Questions Remain Unanswered:

A Second Grade Science Experiment Gone Wrong

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Chapter One

Introduction

Before embarking on my own teaching career, I had the privilege of substituting in several classrooms in several different grade levels. One experience in particular really made an impression. This was in a second grade classroom’s “science lab.” A science lab was an instructional strategy used by two teachers that required one second grade classroom to combine with the second grade classroom next door to do a science related activity.

Miss Smith (pseudonym), the lead teacher, had her students sitting in groups of four, while the students who were in the classroom that I was substituting for piled in on the floor in the front of the classroom. There was a large fish tank filled with water off to the side of the students and several objects beside that. Miss Smith was standing behind the tank ready to experiment. Each of the students received a recording sheet and was asked to put their names on top. The students from the classroom that I was subbing in were busy talking amongst themselves on the floor, turning around to get other students’ attention. The students in Miss Smith’s classroom were playing with their pencils at their seats. They all seemed somewhat preoccupied and not interested in the fish tank to the side of the room.

The activity on this particular day dealt with the concept of sinking and floating. The student’s first task was to predict whether or not objects would sink or float and then watch Miss Smith perform the experiment. She asked the students to yell out sink or float when holding up the different objects. Once the
class spoke, she placed the object in the water. After they watched whether the object sank or floated, they then circled the correct answer on their prediction sheet. Most of the children believed that the big or heavy objects would sink and that the little objects or lighter in weight objects would always float. They were amazed to see that a Halloween pumpkin, floated in water! A discussion broke out amongst the students. “Why is the pumpkin floating? It is too heavy!” Some students turned to each other and asked, “What makes the pumpkin float?” The students tried comparing the pumpkin to some of the other objects that sank, and asked why it didn’t go to the bottom like those objects. Without hesitation, the classroom teacher, as a response to her students, decided to “hush” the conversation and encourage the students to circle what happened on their worksheets, and then moved onto the next item. As if pressed for time, the activity was hurried along, leaving the students confused and in question.

Following this observation and interaction in this classroom, several thoughts occurred to me. Why do these students question the pumpkin floating? Why do they automatically assume that because the pumpkin is so heavy, it will fall right to the bottom of the tank? This sinking and floating activity ended with making predictions, testing those predictions and no further instruction was given. Students were simply left with the notion that pumpkins float. I wondered how this type of instruction helped students construct meaning out of what they were learning and truly grasp the larger concept of density?

After observing these students in their “science lab” and seeing that their classroom teacher not only ignored their curiosity, but reinforced their
misconceptions by not doing anything to address their questions, I decided to look at this lesson through the theoretical lens of inquiry, as defined by Windschitl’s four levels (2002). The lesson, a sinking and floating activity, had the classroom teacher presenting the students with objects to determine whether they float when placed into water or sink.

The second grade lesson implemented by Miss Smith was situated at the lowest of the four levels of inquiry, the confirmation exercise (Windschitl, 2002). Here, the students simply followed a procedure, or in this case, watched the teacher follow the procedure. No further investigations were completed, data was not collected, no discussion among students’ erupted, and no true scientific phenomena were described.

As the substitute teacher and participant-observer (Spradley and Baker, 1980), I noticed that when students were questioning the pumpkin floating that they held misconceptions, which were not addressed by the classroom teacher. So, why did the teacher stop here? Why weren’t these misconceptions addressed? Why didn’t the teacher step back and become an observer of her students and allow them to take their learning to the next level on their own?

**Purpose Statement**

The purpose of this research was to gain knowledge of how to successfully teach science in elementary classrooms. I wondered why the classroom teacher would be satisfied with her teaching after implementing a lesson where such a low level of knowledge was being learned. Similarly, I wondered why the classroom teacher did not give students the freedom and the choice to become
leaders of their own learning. In other words, allowing students to predict, observe, record, and discuss data with each other in the classroom. Major (2006) explained that by using this type of method (predict, observe, record and discuss) with students, they have to recreate their thinking when they see that their prior ideas about a topic don’t work to explain what they have seen and observed in a lesson. This will force them to construct new ideas about what they are seeing and why.

