. I assess frequently, so I wrote additional test questions to accommodate frequent assessment. I also needed to write some additional practice problems and activities to support my students when they were in need of extra practice. Overall, using standards-based grading with the Physics First curriculum allows my students to focus on gaining and retaining the content presented in the curriculum. This has allowed them to not only gain a deep understanding the physics content presented, but also to gain skills as learners that they can carry into their future endeavors.



Bridge Building Contests - Are They Right for your Students?

Ryan Carlton, Springfield Public Schools

That's the question that I set out to answer while looking for ways to spark interest in science, and garner support and involvement from parents at home. I had offered this challenge (for the first time) to selected students the previous year, just to "test the waters" and get a feel for how this competition works. With newly-acquired confidence, I began my all-out effort to create interest, convince students that they could succeed, develop support resources for students, provide construction kits, offer after school help sessions, and above all else WIN (with students: creating, researching, investigating, thinking, and enlisting family help).

My campaign didn't necessarily take place in the order that you might expect. My first goal was to create support resources for the students Having these resources in place would later help make the sale. While brainstorming what students would need to be successful, I remembered what I heard over and over from the previous year, and that was "I just don't know where to start Mr. Carlton…" It was then that I first realized that I was going to have to make a video. It would need to be an instructional video that could walk students through the various stages of: research, design and construction. It would need to be short (10 min) but have enough detail to answer most questions that students could have. The video needed to show researching, designing and constructing a bridge of my own. After getting some spare material from the local MSPE representative (in exchange for them getting a look at the finished video), I set up my laptop webcam, and began capturing time lapse videos showing the various stages of this undertaking. To view this instructional video, visit http://www.youtube.com/watch?v=KV1_UT02sQU.

As the signup date drew closer, it was time to begin the sales campaign. "Who likes to break stuff? Who likes cash? Who likes extra credit? Then you might be a good candidate for the 24th annual MSPE bridge building competition. After receiving your 18 sticks of 3/32" basswood, you will have 5 weeks to research, design, construct and ultimately compete against hundreds of students from area high schools at this regional event hosted in Missouri State University's JQH student center on April 3rd. Check-in starts at 5:00pm. Let me recap: Extra credit, break stuff, CASH. That's right, the top three finishers receive cash prizes of as much as $125 for 1st place, but each of you can get extra credit for the course. Each one of you already has an advantage over students from other schools, and that is that you have available to you: video/web resources, after school help, sketch templates, and you also have me. That's right, I've learned all of the tips and tricks that you'd need to know. In fact, I created a bridge last year that would have taken 1st place for the last 23 years. Someone's going to win the money, and I'm pretty sure it's going to be one of you. Sit back and watch this movie to give you a better idea of what's involved… Here's the signup sheet."

About 50 students signed up… WOW. And just when I thought the hard work was over, I then realized that it was just beginning. One of the best ways I could think of to help students was to provide the same construction tools that I used in the video: a sanding block, baby paint brush, glue, foam board, straight pins, drawing sheet, baby binder clips, and laminate to protect the drawing from glue. I bought (with district science money) enough material to make 62 kits, and distributed them with the wood materials. The students purchased their own X-Acto blade for use at home. I was able to purchase these materials at a cost of about $1.60 per kit, and can reuse them year after year.

The material has been in their hands for several weeks now, but I'm concerned about their progress. The competition is April 3rd, and I'm now fearful that the pressures of getting a bridge completed will be too overwhelming for some students. The feedback I've received leaves me expecting only 50% to finish in time to enter the competition. So, will this be the way the competition goes year after year? Do I plan on only ½ of the participants finishing in time? Well, time will tell, and I'm hopeful and optimistic that I will have a large completion rate, and that Central High school dominates the top spots at this year's annual MSPE Bridge Building Competition. Stay tuned to find out if bridge competitions were right for my students.

The Results - My Students' Bridge Building

Ryan Carlton, Springfield Public Schools

I'm pleased to announce that each of the bridges we brought to the competition did in fact break. The Missouri Society of Professional Engineers that hosted the Ozark Chapter's 24th annual bridge building competition for 18 local high schools were efficient, objective and well organized. They broke 317 bridges between 5:00 pm and 7:30 pm without even getting a splinter. My hat's off to this crew, and hope they continue to provide this community service for another 24 years.

