Give Me Five-
A look into 6th grade inquiry science and incorporating science notebooks

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Abstract

As I began teaching 6th grade science, I realized that I needed to relearn the content before I could even think about teaching the students. As I looked over a new science unit, I decided that in order for the students to better understand the content during the lessons, I needed to make the lessons more inquiry-oriented and hands-on. At the same time, I was wondering how I could get rid of all the science papers that ended up everywhere they were not supposed to be. Inquiry science and science notebooks combined to form the new science unit. The students are learning the new content and retaining it by making connections and illustrations in their notebooks that allow for deeper-level thinking. This inquiry addresses the endless possibilities of science notebooks and how making lessons inquiry-oriented can allow students to develop ideas on their own.

Description of Teaching Context

During my inquiry experience, I will be gathering information about how I can better help the students understand the complex content, along with revising the lessons of our new matter and molecules unit to make it more inquiry oriented. Our classroom contains 24 students, and the majority of these students are middle class white students. There are 14 girls and 10 boys in the class. I have one student
in my class that is Middle Eastern, two African American students, while the rest of the class is Caucasian.

The classroom has an intern, a teacher, the learning support teacher for math and reading and usually a paraprofessional to help with the five learning support students. One of those five learning support students is behavioral/emotional support. After looking over their IEPs (Individualized Education Program), these five learning support students are below grade level in reading, writing, spelling and four of them are below grade level for math, while one is advanced. With these students being below grade level in those content areas, their achievement level transfers over to social studies and science because of the amount of writing and spelling that we do during those lessons. The average sixth grade classroom has 24 students and one teacher. Of the 24 students in my class, the majority are of average academic ability, which is 17, two are above average and five are the learning support students that are below grade level in every content area (except one for math), as broken down above. This is why there is usually a paraprofessional in our room and/or the learning support teacher.

Main Wondering and Questions:

Main Wondering

How can making the new science unit, Matter and Molecules, more inquiry-oriented impact my student’s understanding of science content?

Sub-Wonderings
- How can I use KLEW charts in science to help the students better understand the content and allow them to think in an inquiry-based way?
- How can I enhance the lessons in the matter and molecules unit so that the lessons are more hands-on?
• How can I formulate questions for students so they better understand the content?
• How will using science notebooks provide evidence of student learning?

Data Collection

I collected an array of data in order to analyze how my science lessons were transforming, and to figure out if they were more inquiry-oriented. My data collection began prior to the implementation of science notebooks and continued throughout the inquiry process. To collect data I used student science worksheets, student surveys, student science notebooks, original lesson plans and my lesson plans.

Before:

I started looking over the science lessons in the Matter and Molecules unit and began to add inquiry elements to the lessons, such as, KLEW charts, hands-on experimenting, investigating, and science talks. I used the KLEW charts throughout the first lessons, but when I then implemented the science notebooks, I stopped using the paper charts on the board. I found, though, that even after I stopped using the actual chart that the students and I still made sure that we had evidence to support claims, and the students still developed wonderings. I added more hands-on elements to just about every lesson, but the first lesson in particular was the most transformed. I had the students study ooblek and decide, through claims and evidence, if it was a solid, liquid or gas? The students were able to experiment with the ooblek and test it out themselves.

I decided that a major part of inquiry science was allowing the students to record their own thoughts. A way for students to record their thoughts during
science is through a science notebook. Before I decided to implement the science notebooks, I revised worksheets from the original lessons for the students to see what answers I would receive from them. I organized the worksheets into tables and added a science character somewhere on the page to make it kid-friendly. Also, prior to implementing the science notebooks and revising the lessons, I talked with sixth grade colleagues who had begun to teach the lessons and they were able to give me some insight about what was working and what was not. I was also able to observe these teachers actually teaching the original lessons. These observations gave me some ideas of how I could change the lessons to better benefit my group of students.

*During:* During the process of restructuring the science lessons, and teaching them, I really concentrated on looking at what I was adding/changing about the lessons. I decided to implement the science notebooks three lessons into the Matter and Molecules unit, which allowed me to collect data before using them. In the science notebooks, I set them up so that the left side is for the students. On the left side every day, there is always an ‘in’ and ‘out.’ The students complete the ‘in,’ with something that they have already learned, or something new we will be learning that day. By doing this, I am pre-assessing them and asking them to access their prior knowledge for the lesson we will be doing that day. The ‘out’ usually entails proving to me what they learned during the lesson. I will usually ask them to complete a foldable. A foldable is a piece of paper folded in half where a student will write the term and draw a picture and then on the inside write information about the term, or answer a specific question about the content and draw an illustration.
I always tell the students that it is important that they have the five fingers when completing the ‘out’ and the vocabulary section. I taught them a graphic organizer in which they use each one of their fingers to remember certain elements I want to see in their notebook. The pinky is to underline what they are talking about (underline with the pinky), the ring finger is for them to write the definition (ring their bell), the tall finger is to draw an illustration (because that is most important), the pointer finger is to make a connection (point to it), and then the thumb is for something extra, going above and beyond (thumbs up).

