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Introduction

The teachers of the 2012 Advanced Methods for Teaching Secondary Education (Science Group) class includes an industrious and enthusiastic group of educators. The association that I have been privileged to have had with them this semester has been most enjoyable. My hope is that they will continue to work as science educators and have a positive influence on the students that they teach.

This year's class includes Mary Kate Diltz (Biology I and Introduction to Biology: Meridian High School), Molly Heit (Biology I: North Panola High School), Jeremy Jewitt (Chemistry, Human Anatomy and Physiology and Physical Science: Coldwater High School), Kent Melchiors (8th Grade General Science: Oakhurst Middle School in Clarksdale), and Elizabeth Robertson (Introduction to Biology, Botany, and Environmental Studies: Okolona High School).

I admire each of these young teachers for making the decision to become science educators and for making the education of their students in the natural sciences a priority in their lives.

Johnny L. Mattox, Ph. D.

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Why did the Shipwrecked Sailor Die from Drinking Salt Water?

Mary Kate Diltz

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Abstract

Lab-based instruction is a reward in my biology classes. If the class can behave and act maturely then I will allow them the opportunity to work with each other on their own. If they cannot act properly I will just show them in a demonstration. Experiments and hands on learning excite the students and push them to do more than just memorize their notes. They must apply their learning to different situations in the lab. I have found various experiments that are inexpensive and safe for the students to complete. This article describes one experiment to study osmosis. The experiment requires a triple beam balance, a ruler, petri dishes, potatoes, salt, sugar, water, and a knife. Students first predict why the sailor who drank salt water died two days later. Once they have come up with an answer they write it down and they begin working on the experiment. I cut up the potatoes for my students so that the experiment would be easier. The students will put the potatoes in different solutions and measure the change in the mass and width of the potatoes after 24 hours. This experiment is ideal for high school because there are very few safety hazards and the cost is very minimal. The students will gain valuable practice with measurements and see first hand the process of osmosis.

Background

Osmosis is the spontaneous net movement of water across a semipermeable membrane from a region of low solute concentration to a region of high solute concentration. There are three types of osmotic solutions: hypotonic, hypertonic, and isotonic. The hypotonic solution is one in which less solute is held in the solution than in the cell. This will cause a net movement of water into the cell, causing it to swell. A hypertonic solution is one in which there is more solute inside of the cell than in the solution so the wa ter will move out of the cell. This will cause the cell to shrink. The last solution is isotonic. This is when the solute is equal in the solution and in the cell. There is no net movement of water and the cell shape stays the same.

Materials

The lab was set up the morning of to ensure the potatoes were fresh. Each station received a triple beam balance, a ruler, a cup of sugar, a cup of salt, and petri dishes. The groups retrieved their cut potatoes when the experiment began. All of these ingredients were purchased at the local grocery store and the rest of the materials were in the lab already.

Pre-Lab

My students performed this experiment after two days of lessons on passive transport. We began with diffusion and facilitated diffusion. After they showed that they had gained the knowledge, we moved on to osmosis.

On the day of the lab, I went over a keynote explaining the process of osmosis. The students were able to ask questions and learn about the differences between osmosis and diffusion. Before we started the lab, I shared a story with the students and asked them for their hypotheses. A shipwrecked sailor is stranded on a small desert

island with no fresh water to drink. She knows she could last without food for up to a month, but if she didn't have water to drink she would be dead within a week. Hoping to postpone the inevitable, her thirst drove her to drink the salty seawater. She was dead in two days. Why do you think drinking seawater killed the sailor faster than not drinking any water at all? Today we explore the cause of the sailor's death. We'll prepare solutions of salt water to represent the sea, and we'll cut up slices of potato to represent the sailor. Potatoes are made of cells, as is the sailor!

Lab Procedures

The lab procedures were as follows:

DAY 1

1. Obtain three potato slices.

2. Record the width and turgidity of the potato cylinders in your data table.

3. Put potatoes back in bag to prevent them from drying out.

4. Take 3 plastic dishes and label them with the solution that will be placed in each one--sugar, salt, distilled water.

5. Prepare a saturated solution of salt by mixing as much as you can with water.

6. Prepare a saturated solution of sugar by mixing as much as you can with water.

7. Fill each plastic dish 2/3 full of the correct solution.

8. Take the mass of each potato slice and record the data in your table.

9. Place one of your potato cylinders into each cup and cover the top.

10. Leave the potato slices in the solution for 24 hours.

DAY 1

Solution	Initial Width (cm)	Initial Mass (g)	Initial Turgidity (flaccid or crisp)
Distilled water			
Salt solution			
Sugar solution			