My students' efforts were not all as professional as our hosts. Even though I asked students to submit their bridges during the week prior to the competition, I was still getting bridges during the day of the competition, and the glue was still drying for some bridges during the car ride. This added stress (for everyone), and caused me to be disorganized enough to leave four bridges behind in the classroom (oops). In the two days leading up to the competition, I had students hunting me down in all corners of the building to ask for advice, ask for tools, to work in my classroom, and to get a reminder of how many hours were left until they "actually / really / for sure" needed to be done. But, I was most surprised at how many students approached me to explain why they weren't going to be able to finish their bridges. "My dog ate my bridge." "My sister turned my wood into a stick doll." "Someone sat on my bridge." "I haven't had time (besides the last 5 weeks)." And even when I threatened to harge students the costs of the $5 entry fee, they pulled cash out of their pockets to try and buy their way out of the responsibility. So, how many **bridge eating**, **doll making**, **careless sitting**, **time gobbling sister-dogs** could be out there? Well, the statistics might give us a better idea. Only 22 of the 48 (~ 45%) of Physics First students that signed up and committed to building a bridge outside of class actually completed and submitted an eligible bridge by April 3rd at 3:45 pm in time for the competition. I knew it was going to be about half of the students from the feedback I was getting but these numbers are still disappointing.

So, was this competition worth it? Yes. Despite having a poor completion rate, this competition still served its purpose. I had students researching, designing, building and collaborating with family members, whether they finished on time or not. The ultimate goal of this particular action plan adoption was reached when Physics First topics were household conversations, family efforts, or even just raising parents' awareness of their student's challenges. Now that the competition is completed, I also put together a "sales" pitch in the form of a video inviting next year's incoming freshmen to get involved. To view this video, visit http://www.youtube.com/watch?v=clHqbMBdn_E&feature=youtube

In the first entry about my bridge competition undertaking pn the previous page, I said that one of my goals was to create support resources for students. These resources were videos, tools, and more that could give them guidance, or help them stay organized. The success of my students this year is easily shown by running some statistical analysis of the provided results. Of the 22 Physics First students, two were disqualified based on dimensions, loading problems or weight violations. Of the remaining 20 bridges, the average Physics First efficieincy score was 586. This is only slightly higher than the toal competition average of 551. Our highest scoring freshmen had an efficiency score of 1710.4 - meaning their bridge held 1710.4 times its own wight, giving them 4th place out of 293 eligible participants Overall, students that were registered with me and using my resources ranked me 7th out of 23 teachers. If I consider this to be a baseline year, there is plenty of room for improvement for next year.

With a little bit of investment and effort, you might soon find your students taking on a similar challenge. If you add some resources and support each year, then soon you'll have a well-developed program. A bridge competition may be right for your students and your school. But, you'll never know unless you try.

Literacy in the Physics First curriculum

Angie Parkes, Southern Boone County

Literacy has been a major focus within education recently with the adoption of the Common Core. At Southern Boone, we collaborate on what we are teaching and often have issues with the reading pages in terms of content and language. When I attended the Powerful Learning Conference hosted by Missouri DESE, I learned some strategies to aid in breaking down the reading pages for students. Basically, anything that you want students to do with the reading, you need to model for them before you assign the reading page or go over it with them.

Our department has agreed to use some of the strategies from the conference. I especially liked the annotation portion. With freshmen, I believe you really have to show them what you want and how to do it. However, the payoff is amazing. They seem to retain the information much better than just assigning it. Here is an example. Prior to the conference, I would assign the reading page to be read silently in entirety. Students were instructed to highlight portions of the page that they felt were important. We would have a class discussion afterward. I don't think that generated any lasting retention.

So, my colleague Matt Boldt decided to divide the text into sections. Each section is then assigned to a group. Each person in the group identifies three important facts for each section. Then the groups decide on the best facts from their groups and whiteboard them to share. I have tried this kind of annotation with my students. One method is to read aloud a section to them. Then together we identify the important parts of that section. We underline, highlight and annotate by making connections with the text that are relevant to the group. Students show high levels of engagement during this process and have better reading retention, but usually need a couple of rounds of modeling the annotation to get it to be of usable and memorable substance.