The right side of the notebook is for the teacher. This side is where they glue any revised worksheet I have condensed to fit in their notebook. They are also encouraged to take notes on this side of the page to help them remember any information or key points that I touch on. On the first day of using the science notebooks I asked the students if they thought they would like using notebooks and why or why not? (See Appendix C for responses).

**After:** After implementing the science notebooks and teaching my new science lessons, I asked the students to reflect on how the science notebooks were working for them. I asked them to answer this question honestly: On a scale of 1-10, how helpful have the notebooks been in helping you retain the content? (See Appendix D) I also began to look through the science notebooks and look at the left side of their pages, which is where they were to write their thoughts, draw their illustrations and make connections, for the level of understanding for each student. I ranked them high, medium, or low, based on a rubric that I developed. (See
Appendix E) I also took notes on any patterns I was seeing as I looked through the notebooks on each date. (Appendix F)

I then looked back through all of the lesson plans I had developed and compared them to the original lesson plans. I broke it down into 4 columns- original lesson, inquiry element(s) I added, the in-depth of how I added this inquiry element to my lesson and the reaction I felt I received from the students. (See Appendix G)

Data Analysis

After collecting data that I believed was going to help me in my inquiry, I started to analyze it and look for patterns in the notebooks, student survey responses, and throughout my lesson plans. As I collected the data and began to analyze it, I wanted to make sure that I had evidence that could support claims that I began to discover during and after the process.

I analyzed the data of the responses I received when I first implemented the science notebooks (whether they would like it or not and why?) and compared it to the data I received about how helpful the notebooks were for retaining the science content. I lined up each individual student’s two responses and then broke it down even further from there. I decided to break the responses of one to ten into three different groups to better see any patterns within each group’s responses. I broke down the groups as follows: high, which was eight to ten, the students felt strongly positive about the notebooks for various reasons, and it helps them in some way. The students in the medium group, which was five to seven, felt that the notebooks may be helpful, but there were drawbacks to it. The students in the low group, which was zero to four, did not like any aspect of the notebook. For the high, I
caught onto patterns, such as, the information was in one place, it was organized, easy to follow, and helpful. Patterns for medium included the fact that the notebooks needed more variety, and that they were useful, but not fun. The lowest group felt that it was confusing and there was no variety to them. I placed this data into an Excel spreadsheet with the number of high scores (16), medium scores (6) and low scores (2) and then graphed it. I found that the majority were high scores.

After looking through the notebooks and ranking each child’s left pages low, medium, and high, I placed it into an Excel spreadsheet and tallied how many highs, mediums, and lows I had for each day. After I did this, I placed it into a graph where I could see for each date how the highs, mediums, and lows compared and I found that the majority was mediums for each day. (See Appendix E)

For the responses that I received from the students for the ratings of a scale from one to ten about how the notebooks have helped them better understand the content, I placed the number of each of the rankings into an Excel spreadsheet and then graphed it to find that the majority of the students ranked it a nine. I also compared how the students had felt at the beginning of the science notebooks compared to the final survey I had them complete, that I talked about above. I also looked at the comments each one of them made and broke the rankings into high, medium, and low and looked to see if there were any patterns. (See Appendix H)

The last step in analyzing my data was to look through the science lessons and break it down into four columns, as I had mentioned above. As I went through the column that I had labeled as the impact I felt it had on students, I noticed a pattern in my writing. I found that the words exploration, thinking, and discussion
and argumentation appeared quite often. All of these are elements of inquiry science, which proved to me that I had indeed made the science lessons more inquiry-oriented.

**Explanation of Findings: Claims and Evidence**

After looking over the data and analyzing it through the methods described above, a few claims stood out to me about inquiry science and the integration of the science notebooks.

**Claim 1: The science lessons I created contain more inquiry elements than the original lessons.**

My main wondering through this process was if I would be able to make the Matter and Molecules science unit more inquiry-oriented. After looking through my lessons and comparing them to the original lessons, I found that with the inquiry elements I incorporated into the lessons (science talks, science notebooks, hands-on activities, KLEW charts) I was actually able to make the lessons more inquiry-oriented than they were originally. The evidence for this particular claim comes from the four-column chart I made where I broke down the original lesson, the inquiry elements I implemented, what my lesson looked like with those elements, and the perceived impact it had on the students. Under the final column, the impact on the students, I found patterns of thinking, discussion, and exploration, which I feel are key elements for inquiry science.