**Research Questions**

- What do students know about the science concept of sinking and floating?
- How did one teacher teach the science concepts of sinking and floating?

**Importance of Study**

With the easy access to science textbooks, the push for state testing and the lack of knowledge, teachers end up teaching their students the way in which they were taught (Lortie, 1975). As a result of how teachers were taught (1975 and Smith, 2005 as cited in Shively, 2011), their knowledge about science concepts may be limited.

In researching why classroom teachers tend to follow the norm of “cookbook labs” and their need to stop inquiry instruction before it truly begins, as well as, searching for teaching strategies and techniques to address student’s misconceptions about sinking and floating, I hope to gain valuable information to improve my own personal knowledge of how to teach science.
Chapter Two

Review of Literature

The purpose of this literature review is two-fold. One is to gain a better understanding of what young children think they know about the science concept of sinking and floating and why teachers fail to address these misconceptions. The other is how teachers are currently teaching the science concept of sinking and floating. Through reviewing the literature, my hope is to find out why classroom teachers are okay with implementing lessons that require little to no real understanding and lessons that result in low levels of knowledge.

Driver, Squires, Rushworth, and Wood-Robinson (1994) and Keely, Eberle, and Dorsey (2005) suggested that teachers hold tight to misconceptions of their own as a result of the way they were taught in elementary schools (as cited in Burgoon, Heddle, & Duran, 2009). As a result of teachers not trying to correct children’s misconceptions, they are not changed for the better. Teachers aren’t ready to tackle student’s ideas about a given topic or create opportunities for students to become active in their learning, because inquiry in the classroom is something that is seldom seen (Anderson, 2002). It is the job of the educator to help students understand science, and through my research I hope to gain the knowledge to better my own teaching of elementary science concepts.

As young children explore and engage in the world around them, they try to come up with explanations and reasons as to why things are the way that they are, or why they work the way that they work. Piaget referred to a child being in the sensorimotor stage of intelligence, meaning they go through a process of
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trying out cause and effect relationships to try to further understand the complex world in which they live by asking the question what happens if (Gestwicki, 2011). For example, young children might find out that a plate is breakable by picking up the plate and dropping it onto the floor, or pushing it off of the table. The ideas that children create on their own are typically very different than those explained or interpreted scientifically and are usually inaccurate (Stein, Larrabee, & Barman, 2008). Science educators commonly refer to the inaccurate ideas children hold about the world as misconceptions. (2008). Burgoon, Heddle, and Duran (2009) defined a misconception as a conception that is held by a person that is not, at this point in time, accepted scientific knowledge.

It can be assumed, based on the above research, that children entering the classroom will hold several different misconceptions in all content areas. The task at hand, then, is to find out which misconceptions the students hold so that, in return, teachers are more equipped to tackle those ideas in hopes to get students thinking like scientists. The difficulty with this, however, is that children tend to be reluctant to let go of their previous thinking and accept a new idea or a new concept (Abdi, 2006). Similarly, Driver et al. (1994) and Keely et al. (2005) suggested that even with direct instruction, young children tend to carry this prior knowledge, their misconceptions, as they become adults (as cited in Burgoon, Heddle, & Duran, 2009). Major (2006) agreed by stating, “Even after being told the correct explanation, students would often hold on to their explanation” (p. 22).

The National Science Education Standards stated that something needs to change throughout classrooms to allow students to gain the necessary knowledge
and foundational skills to allow them to move forward in their learning throughout the years (Science, Mathematics, & Inquiry, 2000). There is a need for classrooms to move away from the traditional science teaching, which relies heavily on textbooks, and move toward a more constructivist and inquiry based learning environment. Hands-on learning activities can engage students, make learning more meaningful and help them understand complex, scientific phenomena (Unal, 2008). Good and Brophy (1997) explained that in order for students to swap out their previous thinking for correct concepts they must be presented with ideas that are “more valid, more powerful, more useful, or in some other way preferable to their existing concepts” (as cited in Abdi, 2006, p. 39).