There are many types of templates for use with literacy that are available. Some include vocabulary diagrams, self-assessment on the knowledge of terms, questions pertaining to a specific type of literature like a science article, and a pre-reading concept quiz. All of these help students to get more out of their reading. I personally prefer the annotation because students have to interact with the text. The thing to remember that we have learned from the Physics First experience is that modeling is the best way to teach students how to get information from their reading pages.

Summer Boost for 8th Graders

Jimalee James, Principal, Willow Springs High School

Willow Springs R-IV School District has been using a summer program to help students get a leg up. Some 8th grade students who have been identified as academically at-risk by their eighth grade teachers receive an invitation to participate in a transition course offered each year during the 18-day summer school session.

In the summer course, freshmen teachers introduce incoming 9th grade students to Algebra, Language Arts I, World History and Physics First. During the time dedicated to Physics First, instructor Kevin Hummel provides a glimpse into the concepts students will study in the fall including practice with variables, converting units (miles per hour to kilometers per minute or yards to meters), and a few labs, including the favorite, Broom Ball, a lab that applies Newton's Laws using a broom to navigate balls of different weights through a course taped on the floor.

Upon completion of the course, each student earns one elective high school credit. We find that this "summer boost" helps build confidence and prepares students for a new building and schedules, and especially for the new content.

Brain Benders

Dorina Kosztin,
University of Missouri

The Floating Hourglass

An hourglass floats at the top of a closed cylinder that is completely filled with a clear liquid. The cylinder's inside diameter is just large enough to allow the hour glass to move unhindered up and down the tube. When the device is turned over, the hour glass remains at the bottom until about half the sand has fallen into the bottom compartment. The hour glass will then slowly rise to the top. What is the paradox? What is the physics behind what happens?

Tire Pressure

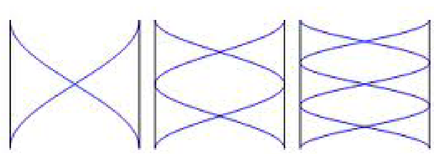
The pressurized air inside an automobile tire supports the weight of the car, right? To check this idea, you first measure the tire pressure when the tire supports its share of the weight. Then you jack up the car until the tire no longer touches the road. You measure the air pressure again. Will there be any difference between the two measurements?

Which One is the Magnet?

You are given two identical-looking steel rods. One is a permanent magnet and the other is unmagnetized. Without using any other equipment, how can you tell which is which?

Sound in a Tube

How does a sound wave traveling down a tube get reflected from its open end, from nothing?



Physics First Provides NGSS Input

The A TIME for Physics First project met on January 19 and 26, 2013 to provide reviews of the final public draft of NGSS. Twentynine Fellows, Coaches, Mentors and Instructors participated in the process, meeting at multiple sites - in Columbia, St. Louis, Springfield on Jan 19 and in Marceline on Jan 26.

Following the methodology suggested in Willard's Science Teacher article, each location organized themselves into subgroups of 2-4 participants. Each subgroup examined one or two of the four high school physical science (HS-PS) content areas and the K-12 progression for that area. They used Achieve.org's survey to provide feedback. All surveys were submitted to the project, collapsed into one document, and submitted as a group's response.

The responses were quite detailed. The highlights are summarized below.

- For the students who are taking a yearlong physics course in 9th grade, (in the state of Missouri, those 7000+ students represent 35% of all physics high school students), the lack of a 4th track in Appendix J that places physics in 9th grade, chemistry in 10th and biology in 11th is disturbing.
- As it is, the physics content in the HS-PS Performance Expectations (PEs) is not coherent in its connections with middle school PEs, and furthermore, omits certain fundamental understanding (motion and electrical circuits, in particular) that are needed to address the HS-PS PEs.
- We urge the modification of the PEs to include these topics, and for the inclusion of the 4th track in the final version of Appendix J.
- Testing percentages attached to each PE could help teachers with time management
- Lots of foundation seems to be lacking to be able to adequately address the PE
- Basic concepts of electricity/magnetism and voltage are absent from the whole framework
- Overall, we feel Energy was more coherent than the other Physical Science Standards
- Many of the basic principles have been ignored in lieu of the high-level applications of the basic principles

As this issue of the newsletter goes to press, the final version of NGSS has just come out. We plan to have Physics First subgroups examine this version and work on aligning our curriculum to it during upcoming follow-up sessions and during this summer.