**Claim 2: On the days that the students had a foldable for their ‘out,’ more students were ranked high because I had given them explicit**
instructions of what I had wanted to see in their ‘foldable,’

including an illustration and explanation.

As I looked through the science notebooks page by page and laid the data out in a spreadsheet and graph, I noticed that on the days I had used foldables, the amount of highs were higher. I accounted this to the fact that I had given the students explicit instructions of what I wanted to see in their foldable, whereas for other ‘outs,’ I had given them a free choice, but always emphasized that I wanted to see color and illustrations. For a foldable, the students needed to include an illustration and an explanation for the terms I was asking them to complete.

**Claim 3: The quality of each student’s work was the same for the science notebooks as for any other subject.**

As I looked at each student and their high, medium, and low rankings for the left side of their notebooks, I noticed that each student was at the level that I expected them to be at, based on the level of work that I had seen currently. I was actually surprised by this claim, because I was hoping that some students would really shine with the notebooks because of being able to draw visuals, which touches on a different learning style than the worksheets provided. The notebooks offer so much freedom, and I thought I would have seen growth from some students because of this.

**Claim 4: The students were able to demonstrate that they understood the content through illustrations and connections in the science notebooks, because they were given the freedom to explain their thinking.**
I decided to use the science notebooks because I felt that the worksheets constricted the students too much, and did not allow them to record their own thoughts and ideas. I also felt that they were basically feeding back the information to me that I wanted to read. The notebooks allowed the students the freedom to draw visuals, use color, and make connections, which allowed me to know that they were really understanding the material, since making connections is considered higher-order thinking.

I had a learning support student approach me after a lesson on volume, mass, and density. I noticed that he had participated more, and he wanted to make sure that I had noticed this fact. He said to me that he participated more because he understood what was going on. The fact that he has ADHD makes it hard for him to concentrate, but with the science notebooks he was able to refer to information and always write or draw something. (See Appendix I for the full transcript).

I also shared the lessons I created and the science notebook idea with a fellow teacher. She integrated notebooks from the beginning and said that she really saw deeper level thinking from the students because of the notebooks. She also added that she liked how the students were able to draw to show their understanding, which I feel is also very important for the students to do. I am very thrilled that not only are my students benefitting from the notebooks, but another teacher feels that her students are as well. (See Appendix J for e-mail).

**Reflections and Implications for Future Practice:**

As I reflect on this process and think about how I could use this to benefit myself as well as my students in further teaching, I have to reflect on my own
science experience as a student first. I believe that as a person who did not love science at all as a student, I would have loved science if it had been inquiry-oriented because there is experimentation, discussion, and hands-on activities that allow the students to discover ideas on their own. The students are exploring without being told right away what the concept is. What makes this form of science work is the fact that there is a platform for students to explore and express their ideas throughout the process. I want to make sure my students enjoy science, and I believe that if I am enjoying it as I teach it, the students will find a love for science as well. It is important that students of any age have the chance to experiment and develop ideas on their own.

When I teach science in my future classrooms, I will most certainly be using the notebooks, whether it is first, third, or sixth grade. I would not expect as much from the students in first grade as in sixth grade, but they can still draw illustrations and write down one thing that they learned, based on a lesson. I will adapt the notebooks as I need to throughout my teaching. I will also make sure that when I teach science, it is inquiry-oriented because I feel that the students benefit from the inquiry approach because they are formulating their own ideas by discovering. Inquiry-based science and science notebooks will be used in all of my future classrooms because I believe in the success I have experienced when using them.

Appendix A: Inquiry Brief

Context

During my inquiry experience, I will be looking into strategies I use to learn the complex content of 6th grade science. I will also be gathering information about
how I can better help the students understand the content, along with revising the lessons of our new matter and molecules unit to make it more inquiry oriented. Our classroom contains 24 students, and the majority of these students are middle class white students. There are 14 girls and 10 boys in the class. I have one student in my class that is Middle Eastern, two African American students, while the rest of the class is Caucasian. The classroom has an intern, a teacher and usually a paraprofessional to help with the 4 learning support students across all subject areas, and 1 student who is emotional support. The average sixth grade classroom has 24 students and one teacher. Of the 24 students in my class, the majority of average academic ability, which is 18, 2 are above average and 4 are learning support students, so they are below the academic level of 6th grade in reading, writing and spelling, which carries over to Social Studies and Science because reading, writing and spelling skills are used during every lesson. This is why there is usually a paraprofessional in our room and/or the learning support teacher.