To do this, Abdi provided teachers with several ways in which to “foster a climate of inquiry”, some of these included: 1.) “Asking inquiry type questions; 2.) Let children engage in self-clarification of their own views; 3.) Ask them to elaborate; and 4.) Make sure the new concept is applicable and relevant” (p. 39).

**Common Sinking and Floating Misconceptions Among Elementary Students.**

Young children have first hand experiences with the concept of sinking and floating as they go through life: from rubber ducks in the bathtub, to boats in the ocean and swim lessons. Yin, Tomita, and Shavelson (2008) found that some of the most common misconceptions young children hold include: “big/heavy things sink while small/light things float, hollow things float, things with holes will sink, flat things float, and hard things sink and soft things float” (p. 36). Unal (2008) also found that children tend to believe that the weight of an object will
make it sink or float. Similarly, Joung (2009) suggested that children lean more towards an object’s shape or what the object is made up of when explaining why they believe an object sinks or floats.

In addition, if teachers assume that students already know the scientific meaning of words, they will find that they receive several different responses that may or may not be accurate descriptions. For example, Joung (2009) found that she received some interesting responses from students when asked what they understood as “floating”. Her year five students thought of bubbles floating in the air when they were asked what they knew about the concept of floating. She found that the definition of the term that is used in everyday life had a negative effect on what the word floating meant scientifically. She suggested that although words may seem easy enough for young children to understand, the meaning that teachers use could be different than the meaning that children place on the same words, like the meaning of the words ‘sinking’ and ‘floating’ (Joung, 2009).

In summary, as mentioned above by Piaget, young children go through a stage of curiosity and what will happen “if” (as cited in Gestwicki, 2011). As a result, misconceptions are created. These common misconceptions then become the foundation for teachers to begin focusing on inside of the classroom, if done correctly. Good teaching strategies will allow students to clear up any misconceptions that students hold. In the lesson I observed, Miss Smith did not attempt to clear up misconceptions, so I would like to attempt to explain why this may have occurred.

Teachers Beliefs about Teaching Elementary Science.
Elementary science teachers, according to Levitt (2001), hold onto their own beliefs about teaching and learning in general and with the nature of science and the teaching and learning of science. When teachers are asked about their role in the elementary science classroom, they typically respond by explaining how they simply spit out the facts to their students. This could be because the classroom teacher does not have all of the answers for their students when they ask science related questions or just because they are relying too heavily on the science textbooks.

According to Cronin-Jones (1991), teachers believe that they need high-tech equipment to teach elementary science, or they believe the science concepts that need to be taught are above the students’ intellectual level, or that there isn’t enough time in the day to fit science into the daily instruction (as cited in Levitt, 2001). Similarly, LaPlante (1997) found that when classroom teachers are ill prepared and do not understand science concepts, it is unrealistic to expect them to teach science using inquiry or help their students gain a sufficient understanding of the basic science concepts (Brickhouse, 1990; Shulman, 1986 as cited in LaPlante, 1997).

Unfortunately, these beliefs are something that can occur early on in life and can impact the way that elementary teachers teach (Smith, 2005). Smith stated that the strongest influence that one has in teaching science is how he or she was taught or how they themselves learned science.

**Inquiry in the Elementary Classroom.**
Going deeper into inquiry is just what the classroom teacher should have done, but what exactly is deeper inquiry (Science, Mathematics, & Inquiry, 2000)? Inquiry, according to Olson and Loucks-Horsley (2000), is a multi step approach to learning, which includes:

“Making observations, posing questions, examining books and other sources of information to see what is already known, planning investigations, reviewing what is already known in light of experimental evidence, using tools to gather, analyze and interpret data, proposing answers, explanations and predictions and communicating the results” (p. 14).

Inquiry involves students gathering data, analyzing what they collected, and talking and discussing what was observed and collected.

Barrow (2006) stated, inquiry, during this past century, has been interpreted and changed which has resulted in confusion among those trying to teach and learn by it (as cited in Glasgow, Cheyne, and Yerrick, 2010). Thus, inquiry can be defined in several ways. One being that inquiry is “a wide range of intellectual activities, including hypothesis testing, practical problem-solving, modeling and engaging in Socratic dialogue” (Windschitl, 2002, p. 113). Inquiry can also occur when questions are asked, educated guesses are created, investigations are designed and data are collected and analyzed in order to find answers to the questions.