Solutions to December 2012 Brain Benders

The Cold Drink

At a bar, there is a bucket containing ice, some of which has melted. A bartender gets an ice cube weighing 20 grams from the ice bucket and puts it into an insulated cup containing 100 grams of water at 20 degrees Celsius. Will the ice cubes melt completely? What will be the final temperature of the water in the cup?

Solution:

The ice in the bucket is at 0 degrees Celsius. How do we know this? The Celsius temperature scale is defined to be 0°C when ice is in thermal equilibrium with water, and 100°C when water is in equilibrium with steam. An ice bucket does not provide extra cooling, it just maintains the object's temperature.

The specific heat (S_h) of a substance is the amount of heat required to change the temperature of 1 gram of the substance by one degree Celsius. By definition, the specific heat of water is 1.0, and this amount of heat is called a calorie. A kilocalorie is 1000 calories, also called a "Calorie" with upper case.

Latent heat is the heat required to change the state of a substance from solid to liquid, or from liquid to gas. Water is in thermal equilibrium with ice when it freezes at the same rate that the ice melts. The heat for melting or freezing water, also called the heat of fusion (H_f), is 80 calories per gram at 0°C, which is the equilibrium temperature. In other words, it is necessary to add 80 calories of energy to melt one gram of ice at 0°C into 1 gram of water at 0°C. Conversely, it is necessary to remove 80 calories of energy to freeze one gram of water at 0°C. The heat for boiling or condensing water at 100°C, called the Heat of Vaporization, is 539 calories per gram, although this is not relevant to our problem. The following graph summarizes the effect of energy on the temperature of water in its solid, liquid, and gaseous phases.

The problem can be solved by breaking it into smaller pieces. The amount of energy needed to melt the ice is Wi×Hf, where Wi is the weight of the ice. In addition, the 20 grams of water obtained from the ice must be heated from 0°C, which is the temperature of the ice, to the final temperature Tf.

Where does the energy for melting the ice come from? Since the cup is insulated, the heat has to come from the 100 grams of water at 20°C. The amount of heat required to melt the ice and to increase the temperature of the resulting water to the final temperature is equal to the heat lost by the 100 grams of water. This can be expressed by an equation:

$W_i \times H_f + W_i \times S_h \times (T_f - 0°C) = W_w \times S_h \times (T_{wi} - T_f)$

where

W_i = weight of ice = 20g

H_f = Heat of fusion = 80 calories/gram

W_w = weight of water = 100g

T_f = final temperature,

T_{wi} = initial water temperature = 20°C

S_h = Specific Heat for water = 1.0 calories per gram per °C

Substituting the values we get:

$20 \times 80 + 20 \times 1 \times (T_f - 0°C) = 100 \times 1 \times (20°C - T_f)$

$1600 + 20T_f = 2000 - 100Tf$

$120T_f = 400$

$T_f = 400/120 = 3.3°C$

The final temperature is 3.3°C. If we had had more ice or less water, there would not have been enough energy in the water to melt all the ice. Once the temperature of the water reaches 0°C, no more ice can melt.