DAY 2

1. Carefully remove the potato slice from the distilled water solution and pat it dry.

2. Measure the width of the potato slice and record the width and appearance.

3. Measure and record the mass of the slice.

4. Repeat steps 1-3 for each potato slice in the salt and sugar solution.

5. Clean up your equipment area and return materials to their proper place.

Solution	Final Width (cm)	Final Mass (g)	Final Turgidity (flaccid or crisp)
Distilled water			
Salt solution			
Sugar solution			

Data Analysis

Some students had a problem labeling their petri dishes and keeping the solutions inside. They were asked to join a group who could distinguish the differences. They were able to calculate the mass and the width. From here they could determine

what type of osmotic solution each solution was. Finally, they were able to answer questions relating back to the experiment and transport.

Potential Problems

This experiment was fairly simple, but some problems did arise. First, students were unable to read the labels on the containers. Second, there was an issue keeping the solutions inside of the petri dish. Third, some of the students did not see the importance of keeping the potato from drying out. Some students failed to make their measurements in cm and make them accurately.

Conclusion

To fully understand the experiment that we did, the students needed to follow directions and do as they were told. Unfortunately, many of them had issues with this and in turn their experiments were unable to turn out good data. They were unable to make good conclusions and connections between what we learned in class and what they did. Although they may not have done everything exactly as I asked, they were still able to gain valuable time using the triple beam balance and practicing their measurements. Labs are a great way to reiterate what the student has learned in class and show them how science is all around us.

The Collection
Molly Heit

Going into my first full year of teaching at a rural school in Mississippi, I knew things were going to be tough, exhaustion was going to set in, and my emotional equilibrium would be thrown woefully out of balance for the next two or so years. I knew that there would be really good moments to go along with the bad, and although the good may seem few and far between in the beginning, over time it would start to even out. At least that is the impression given off by others who have been or are currently in the program.

Having gone through the initial summer school training and three full months of teaching in my position as a Biology 1 teacher, I am surprised to find that the problems and issues still currently seem to outweigh the positives. On some days, the really tough ones when I am running low on sleep and the students do not respond to consequences and test averages come back in the 40's, I wonder how I can make it through another year and a half of this. Deep down, I know I will not quit and I will finish teaching this year's sophomore class and next year's sophomore class. I know that the second year will most likely be easier. I know that I will be teaching fewer students next year, and more well behaved ones to boot, and I know that I will be reusing material instead of constantly creating it. But the double edge sword of having high standards and expecting us as new teachers to go above and beyond those standards to perform, is that stress and worry related to going above and beyond.

I work too much. Over any given regular school day, too many hours are spent on the classroom and too few are spent on keeping me happy, healthy, and sane. When I arrive in the morning, there may only be one or two others already in the building. Getting to school early does not bother me. I like to come in when the school is still quiet and dark as a way of resetting the classroom clock. I teach the same prep for six periods, as well as an enrichment period dedicated to Biology test preparation. I have my planning period during the last class of the day, and it is usually filled with putting the classroom back together, meetings, or preparing for after school tutoring held on Mondays and Wednesdays. By the time I get back to the house, there is still two or three hours to spend on planning for the next day and grading. Working on using in class downtime more effectively will help cut down on time grading papers outside of school. Using one day a weekend to map out and plan the upcoming week is another way to free up personal hours after school on weekdays. While I am advancing each week on increasing the quality of my work and decreasing the time spent on work, I still feel the need for much improvement.

I also stress too much. Taking a step back from my own improvement and turning the lens to look at student improvement so far this year, I find it hard to tell whether students are or are not on track for where they need to be by the end of the year. The pressure to have 50% of test takers score proficient or advanced on their Biology 1 state test has been applied since the beginning of the school year, and I find the amount of pressure increasing as the school year progresses. I am not worried about half of the class. There are many who are well on their way to scoring advanced, and many more who I

believe will score proficient. Then there are the students who are currently failing my class or who are always hovering over the border, and beyond whether or not they will pass my class and continue on to a science elective next year, I worry that they will not be as prepared as they need to be come state test time in May. I worry that I do not have what it takes to attain their attention and keep it for another six months. I worry that they will not pass this test, maybe even not graduate, and some of that blame will rest on me. Even when I am technically not working on anything, I think and worry and stress about past and future interactions with students.