Eick and Reed (2002) shared similar thoughts on what inquiry in the classroom should look like. They believed that inquiry lessons give students a rationale for watching something happen first hand, taking notes on what they see, discussing what they have observed and then analyzing what they have collected scientifically.
Inquiry learning has several different levels and can look different depending on the level of inquiry. Windschitl (2002) labeled four levels of inquiry. The first level of inquiry, which allows very little student control in investigating, is confirmation experiences and during this level students are following steps to perform an experiment in which they already know the outcome. The next level, structured inquiry, still requires students to follow steps however; students are to discover an answer to an unknown question. The third level of inquiry is guided inquiry. Here students are investigating a problem given to them by their teacher in which they are able to decide on how to find the answer. No step-by-step directions to follow are given to the students in the third level of inquiry. The final level of inquiry is called open or independent inquiry. Here students are able to develop their own questions and solve them independently.

**Teaching Strategies.**

Research that has been conducted to learn more about the concept of sinking and floating, in particular, has yielded conclusions of which can provide teachers and educators with ideas of how to implement sinking and floating activities inside of the classroom.

Yin, Tomita, and Shavelson (2008) identified three steps teachers should take to encounter student misconceptions. These included: recognizing current conceptions on the topic being discussed, leading the students to see that their prior knowledge is restricted, and aiding the students in changing their ideas conceptually by allowing them to explore the scientific explanations.
Hardy, Jonen, Moller and Stern (2006), investigated the effects of two separate instructional supports, high instructional support and low instructional support, on 163 students’ conceptual understanding of sinking and floating. All of the materials for each of the lessons in the unit were available to the students receiving low instructional support at one time; discussions were student centered, and the classroom teacher rarely contributed. However, the students who received high instructional support had access to materials depending on the specific subtopic being investigated in the specific lesson; whole class discussions took place, which included frequent participation from the classroom teacher. Hardy et al. (2006) found that children’s

“Conceptual understanding of floating and sinking can be optimized by instructional support provided through the sequencing of instructional content and the frequency of cognitively structuring statements by the teacher” (p. 323).

The researchers made it a necessity to provide their students with friendly, easily understood language. They made sure to use vocabulary terms that the students would be familiar with, or made an effort to introduce new vocabulary terms to them.

In addition to paying attention to language and vocabulary when teaching about sinking and floating, it is important that hands-on experiments, group work and discussion, and the predict-observe-explain (POE) science method is used. The POE method consists of a prediction phase, an observation phase and an explanation phase. Major (2006) referred to this method as an idea to “first confirm students’ conceptions followed by a second, similar demonstration that provides discrepant information creating cognitive dissonance” (p. 23). In other
words, students will find that their ideas will no longer be plausible explanations for why something occurs, thus, having to come up with new explanations. The POE method encourages students to first predict what they believe will happen, observe what actually does happen, and then explain why they think it happened (2006). Educators should correct students’ prior knowledge and help them form a more scientific explanation for these phenomena.

Unal (2008) believed that using engaging activities for students could lead to conceptual change. Yin et al. (2008) shared similar ideas and suggested that rather than educators telling students that what they are thinking is wrong and trying to get them to understand the scientific belief through direct instruction, students need to experience the concept of sinking and floating first hand. Furthermore, they believed that through the predict-observe-explain teaching method, students’ conceptual change would be supported.

Finally, Hardy et al. (2006) stressed the importance of group discussion and participation in the learning environment and concluded that when students are engaged and interacting with one another, their scientific reasoning skills are supported.

**Summary**

As noted in the literature from the previous paragraphs, when teaching about science concepts in the classroom it is important to allow for student exploration and discussion. When this occurs, students will discover for themselves how what they originally thought doesn’t work and will, in return, have to come up with new ideas about the world in which they live. Their prior
background knowledge, or misconceptions, will soon become more and more scientific as they begin to ask questions, look at and evaluate evidence, form explanations, and justify their explanations.