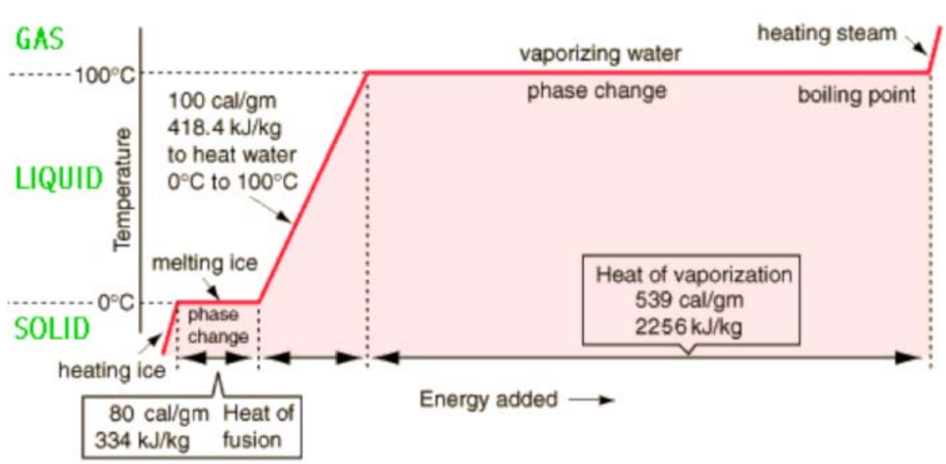
How much ice could be melted by 100 g of water at 20°C? Using the equation above, where the final temperature is 0°C and the weight of the ice is unknown, we have:

$W_i \times 80 = 100 \times 1 \times 20$

The maximum amount of ice that could be melted is:

$W_i = 2000/80 = 25$ grams

If the amount of ice exceeds 25 grams, the remainder will just float in 125 grams of water at 0°C.

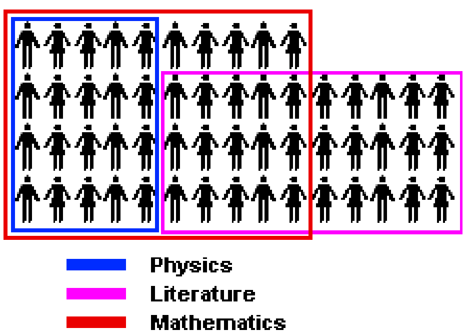


The Mathematics Class

All students in the physics class also study mathematics. Half of those who study literature also study math. Half of the students in the math class study physics. Thirty students study literature and twenty study physics. Nobody who studies literature studies physics. How many students in the math class study neither physics nor literature?

Solution:

If 20 physics students all take math, and half of the math students study physics, there must be 40 students in the math class. If half of the 30 literature students take math, then 15 of them take math. Since none of the literature students study physics, only five students in the math class study neither physics nor literature.



The Aquarius Problem

You need exactly 4 liters of water, but you only have a 3-liter bottle and a 5-liter bottle. How do you do it?

Solution:

Fill the 3-liter bottle and pour it into the empty 5-liter bottle.

Fill the 3-liter bottle again, and pour enough to fill 5-liter bottle. This leaves exactly 1 liter in the 3-liter bottle.

Empty the 5-liter bottle; pour the remaining 1 liter from the 3-liter bottle into the 5-liter bottle.

Fill the 3-liter bottle and pour it into the 5-liter bottle. The 5-liter bottle now has exactly 4 liters.

Here is another way to do it

Fill the 5-liter bottle and pour the water into the 3-liter bottle until it is full. This leaves 2 liters in the 5-liter bottle.

Empty the 3-liter bottle and pour the 2 liters of water from the 5-liter bottle into the 3-liter bottle.

Fill the 5-liter bottle again.

Fill the 3-liter bottle from the 5-liter bottle. Since the 3-liter bottle had 2 liters of water, only one liter is transferred leaving exactly 4 liters of water in the 5-liter jug.

NGSS - What it Means To Me

Doug Steinhoff, Peer Teacher

Like a lot of you, when I started teaching it was a hodge-podge of different things; plate tectonics, weather, ocean currents, atoms, renewable and non-renewable energy, and the list goes on. What made matters worse was the fact that other schools in the state were teaching completely different topics than what I had been instructed to do.

Soon came the MMAT Test. This test was to get the district and possibly the state to some level of uniformity, although the only uniformity was how everyone was so upset at what was happening. I remember venting one time to an "ol' timer" who told me not to get too upset. She mentioned that everything comes and goes, be patient and all bad things will pass. Sure enough it did, along with the MAP test, the NCLB act and I'm sure that even NGSS will suffer some setbacks in the future.