**Rationale**

The inquiry experience will focus on making the new matter and molecules unit more inquiry-oriented, so the lessons lend themselves to KLEW charts, science notebooks, possibly technology and hands-on demonstrations where students are able to explore and be engaged with the content. I have been teaching science and noticing how difficult the content is for me to relearn or learn for the first time. I am also trying to create lessons so that I am able to break down the content for the students, so they are able to learn it.
I chose this particular topic for a couple of reasons. Science is the first subject I began to lead in my classroom. In doing this, I have some experience of teaching inquiry science to my class and I see that there are opportunities for me to institute new ideas into the next science unit because it is brand new. I have found science inquiry intriguing because I never enjoyed science as a student, but now that I am the teacher, I am really enjoying learning the content and then teaching the content to the students. I was also interested in this topic because I did not realize how content heavy sixth grade science is. The content is heavy because there is information in this unit that is new to me and I would assume is new to the students. I have been doing research beyond the lessons about this material so I can become an expert in this area of science. This way, when my students have questions I am able to answer them.

After reading about inquiry science and integrating KLEW charts and science notebooks, I decided that I wanted to integrate new items into my revised inquiry science lessons on matter and molecules. I want to discover how I can learn this content heavy curriculum and then provide ways for students to better understand the content, whether it is through KLEW charts and/or science notebooks. Inquiry science to me is when I am able to start a lesson with a topic, ask the students what they think they know about a topic and then lead them into an activity that will let them explore the topic on their own. In being able to explore the topic, the students will then be able to explain their findings from first hand experience and further elaborate on their thoughts. Throughout the lesson, and especially at the end of the lesson, I want to make sure that I evaluate the students in some way. Whether I
have an exit slip in which they explain one thing they learned, or a few problems so I know that they understand a particular formula.

Also, I believe that wonderings are a major part of inquiry science because the students are discovering and questioning. Inquiry science is when the students are able to formulate their own ideas and place their own connections to the term. It is critical that the students are able to see the actual term before they find out what it is, so they are able to make a connection on their own. This way the students will have something to connect the term to when it comes into the lesson again.

Main Wondering

How can making the new science unit, Matter and Molecules, more inquiry-oriented impact my student’s’ understanding of science content?

Sub-Wonderings

- How can I use KLEW charts in science to help the students better understand the content and allow them to think in an inquiry-based way?
- How can I enhance the lessons in the matter and molecules unit so that the lessons are more hands on?
- How can I formulate questions for students so they better understand the content?
- How will science notebooks look when I incorporate them into my teaching and will they better benefit the students, rather than having worksheets, because they will be able to reference past material?
- How can I break the content down for myself so that I am able to learn and understand these heavy content lessons?

Timeline

February 7-14
- Analyze data from the videos of my previous science lessons
- Review material concerning matter and molecules
- Create first 3 lesson plans for matter and molecule unit

February 15-22
- Review videos and look for students participation when using the KLEW chart, compared to other videos without KLEW charts
- Research science notebooks, using the *Science Notebooks: Writing about Inquiry* text.
- Start to create science notebooks that we will be using in upcoming lessons.
- Talk with Kris about my upcoming science lessons.
- Create a Core 1 plan (to lay out what content is coming up)

**February 23-28**
- Start teaching Matter and Molecules unit. Lessons 1.1, 1.2, and 1.3.
- Talk with Kris about the lessons I have taught and my upcoming lessons.
- Create/work on lessons 1.4, 1.5 and 1.6 for next week.

**February 24**
- Revised Draft of both the Inquiry Brief and Annotated Bib due via email to Classroom PDA for grade.

**February 25- March 4**
- Continue teaching Matter and Molecules lessons. Lessons 1.4, 1.5 and 1.6.
  - Institute science notebooks this week.
  - Interview colleagues who have taught some of the matter and molecules lessons.
  - Observe colleagues teaching matter and molecules lessons.

**March 5-14 (Spring break)**
- Look over and analyze data.
  - Use Studiocode to code for my questioning. I will be using Bloom’s Taxonomy to look at my questioning, mainly during science talks and when using my KLEW chart. I am certain that the science talk and KLEW chart time will overlap.
- Plan and review lesson plans that are coming up after break.
- Catch up on anything that I need to do concerning inquiry.

**March 15-22**
- Continue teaching science lessons
- Continue analyzing data
- Look over my analysis and reflection of science lessons taught so far.
- Continue interviewing of colleagues about matter and molecules lessons.

**March 17**
- Bring data analysis to seminar

**March 23- April 8**
- Continue analyzing data
- Start rough draft

**April 9-15**
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- Complete rough draft

April 16
- Inquiry paper draft due

April 17 - May 1
- Fix rough draft and add necessary items.