As noted in the literature, children of all ages hold onto these ideas that they believe to be valid explanations of the way in which the world around them works. They gain this knowledge and these thoughts from their everyday lives. It is up to classroom teachers to become effective teachers by separating their own personal beliefs and allowing their students more choice in their own learning process.

It is no doubt that students will come into the classroom with explanations about why something either sinks or floats in water. Educators and teachers alike will most likely realize that within their own classrooms several of the students hold onto the same misconceptions. Given that the science concept of sinking and floating is something that all children will have direct experience with one way or another before entering the classroom, as well as, the many misconceptions they hold on the topic, it is important that the prior knowledge that the children hold is acknowledged, explored and corrected.
Chapter Three

Methodology

Participants and Site.

The sample used in this research included one female elementary school teacher and elementary school children in a multiage classroom. The classroom teacher taught an inclusive classroom of second grade students. Once a week this classroom teacher teamed up with the second grade classroom teacher in the next room over and her students to create a science lab for both classes. The school in which the classroom teacher was observed in was one of two elementary schools in a suburban community in the Northeast.

The students used in this study were in kindergarten, first and second grade. Out of the fourteen students who consented to participate, 6 ended up being interviewed for the purpose of this study. More specifically, two kindergarten students, two first grade students and two second grade students were used in this sample. Even more so, a boy and a girl from each grade level were chosen to participate to see whether or not there was a correlation between the response given and the gender of the student.

Data Collection.

The research conducted for this study involved a few different methods of data collection. The first data collection method was observation and field notes. While the last data collection method was in the form of student interviews (see appendix) and artifacts.

Observation/Field Notes.
The classroom teacher who was involved in the study was observed during a 30-minute science lab lesson in which field notes were taken and expanded according to the methods described by Spradley (1980) based on what the classroom teacher said and did, as well as, how she responded to her students. Field notes were expanded after each observation.

**Interviews/Artifacts.**

From the literature read, it was apparent that it is common for young children to believe that the weight or shape of an object determines whether an object will sink or float and not focusing on the material that the object is made of, in particular. Thus, during the interview process described by Creswell (2007), I presented each individual with the same material of an object, and changed the shape of the material to get a better understanding of what each student thought would occur after placing the shape into water. First, each student was presented with clay. I began by encouraging the students to play around with the clay for a minute to get an idea of what it felt like. I then took that same clay and turned it into a ball. I asked the student to predict if the ball would sink or float and then asked why. Student responses were recorded on a worksheet. The worksheet included a picture of a tank of water to demonstrate where the clay landed and space to record written answers. First students made a prediction. Their prediction was drawn in the tank of water as well as recorded in words. Next to the prediction, there was the same picture and space for written answers under a heading of observation. Once predictions were recorded, the student was able to take that ball of clay and test their hypothesis or prediction. I asked the student
why the ball of clay sunk to the bottom. We then repeated the process only this
time the ball of clay was flattened into a pancake. Again, I asked the students to predict if it would sink or float and ask them why. Lastly, the flat pancake was molded into a snake. Again, the students repeated the process of predicting-observing-and explaining.

The initial questions that were asked included:

- What do you think will happen to the ball of clay if we put it into the water?
- Why do you think it will sink?
- How do you know it is heavy?
- What happened after we put it into the water?
- Why do you think that happened?
- What do you think will happen to the flat pancake if we put it into the water?
- Why do you think it will float this time?
- How do you know it is light?
- What do you think will happen to the snake when we put it into the water?

Follow up questions that were asked as a result of their responses from the initial questions included:

- What do you mean by solid?
- If I took some of the clay away, what will happen to the pancake?
- What do you mean the ball doesn’t have something around it?
- What makes you think that the water is light?
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Following the experiment with the three shapes, a final question was asked to summarize the experiment. I asked each individual why they thought that all three of the shapes, the round ball, the flat pancake and the snake, all sunk to the bottom of the tank.

Data Analysis.