The question is this… over the years, have we learned anything? Let's think of our class time. Do you feel like I do at the end of the day? Isn't your last hour the best hour because you've had so many chances to practice your lesson? My first hour students are my guinea pigs. Sure, I feel sorry for most of them, and yes, maybe their test scores are a bit lower than the rest but come on, we all have to start somewhere. Even the Apollo rockets didn't work perfectly and they had the best engineering team in the nation. Even after 12 tries, they still had major problems.

I guess what I'm saying is that although I don't like having tight restrictions on what I can do in my class, I also really like that my fellow teachers can offer me some fantastic lessons/activities that help me be a better teacher. Using the ideas of so many other great teachers makes my class a better, more efficient environment.

So the key to my success is based on those whom I surround myself with. Sure, some might call it stealing, but what are they going to do, put me in teacher detention?

So what does this have to do with the Next Generation Science Standards, you ask? If we can pull together to develop a program like Physics First and show each other that we can help each other build on our successes and avoid future failures, then why wouldn't we get it passed on to the rest of the world? With NGSS we will soon have a network of people that consists of thousands of physics teachers with whom we can look to for support. Does it mean change? Yes. Do you like change? Probably as much as a photo day at school, right? But think of the big picture. You have a BIG leg up on the rest of the group. Now take it and run with it! But go slow, you're not going to change the world overnight.

May the Force Be With Your Bridge

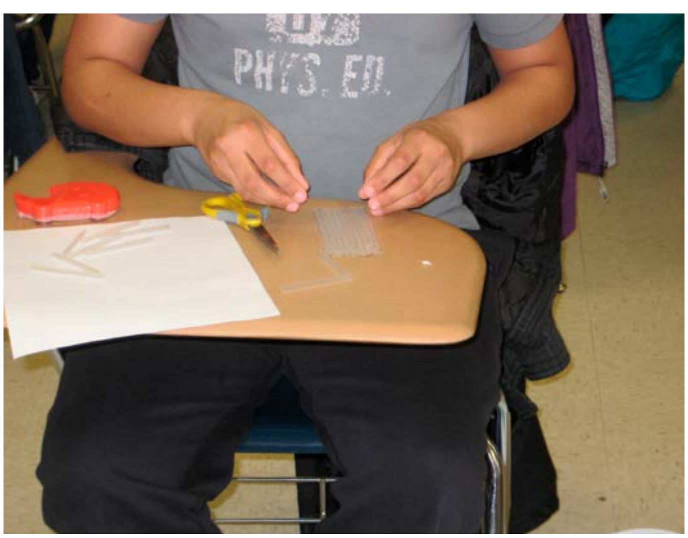
Christina Brands, Portageville High School

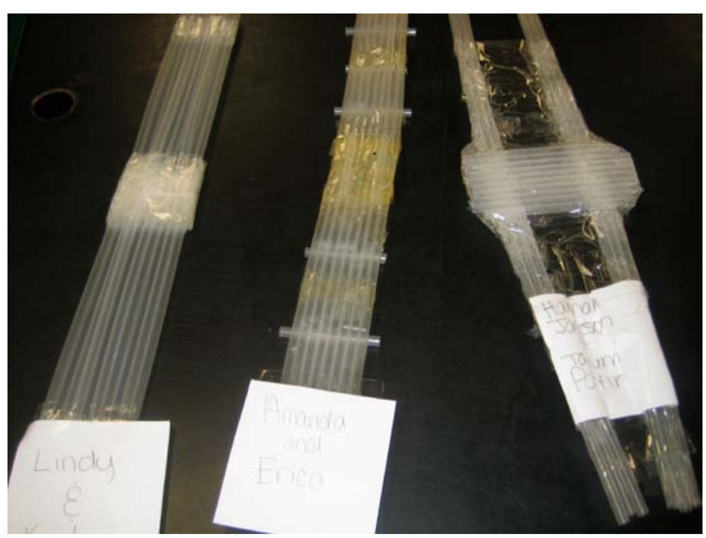
During a reflection meeting with the wonderful John Willenberg, I mentioned that I wished I had a bridge building project for Physics First. Of course, John had an activity called "Straw Bridges" that he emailed to me that day. I love doing problem-solving, project-based learning with my students, especially now with the emphasis on problem-solving and engineering concepts in the NGSS. I decided to insert this activity in the Forces unit. I did this project after my students learned about forces and force diagrams and before starting Newton's Three Laws of Motion.