May 2
- Final Inquiry paper due

May 8
- Inquiry Conference

Data collection ideas

Interviews: I will be interviewing other colleagues, as well as, my SCIED teachers from the Fall semester. I will be interviewing other colleagues with the hope that they can share with me what has worked for them for the lessons they have taught so far and possibly any other ideas they have for the lessons that they would like to try next year, based on how the lessons went this year.

Document Analysis: I will be comparing the original lesson plans to the lesson plans I have developed, based on those original lessons. I will want to compare these in order to find out how I further enhanced the lessons to make them more hands on. I will also look at how I brought in a KLEW chart and how I was able to make the lesson more inquiry-oriented.

Video: I will use Studio Code to code my lessons, specifically my science talks, to look for my questioning. I will use Bloom’s Taxonomy to code my questioning.

Resources in order for me to learn more in-depth about the material: I will be using science books, the ERIC database, and other science resources about matter
and molecules in order to help me break down the content before I teach the students.

Appendix B: Annotated Bibliography


This webpage is all about inquiry science. This will greatly help me understand and have a better grasp on inquiry science and different experiments and lessons I can try with inquiry science. It will also allow me to better develop the lessons I already have planned out. It provides links to different tools for interactive inquiry lessons, which would be very exciting for the students I believe because we never use laptops during science class. That is one way that I could bring technology into the lessons. This website has a plethora of information to help me better enhance my lessons and learn more about inquiry science experiments.


This book discusses setting up science notebooks and using the notebooks once they are set up. I am going to use their suggestion of having the students draw sketches in their notebooks because I feel that this is a very powerful way for the students to grasp and retain concepts, especially for visual learners. I am looking into setting up science notebooks for our next science unit, so this book will give me ideas for how to go about creating notebooks for my students to use. For example, I am going to have the students use their notebook as a resource to look back on because my thought now is to have the students present something at the end of Core. In having the students present, they will be able to use their notebooks to reference the material and content. Unlike worksheets, their information will be all in one place. Science notebooks are something I want to implement, so this resource will greatly help me.


This book discusses and looks into investigating matter and then breaks matter down into different parts. I will be teaching a new unit, matter and molecules, so through my inquiry I am looking into content and how I can better understand the material before I teach the students. My next step is to then break it down so that the students will be able to comprehend the content. From this book I learned that when liquids are heated, the spacing between the particles increases, so the liquid expands. The exact opposite occurs when a liquid is cooled. This book will allow me to understand matter, so that when I go to plan the lessons for this
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unit I will have background knowledge and also I will be able to reference it as I begin to plan.


This journal article talks about KLEW charts and how adding the ‘E’ to the KLEW chart really allows students to see their evidence. I have found this article very helpful because I have begun to introduce KLEW charts to my science lessons and believe that the KLEW chart helps break down the information/content for the students to better understand. It also helps me to recall information as we progress through the lesson and investigation because I am able to quickly reference it, as it usually stays posted on the board throughout our lessons. I also learned from this article how I can really get my students thinking about evidence by using the ‘L’, or what they learned, and then having them support it with the ‘E’, or evidence. This article will help me further understand how I can use KLEW charts effectively during my lessons.


This article looks at science inquiry, defining what it means and how to use science inquiry in the classroom. This article is 5 years old, so the article appears to have been printed when science inquiry first began, which gives me a look at science inquiry at the beginning. This article will help me form a better understanding of science inquiry through the material in the article. It mentions in the article that science inquiry is at the heart of learning because children are naturally curious and have questions, which inquiry science does not overlook, but embraces. Also, the article discusses what NSTA recommends for science teachers when using science inquiry, like implementing approaches that make the students question and explore, and then use those experiences to questions even more because of what they have found. This is one of the many recommendations on their website, and I believe that they will be helpful in planning and then implementing science lessons.


This book looks into science as inquiry and emphasizes how important it is to have students question. With science inquiry as my general topic, this book will help me with how I question my students when teaching inquiry science. This book
will also allow me to think about how I want to structure my lessons, looking at group and individual work, and also how to help children formulate thoughtful questions. This book is extremely helpful because it has sections entitled Teacher’s Voice, in which teachers discuss their experiences.


Since I am interested in looking into the content and looking at how I learn the material and then help the students learn the content, this website really breaks down the material and has materials for sixth grade science that includes matter and molecules, which is the unit I will be teaching next. This is a great resource also to help the students understand the content because it is very interactive and allows the students to make connections, such as in the following activity. There is one activity in particular that is interactive and has the person find matter in a kitchen and then gives an explanation of each piece. The website is laid out in a way that is easy to access and use.