Once data was collected, it was important to view the collection of interview responses, artifacts and field notes to find categories, themes and quotes for commonalities that arose (Corbin and Strauss, 2008). After reading over the interview responses and interviews, one specific theme was apparent: 1.) Students had misconceptions of why objects sink and float. After reading over the field notes, I quickly noticed several things that the classroom teacher did supporting my claim that ineffective teaching took place in the science lab. Some common themes that arose while analyzing the field notes included 1.) Not going further into discussion about what was seen by the students and abruptly ending the conversation, and 2.) Not addressing students’ curiosity, confusion and/or questions that arose.
Chapter Four

Findings

The Student’s Had Misconceptions About Sinking and Floating.

There were several commonalities amongst the participants’ responses regarding whether the objects would sink or float when placed into water. When exploring what might happen with the round ball of clay, all of the 6 students believed the ball would sink or “go to the bottom.” Four out of 6 of the participants believed that it would sink “because it is heavy.” Similarly, 2 of those same 4 participants believed that the clay ball was too heavy for the water to hold up. The following quotes show sample student responses regarding the round clay ball:

“It will go to the bottom because it is too heavy for the water to hold. It doesn’t feel heavy, but it might be for the water.”

“Water moves when someone jumps in it. It will sink because it is heavy and the water is light.”

When asked what made the clay heavy, 2 of the 4 same students gave these answers:

“It is heavy because there is a lot of clay sticking together.”

“It is solid in the middle. There is no air inside of it, it is just that material, it is not empty.”

The final two students, regarding the question about what would happen if the ball of clay were placed into the water agreed with their classmates in that they believed it would sink, but gave a different reason as to why they thought it would sink. One of the kindergarten participants believed that it would sink because “it didn’t have any arms or legs.” The final student, a first grade student, who was
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identified by the teacher as one of her lower students receiving pull out resources, responded with:

“It doesn’t have something around it so gravity can’t pull it up. You know, the things that safety men throw to you and you put around you to help you stay above the water, a lifesaver!”

For the second shape of clay, the flat pancake, there were similar responses. All but one student believed that the flat pancake would float or “stay at the top” of the water. Two students, both girls, believed that the flat pancake was lighter than the round ball so it was going to float. The other students ranged in responses as to why they thought the pancake would float. The kindergarten boy said that it would float because it was soft, while the kindergarten girl thought that it would float because it was flat. The first grade boy believed that it would float because it was bigger than the ball, in that the flat pancake had more of a “platform.” The one student who believed that the pancake would sink was the second grade boy. He thought that it would sink because:

“The round ball of clay sunk and the pancake was made with the same amount of material.”

From this response, I decided to ask the student what he thought might happen then if I added more clay to the pancake. He said that it would still sink because it would be even heavier. When asked what he thought might happen if I removed some of the clay from the pancake and then placed it into the tank of water, he said that it would be somewhere between the top of the water and the bottom of the tank. When asked what he thought might happen if I removed even more clay from the pancake, he responded:

“It would float because a lot less clay would be used for the pancake.”
With the last and final shape, the snake, each of the participants again gave similar responses. Two of the 6 participants believed that the snake would sink because it was heavy, while 2 different participants thought that it would sink because it was hard. The other 2 students responded with different answers. Again, as mentioned earlier with the round clay ball, the same student believed that “it would sink because it didn’t have any arms or legs.” The final participant said that the snake would sink because again it was made from the same amount of material as the round clay ball and the flat pancake. So, as a follow up question, again I asked him what would happen when I removed some of the clay from the snake? He responded that if half of the clay were taken away, the snake would be somewhere between the top of the water and the bottom of the tank. He also said that if I took out more than that, the snake would float. He concluded:

“*The smaller the [amount] of clay, the more it will keep rising because less clay means less heaviness.*”

Once the students observed what actually had happened to the three different shapes of clay, three of the students thought that all of the objects sank because they were “heavy.” One student responded that the three objects sank because “they had no gravity.” One student believed that the objects sank “because they couldn’t swim.” The last participants reasoning as to why the objects all sank was because “only small things can go to the top and they need to be soft.”