Working in pairs, students used twenty plastic drinking straws (not the bendable type), scotch tape (lots), scissors, and a ruler to construct a bridge of their own design. The bridge had to be at least 25 centimeters in length to span the "river" and could not touch the "river." The design objective was to make a bridge that supports the most weight. We tested the bridges by placing a small plastic cup on the assembled bridge set up to span two desks (25 centimeters apart). The cup was filled with pennies until the bridge failed (the cup fell off) or broke.

I had 36 pairs of students complete this task. They were given a 53-minute class period plus 10 minutes of the next class period to build their bridges. We tested the bridges during the second class. My second hour winner held 295 pennies; my fourth hour winner held 170 pennies; my seventh hour winner held 200 pennies. My students were given a grade for completing their bridges by the deadline within the design constraints. The winners received a prize to encourage them to do their best. Students also had to draw a correctly labeled force diagram for their bridges. And, best of all, students loved this activity; they have asked to do it again already!!

The original reason I wanted a bridge building project for my Physics First students is because I do a similar project with my senior Dual Credit Physics class. The discussions we have about force when they are building their bridges are much more valuable than any lecture I could ever give. Each year, the Southeast Missouri Department of Transportation holds a Bridge Building Competition. MoDOT provides 15 pieces of 1/8 square inch balsa wood, a bottle of wood glue, and string. Students must construct a bridge that is 16-20 inches long and 2-9 inches wide. The bridges are judged based on structural efficiency (load held/weight of bridge). The bridge is tested when placed on a platform. A plastic car is placed on the bridge, while a bucket attached to the car hangs below the bridge. The bucket is filled with water until the bridge breaks or fails (deflection of one inch under loading location). I had a student place 25 out of 253 this year and have had two bridges hold 123 and 125 pounds. For more information on this competition, you can visit http://www.modot.org/southeast/talkin_transportation/BridgeCompetition.htm.





Summary Academy 2013
June 3-14

Welcome to the final summer academy of this project!

The Year 3 summer academy for Cohort 2 Physics First Fellows will be held June 3-14. Two tracks will be available – the Advanced Physics track, which will run the full two weeks, and a flexible track where Fellows can choose among a few different topics, each of which will run 2-4 days.

Flexible track options include creating technology (video, animations, PowerPoint) that enriches the PF curriculum, differentiation in PF units, assessments, modifications for SPED, alignment with NGSS, and other topics as suggested by Fellows.

Fellows who take the Advanced Physics class will also research and create presentations on topics related to the history of physics. Flexible topics groups will present their work at the end of the academy as well.

Fellows who choose to live on campus will be housed in the College Avenue dormitories. Classes will be conducted from 8:30-4:30 daily. The Laws Observatory will be open on select days for your sky-viewing pleasure.

We are all looking forward to having you here!

Fast Facts:

Grant period: September 1, 2009 - August 31, 2014

Funding Agency: National Science Foundation
Target Participants: Ninth grade science teachers in Missouri school districts

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Conference Presentations

NSTA Regional Conference, Dec 6-8, 2012

- Online Mentoring‹Successes and Challenges, Joan Twillman, Lisa Grotewiel, Sara S. Torres, Meera Chandrasekhar, Ya-Wen Cheng

NSF MSP Learning Network Conference, Feb. 11-12, 2013, Washington DC:

- Mentoring and Supporting Physics First (poster), Presented by Meera Chandrasekhar, Deborah Hanuscin, Sara Torres, Sarah Hill, Christi Bergin
- Using a reflective tool for online mentoring, Sara Torres, Sarah Hill, Ya-Wen Cheng, Meera Chandrasekhar
- Examining Fidelity of Implementation of a Year-Long Curriculum in 9th Grade Physics, Deborah Hanuscin, Christi Bergin

National Association for Research on Science Teaching, San Juan, Puerto Rico, April 2013

- Examining Fidelity Through Two Lenses: Teachers' Implementation of a Yearlong Curriculum in 9th Grade Physics, Hanuscin, D., Rebello, C., Sinha, S., Cheng, Y., Muslu, N., Foulk, J., & Chandrasekhar, M.
- Teacher Leadership Pathways as Seen Through Blogs, Sinha, S., Kuby, C., & Hanuscin, D.