I stress myself to come up with new and engaging ways to present the material so that it will stick with a variety of learners. We already do not use the text book, unless students need to look up a picture or diagram. They keep track of their own interactive science notebook inside of a composition notebook, and aside from the few who have misplaced it, most students keep all of their notes in the notebook and take it home with them every day. While I hope to greatly improve the effectiveness of the interactive science notebook for next year, I have found it to be very beneficial. Incorporating paper projects has also been a small success. We recently made ATP Money, where students practiced creating ATP and ADP molecules out of paper and string on a printout of a dollar. Earlier in the year, students illustrated bonding inside and between water molecules using Mickey Mouse Water Molecule cutouts and string. While my classroom has very limited space due to the number of desks covering the coveted floor space, we have been successful in completing a cheek cells DNA extraction lab and cabbage juice indicator lab with time constraints and very limited resources. My hope is that peppering the lectures enough with songs, projects, and labs throughout the year will be enough to keep the class engaging and informative.

I know that things will get better. I know that I, as an educator, will get better. I know that my students will learn more biology, and they will work. I know that my life will find a new equilibrium because I know that I will not survive long being this out of balance. I do not know how much I have to give, but I am constantly feeling like I am giving my all. And sometimes it does feel more like that all is being taken, rather than being given. When I feel stretched to the limit, somehow I find a little bit more to give tucked away in a long-forgotten corner. I dust it off and present it to this new world in which I find myself, only to go back into the Labyrinth searching for another hidden twist and turn. Sometimes, when I am lucky, those little amounts of all are traded, not taken, for a smile, a pleasant exchange, a lightbulb flickering on in a student's mind, a brand new story to add to the collection.

Student Perspectives On Science and Their Science Educator

Jeremy Jewitt

Coldwater Attendance Center - Coldwater, MS

Italian astronomer, physicist, and philosopher Galileo Galilei once said, "You cannot teach a man anything, you can only help him find it within himself."[1] As a lifelong student, I can attest to Galileo's claims: my most rewarding intellectual experiences didn't come from simply listening to a lecture or following the directions of a handout. They came from within, when curiosity overwhelmed personal complacency for what I'd learned thus far. Where Galileo's quote can be perceived as inadequate is in terms of practicality. Being an inspiring force for students is noble and should always be your goal as an educator. However, the reality is teachers are worked enough just by planning and providing daily instruction.

I'm a first year science (Chemistry, Physical Science, and Human Anatomy and Physiology) teacher at Coldwater Attendance Center, a small school in Coldwater, Mississippi that includes grades three through twelve. Teaching three lab-based science courses is no easy feat, especially for a first year teacher. Although I'd love to be the type of teacher that sparks an interest in science in all of my students, I'm cognizant of the fact that I'm just not that skilled yet. In the meantime, I regularly look for ideas that could make such a task easier, and getting to know my students will help.

Therefore, this fall, I set out to gauge my students' opinions about science itself and my effectiveness as their teacher. To do this, I administered a questionnaire created by the University of Wisconsin Oshkosh in 2011.[3] The questionnaire consists of twenty questions and is divided into three parts: students' opinions on science in general, general opinions about their current

science class, and their opinions about how often certain activities occur in their science classroom. Due to the length of the questionnaire, a link to all statistical data can be found on the Reference page.[2] The following are general summaries of the results:

Part 1 - General attitudes towards science.

Students overwhelmingly indicated they enjoyed science (56%). A majority (51% and 50%, respectfully) also indicated that "reasoning skills used to understand science can be helpful to me in everyday life" and that "science is important to everyone's life." On the other hand, the majority of those surveyed (71%) indicated a desire to take no more science classes and (57%) would not like a job that involved science.

Due to my limited time with students so far in the school year, it would be hard to attribute their general lack of interest in pursuing more science courses or career to my teaching alone. However, knowing their opinions early on could improve pedagogical techniques in the classroom. Lessons and concept examples could be tweaked to include subjects and careers they're interested in.

Part 2 - General attitudes towards current science class.

Students overwhelming (92%) noted that their current science teacher "expects me to do my best all the time". They also agreed or strongly agreed that their "science teacher prepares me for further study in science" by an overwhelming margin (82%). Most also felt their science teacher uses hands-on lessons (59%). However, when asked if they feel comfortable voicing their opinions in their science classroom, most said responded negatively (41%). When asked if they often feel bored in their science class, most students responded negatively as well (60%).

Seeing that my students have recognized the high expectations I have for them is great. However, seeing so many respond saying they do not feel comfortable voicing their opinion is troublesome. Perhaps allowing more discussions, hands-on activities, and labs will increase morale and excitement in my classes.

Part 3 - General statements about what occurs in current science class.