This book contains many hands on experiments for students, particularly with matter and molecules, so I will hopefully be able to incorporate some of these experiments into my lessons. This way, the students are able to discover concepts and ideas on their own through experimenting. The experiments have lesson plans to go with them, which is also extremely helpful. Although, the lesson plans are not inquiry based, so I will have to move the lesson plan around so it becomes an inquiry lesson plan.


This book contains a variety of experiments to do with kids in order to help them learn more about the content, and also to help adults teach chemistry to kids. I will use this resource to help me develop my lessons by using some of these experiments and also using the content to help me develop my understanding of the concepts. I want to make sure that I incorporate hands-on experiments with my matter and molecules unit, so I think this book will be very helpful for that purpose.

This book contains a variety of science topics, anywhere from chemical changes to humans and other animals. This book also discusses investigation, invention and experiment, so this resource will be very helpful when looking into inquiry science. The experimenting section, in particular, I found extremely helpful. Wenham discusses how in inquiry based science there are demonstrations, not experiments, because experimenting is only part of the investigation. I will use this resource to better understand the material I will be teaching, as it includes states of matter and physical change.

Appendix C: Initial feelings/reactions to the notebooks:

Appendix D: How effective the students have felt the science notebooks are for retaining the content, on a scale of 1-10.
The above results broken down into high, medium and low rankings:

Appendix E: The ranking of each student’s left notebook pages over 6 days, based on a scale of high, medium and low. The rubric was as follows:

High- LOTS of color, at least one connection, color used to highlight key words, in-depth illustrations (that make connections), explanations to their thinking, captions for illustrations, show a firm grasp of the content (through illustrations, connections)

Medium- some color, an illustration that makes a connection, but it is not higher-level or in-depth (meaning you are not thinking out of the box), demonstrates a basic understanding of the content
Low- little/no coloring, no illustrations that connect to the content, demonstrates little/no knowledge of the content

Appendix F: Notes as I looked through their science notebooks

March 4th
Notes:
I do not see any patterns across the board, and I am concluding this because each of the students did something different this day because they were asked about their SCoodle, also this was the first day we used the notebooks so I also asked them what they thought about them right now- patterns- more organized, easier, helpful, fun

March 17th
Notes:
Patterns: 3 states of matter, cut-physical property, movement of molecules, most students drew the particles of the 3 states of matter and their molecules

March 18th
Notes:
Patterns: the foldables made them separate and look at each. For the in, most students used Michael’s example of a tree to a wooden bat for the physical change, so they were retaining the connection from the day before. For chemical change, most students discussed the vinegar and baking soda experiment from this day (some also drew a picture of it). Misconceptions- states of matter changing are chemical changes. It should be physical change. Maybe I didn’t teach this correctly. Many students talked about the physical change of the index card.
Claim?? On the days we used foldables, more students were high because they had to really break down what they had learned and show an illustration of each term.
March 23rd
Notes:
Patterns: Mass- stays the same, weight- changes, mass will change if I lose a body part (my demonstration/description), drew the coke bottle exploding, less gravity (with weight), mass stays the same, for a picture for weight- about ¾ of the class drew a picture of a scale in order to weigh themselves. Mentioned that the Mentos were a solid, coke was a liquid (chemical reaction), drawings of astronauts(from Youtube video)

March 24th
Notes:
Patterns: the objects the students chose, and then had to draw and color, were large objects for the ‘more mass’ and small objects for the ‘less mass.’ Each student had to draw their 2 objects for the ‘in’, and everyone did this and labeled what each one was, and colored it!!

March 26th
Notes: A pre-assessment of volume, then the out was for me
Patterns: weight, liquid, how much space (in a container), size, water, most drew containers with water.

**Appendix G: My lesson compared to the original lesson**

<table>
<thead>
<tr>
<th>Original Lesson</th>
<th>Inquiry Element</th>
<th>My Lesson</th>
<th>Impact on students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson 1- Students sitting, listening to the teacher and other students talk about ideas for the states of matter</td>
<td>KLEW chart, interactive experiment with the ooblek</td>
<td>I added a KLEW chart to the lesson so we could look at our thoughts progress. I also added ooblek to the lesson so they could explore the states of matter and back up their claims with evidence from what they observed with the ooblek</td>
<td>The students were able to handle material that consisted of a solid and a liquid. This allowed them to draw their own conclusions through exploration.</td>
</tr>
<tr>
<td>Lesson 2- Students were to write down if the statement was true</td>
<td>KLEW chart, within their worksheet.</td>
<td>I switched the worksheet and had the students write their evidence as to</td>
<td>KLEW charts allow the students to see their process of thinking</td>
</tr>
</tbody>
</table>
or false. why the statements were true or false. I also had them write down things they ‘K’new about solids, liquids and gases. As they were watching the movie, I had them record claims (what they Learned) and Evidence.