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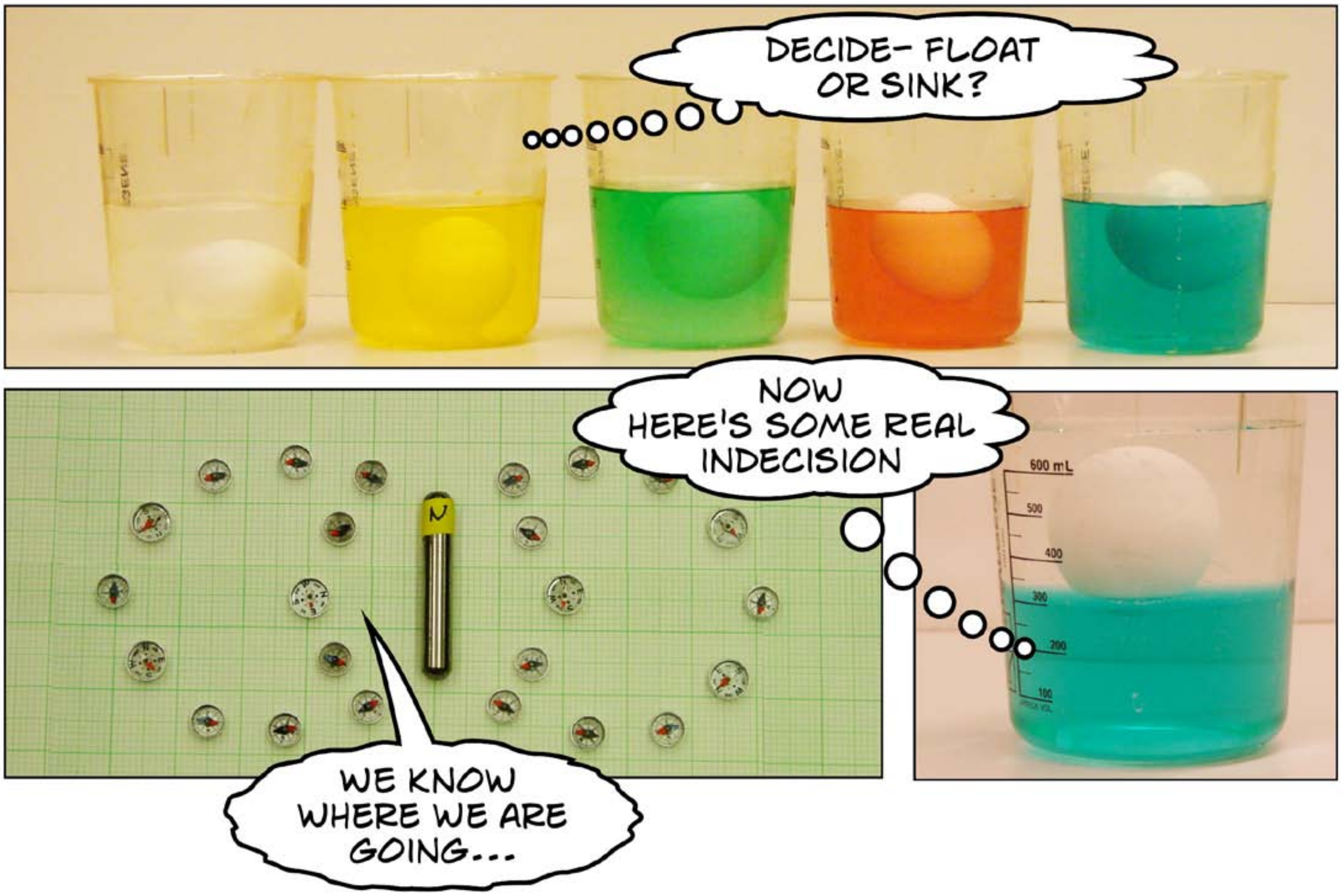

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