**The Classroom Teacher Did Not Address Students’ Misconceptions.**

After taking a look at the data that was collected about the classroom teacher, two themes were found. The first theme that arose was that the classroom teacher did not address the misconceptions that her students had about sinking and
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floating. This happened on two separate occasions. The classroom teacher would not go into further discussion after presenting the students with opportunities to observe. The first instance was when the class was presented with a video about sinking and floating from BrainPop. Once the video was finished, the classroom teacher went directly into the activity without discussing what the students had just seen in the video. Nothing from the video was addressed or gone over in detail. A second instance where the classroom teacher did not go into detail was after demonstrating whether the various objects sank or floated in the water. After the object was placed into the water, and the students saw whether it sank or floated, the teacher directed students to circle ‘sink’ or ‘float’ on their worksheets, and moved onto the next object, without asking questions or clarifying misunderstandings. I noticed that the students turned to one another with looks of confusion, frowns on their faces, and shrugged shoulders when their predictions turned out to be incorrect and the classroom teacher didn’t address why.

The second theme that was discovered after analyzing the field notes was the fact that the classroom teacher ended discussions that began among the students by not addressing students’ curiosity, confusion and/or questions. I witnessed the students asking each other questions about what they had just seen in the demonstration, and the classroom teacher’s response was “quiet down”, “shh, I can’t continue until you are all quiet” and “you’ll be able to do this experiment at home with your families, let’s move on.”

In general, from this experience, it was found that students do indeed hold misconceptions about the concept of sinking and floating. More specifically, they
hold onto misconceptions about the idea of sinking and floating that were not addressed.

Summary

As seen in the findings, two things occurred that day in science lab. The students had several misconceptions about the science concept of sinking and floating. This was seen through the interview questions asked, as well as through observation in the classroom. Students were confused during the activity, they wanted to know more about what they were seeing, and they had several questions about what was sinking and what was floating. A second thing that happened that day in the science lab was that the classroom teacher did not address any of the student’s questions, concerns, curiosities and ideas. Students, instead, were asked to keep quiet while the classroom teacher continued her lesson and instructed students what to do and when to do it.

Chapter Five

Discussion

After conducting this research, it was found that students had misconceptions about the science concept of sinking and floating and that the classroom teacher did not address these misconceptions.

As a result of the classroom teacher ignoring the students outcries of questions and curiosities, with responses of “quiet down”, “shh, I can’t continue until you are all quiet” and “you’ll be able to do this experiment at home with your families, let’s move on,” the students were given no ownership of their own
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learning, almost to say that the questions that the students had about what they were observing were not important and did not matter.

These misconceptions then, because they were not addressed, become beliefs, beliefs in which are very difficult to change and get rid of, that the students carry with them through life, as they become adults (Stein et al., 2008). The big idea that these students will take away from this activity that was done in second grade is that if you have questions and raise your hand, the classroom teacher will not accept them and that the questions they have are not important. What is important to teachers, however, is that the activity is done in the time allotted with minimal distraction and no sidetracking took place.

The cycle is then started. These students will go through their education not asking questions, not providing their ideas during discussion and not sharing their thoughts on a given concept all because their classroom teacher in second grade told them to “quiet down.” This is evident in college classes today. During a seminar lesson when a professor asks a question to his or her students, who do you think raises their hands? Not one student, thus, the professor answers it for the students. Where do you think this started? These college students, somewhere along the line, had a teacher who made them feel small and invisible in the classroom, like what they had to say was not important, when they wanted to discuss what they were observing and instead of addressing their questions, concerns, or ideas they simply “hushed” the conversation. This cycle will remain never ending unless something is changed and the ineffective teaching strategies become effective teaching strategies.
References


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Appendix

Interview Questions

1. What do you think will happen to the ball of clay if we put it into the water?
2. Why do you think it will sink?
3. How do you know it is heavy?
4. What happened after we put it into the water?
5. Why do you think that happened?
6. What do you think will happen to the flat pancake if we put it into the water?
7. Why do you think it will float this time?
8. How do you know it is light?
9. What do you think will happen to the snake when we put it into the water?
10. Follow up questions that were asked as a result of their responses from the initial questions included:
   11. What do you mean by solid?
   12. If I took some of the clay away, what will happen to the pancake?
   13. What do you mean the ball doesn’t have something around it?
   14. What makes you think that the water is light?