<table>
<thead>
<tr>
<th>Lesson 3- Six common objects were used that had a different weight/mass and had to look for characteristics for the 6 objects,</th>
<th>KLEW chart (on googledocs), demonstration, further exploration/experimentation</th>
<th>I had the students help me with the KLEW chart by using Googledocs. I also brought in a demonstration that showed the 3 states of matter (water, ice, and water vapor) that had them engaged. I also brought in 2 mystery bags for each student so they would have to use different senses (touch) and also use mass because they can’t see it. I asked the students at the end of the lesson- What do these characteristics explain?, the outside of the object?, the makeup of it?, I was looking for the answer- physical properties of</th>
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</table>
Lesson 4- The lesson has them explaining that what happened to the card was a physical change.

| Lesson 4- The lesson has them explaining that what happened to the card was a physical change. | Science notebooks | ‘in’ is like the ‘K’ in the KLEW chart, asking them what they remember about physical properties. I changed the lesson so that I never mentioned physical change. At the end of the lesson, after exploration, I asked them: With what we did to the index card, what term could we use to describe what happened to it? For their out, I had them write something new they learned and that they had to draw a colorful illustration. | Students need to think through and access prior knowledge before we begin to talk about the new concepts. |

Lesson 5- Lesson started with

| Lesson 5- Lesson started with | Science notebooks | ‘in’- what they remember about physical change, and what they think chemical change might be. I added in a discussion at the end of the lesson to tie everything together. I also added questions- “What happened when you did the experiment? Did the weight change? And why do you |

Discussion allows the students to talk through and share their ideas.
| Lesson 6 - The students were to use a website where they had to put in the weight of 100, and then the weight on the other objects appeared automatically. | Exploration Science notebooks | I changed the website that the students used to explore the weight. Out-foldable for mass and weight. | The website had more items for the students to explore. The foldable allowed them to think through mass and weight. |
| Lesson 7 - Students explore with their group the mass of each of the round objects and fill out a worksheet with the answers. | Science talk, science notebooks | ‘In’- students had to find an object with a small mass and a bigger mass and draw it in their notebook. We used these objects to discuss their first thoughts about the question- is mass dependent on size? After the students placed their objects in the order they thought they went it, I had the students gather on the carpeting. I handed 10 students the 10 round objects and had them place them in the order they thought was correct. We had a great discussion about this. | Students have a platform for discussion and argumentation. |
Appendix H: A look at how the students’ ideas changed/didn’t change from the beginning of the notebooks, and then after 6 lessons of using the notebooks.