When asked if they "record, represent, and/or analyze data", the majority (45%) responded with "sometimes." "Rarely" or "Never" combined accounted for nearly the same amount (42%). When asked if they "work on projects or assignments with other students in the class where everyone's grade depends on the performance of the group", the majority (45%) also responded with "rarely". However, "rarely" was only scantly noted (13%) when asked if students are "given problems to work on that can be solved in many different, acceptable ways."

I rarely give group work, and the questionnaire results show this. This is mostly due to classroom management issues and organization. Later this fall however, students will be required to participate in a school-wide science fair, which I'm heading and organizing. Students will be allowed to work with a partner, and will be given the opportunity to use lab materials as well as use lab facilities during and after school. Therefore, student opinions on group assignments should change in the near future.

In conclusion, the results of this impromptu and informal study are by no means definitive. They merely represent a snapshot into how my students currently view science, the learning environment I provide, and the methods I use. The questionnaire was introduced by me, therefore introducing obvious bias. Nevertheless, the results are useful to my continuing role as a

science educator. To gauge if I've successfully used these results to alter future classroom activities and procedures, I will give the questionnaire again at the end of the school year and compare results.

References

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Making Science Fun and Relatable

by Kent Melchiors

Before beginning the school year, I looked forward to making science both fun and relatable for my students. It shouldn't be difficult; science is all around us. After all, science is the study of the physical and natural world. The amount of life found in the oceans or the ability of our ears to hear are just two examples of interesting facets found in the sciences. As a student, I gravitated towards the understanding of how things work. Understandably, I was excited to make students animated about how the world functions. I wanted to teach them to think and ask questions. As an eighth grade science teacher in Clarksdale, Mississippi, I teach a smattering of life science, physical science, and earth and space science. I have found it difficult to pique the interest of the average student. What can teachers do to foster an intrinsic love of learning?

Lab Activities and Field-Based Learning

Sitting in a class and listening to a teacher isn't my idea of fun. What can a first-year teacher do to promote a love of science? The obvious answer is to make it interactive...labs, field trips, etc. In my experience, this isn't always easy. Preparation can be time consuming for teachers that already feel overwhelmed with other work. Additionally, lab equipment in many schools can be inadequate and expensive to buy. Lastly, many first year teachers struggle with classroom management. Leading a class through a lab activity or field based learning experience can be a struggle. I was disappointed to have a student snort flour during a cellular respiration lab and to have several students return broken rulers after a measurement lab. The general advice with labs would be to start small and develop a routine with standard procedures. The rest of this paper will discuss non-lab activities that can promote understanding and critical thinking.

Music

It can be easy for a student to get lost in the shuffle and tune the teacher out during class. My students love music. They love to beat on the desk and sing their favorite songs. The students that are rarely enthused about learning often come to life when they are able to listen to music. I love to be able to incorporate music into my lessons. The music can be in the form of a corny rap lecture or a song that tangentially relates to the topic. For example, during a lesson about parasites, I played a music video that promotes World Malaria day to teach the greater impact of the *Plasmodium* parasite. I also found success by allowing my students to invent their own beats and lyrics and perform the song in front of the class.

Video and Pictures

Technology is ever present in my school. I don't have paper to make copies, but I do have about $12,000 of technology in my classroom. At the beginning of the school

year, I used the technology to project my notes onto the board. As a new teacher, it's easy to fall into the rut of giving the notes a student will need to pass a test. However, notes are not enough. Students need a broader understanding to retain the information that is being taught. Pictures and videos can make these words come to life. As a result, students are left with an indelible impression of what is taught. These pictures and videos will take the student much farther come test time than written words in a notebook.

Variety

As a first year teacher, you have to use what you know to teach. It's easy to get into the routine of bell work, notes, guided practice, independent practice. Before starting the school year, I felt that I could scaffold the lesson and break it into its components, so that any child would be able to understand what is being taught. I was correct, but only for those students that could endure the monotony of the same routine. Children learn in a variety of ways, so it's important to vary the style of teaching to reach all of the students in the classroom. Don't be afraid to be creative. If it doesn't work, you can alter how you do it for the next lesson or not do it at all. However, failing to incorporate a creative element into the curriculum will discourage the students that can't endure notes and lecture and leave students without an important aspect of science: creativity.

Data Analysis

Students need to learn how to analyze data. It's imperative that they are forced to take information and make inferences based on the data given. Students are accustomed to looking through books and finding the answer written in the same format as the question is presented. Students should be required to try and interpret data on a regular basis. The teacher should facilitate this through step-by-step processes to aid in reaching higher level thinking problems.

In closing, if you are having trouble engaging the students in lab activities, there are other ways to captivate students and make the information fun and relatable. Be creative. Vary the types of lessons. Use media.