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Beginning</th>
<th>Now</th>
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</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>No, Didn’t think he’d like it</td>
<td>writing stuff down helps, and he likes that he gets to draw. Question- Why has your opinion changed?</td>
</tr>
<tr>
<td>Student 2</td>
<td>Good idea, but never used them before, so didn’t know what to expect</td>
<td>because helpful to look back over. Question- Is this what you expected??</td>
</tr>
<tr>
<td>Student 3</td>
<td>Yes, help me organize my work</td>
<td>because helpful. Question- Has it helped you get organized? How?</td>
</tr>
<tr>
<td>Student 4</td>
<td>Yes, more organized and teach more</td>
<td>because the routine is the same for every lesson (IN, experiment, vocab, and then out) Question- How could I change it so it wouldn’t be the same every day? Do you have any ideas I could try to make it more exciting and different?</td>
</tr>
<tr>
<td>Student 5</td>
<td>Yes, very organized</td>
<td>because it’s all together, but we need more room. Question: Do you have any ideas of how I could provide more room for you? Anything I should cut out so you have more room to write? And for what section do you find that you need more room?</td>
</tr>
<tr>
<td>Student 6</td>
<td>Yes, really fun, will be helpful because she likes to be organized.</td>
<td>because helpful and useful, but not fun to have to write something about the lesson every time. Question: What could we do instead of writing</td>
</tr>
<tr>
<td>Student</td>
<td>Opinion</td>
<td>Reasons</td>
</tr>
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<td>-----------</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Student 7</td>
<td>No, Rather use separate sheets because they can be organized more easily.</td>
<td>something down every time? Do you have any ideas?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6, because you can look back from previous lessons.</td>
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<tr>
<td></td>
<td></td>
<td>Question: Have you found that this notebook is more organized than the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>worksheets now that we have been using them?</td>
</tr>
<tr>
<td>Student 8</td>
<td>Yes, waste less trees and every subject now we have a folder or notebook.</td>
<td>10, can look back if I have a question, instead of guessing</td>
</tr>
<tr>
<td>Student 9</td>
<td>Yes, can track what is learned</td>
<td>6, easy to keep around, and don't like scales</td>
</tr>
<tr>
<td>Student 10</td>
<td>Yes, won’t have tons of papers, help organize ideas</td>
<td>4, easily look back over work, likes the glossary because it helps her</td>
</tr>
<tr>
<td></td>
<td></td>
<td>understand some lessons.</td>
</tr>
<tr>
<td>Student 11</td>
<td>Yes, easily gather knowledge. Doing the same thing for reading helps</td>
<td>8, It is all in one place, and you can put what you're thinking before</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the lesson begins.</td>
</tr>
<tr>
<td>Student 12</td>
<td>Yes, more organized and fun. Also, wants to learn new science words</td>
<td>3, look back to recall information, likes papers all together</td>
</tr>
<tr>
<td>Student 13</td>
<td>Yes, organized, which makes it easier</td>
<td>1, it is organized, keeps all info in one neat place</td>
</tr>
<tr>
<td>Student 14</td>
<td>Yes, hates all the papers, easier and nicer to have all work in one place, wants to find more science vocab</td>
<td>1, it is helpful, keeps everything in one space</td>
</tr>
<tr>
<td>Student 15</td>
<td>Yes, keep me organized</td>
<td>4, If I forget things, they are written down</td>
</tr>
<tr>
<td>Student 16</td>
<td>No, we may lose it, and if we do, then we will lose the all the lessons, not just one paper</td>
<td>1, gets confusing with where you are supposed to write. On the sheets it told where to write and it is already set up.</td>
</tr>
<tr>
<td>Student 17</td>
<td>Yes, I will</td>
<td>10, always look back if don't know a word, don't have as many papers to lose.</td>
</tr>
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<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>Student 18</td>
<td>Yes, don’t like packets, used a notebook for spelling and math</td>
<td>6, helps better than having papers, easier to find and turn in</td>
</tr>
<tr>
<td>Student 19</td>
<td>No, not sure what to expect, seem kind of strange, different than the worksheets</td>
<td>5, it is organized, but not much variety in taking notes. Also, if someone lost one, they would get a terribly grade.</td>
</tr>
<tr>
<td>Student 20</td>
<td>No, annoying to write in, it’s hard to write in bc of the lumps from the gluesticks</td>
<td>5, doesn’t make a difference if we use them or not, annoying to have to glue things in every day</td>
</tr>
<tr>
<td>Student 21</td>
<td>Yes, papers get lost easily in a binder, but not in notebooks</td>
<td>10, not easy to lose, easy to follow</td>
</tr>
<tr>
<td>Student 22</td>
<td>Yes, much more organized, like reader’s notebooks</td>
<td>8, info one place, all attached, can look back at different lessons, helps me be neat</td>
</tr>
<tr>
<td>Student 23</td>
<td>Yes, could use it if forget stuff, so it is useful.</td>
<td>Would put a 10, but don’t like writing. Helps her remember things, useful for notes and vocab.</td>
</tr>
<tr>
<td>Student 24</td>
<td>Yes, convenient way to keep info, very useful</td>
<td>8, easy to review because everything is in the same place. There’s not a label for the lessons, except the index (a negative)</td>
</tr>
</tbody>
</table>

High is blue: 8-10. These students feel strongly positive about the notebooks for various reasons. Helps them in some way
Medium is yellow: 5-7. These students feel that it may be helpful, but that there are drawbacks to it.
Low is green: 0-4. These students do not like any aspect of the notebook.

Patterns in the why: organized, easy to follow, fun, help remember things, look back, helpful

Patterns with the high (16)- information in one place, organized, easy to follow, helpful
Medium (6)- more variety needed, helpful, useful, but not fun
Low (2)- gets confusing, no variety

Appendix I: Transcript with the student that shared how the science notebooks are helping him retain content:

Student A: Using the science notebooks helps me better understand for science so I can participate. I can look back at what I have learned earlier, and use the resources from previous lessons so it can help me understand. I don’t know if you know, but I have ADHD, and that makes it hard for me to concentrate, but I was able to today!

Appendix J: E-mail from a fellow teacher

Steph,

Thank you for sharing your science notebook lessons with me. As a first year teacher they are great for helping me break down the information and put it into a format that is easy for my students to understand. They are also unique so the students are excited to use their notebooks!

The students in my classroom are really showing a deeper understanding of the materials thanks to your notebook idea. I especially like it that they can draw pictures of their thinking.

I look forward to using more of your lessons,

A fellow teacher