Ice Scream, You Scream

This apprenticeship is designed to help students observe, ask questions, and think like a scientist by doing delicious food science experiments leading to an understanding of how ice cream is created. With their understandings and questions about the science behind ice cream making, they will create a video dispelling misconceptions about science and testing hypotheses of their own. Throughout each experiment and experience, students will learn about what chemists, cooks, and scientists do in their research and how they can be scientists and experimenters in their own kitchens.

Standards and Objectives

Citizen Schools Unit Standard #1: Citizen Schools students will create and test a hypothesis.

Lesson Objectives
- Define and give examples of a hypothesis
- Ask a clear question and form a hypothesis that connects to it
- Explain the role a hypothesis and data play in learning about a phenomena
- Explain the methods(s) by which a hypothesis can be tested
- Conduct tests of a hypothesis and gather data

Citizen Schools Unit Standard #2: Citizen Schools students will demonstrate how to use technology to produce a desired product

Lesson Objectives
- Identify the technology to be used and the product being created
- Give examples of how their technology will assist with the creation of their product
- Use digital technologies, communication/networking tools and/or social networks appropriately to access and create information
- Use new technology by both following steps and experimenting or innovating
- Evaluate their skill in use technology to create the desired product

Guiding Question

What is one universal and debatable question will students wrestle with in this apprenticeship?

- What does it mean to be a scientist?

Assessment (WOW!)

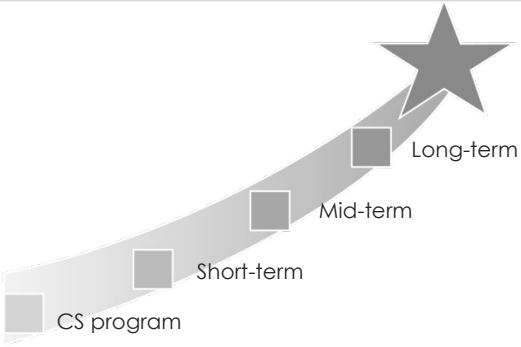
Students will make a video exposing the science behind food (see Rubric). They will also serve as a panel of "distinguished experts" in the field to answer questions about their breakthrough discoveries if time allows.

Basic Unit Plan

Week	Connections to Standard/WOW!	Week	Connections to Standard/ WOW!
1	*Learn about WOW!, procedures, and the scientific method*	6	*Make ice cream and synthesis food science principles*
2	*Develop observation and inquiry skills*	7	*Brainstorm topics for video and begin writing scripts*
3	*Use inquiry skills for experimentation*	8	*Continue writing scripts and begin recording their video*
4	*Develop critical thinking and analysis skills*	9	*Complete recording of the video.*
5	*Learn to draw and share conclusions from observations*	10	*Finalize and evaluate video. Set up panel (if time permits)*

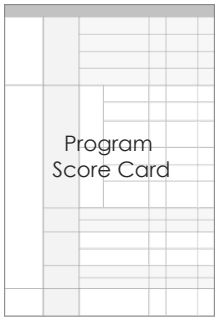
UNIT NAME

UNIT CONTEXT / BIG IDEA



This apprenticeship will explore the skills and ideas central to careers in Chemistry and Food Science. The ability to critically question the world based on detailed observations and the motivation to test one's ideas and share them with others are essential to student's success in science enrichment courses in high school and college. Through this apprenticeship, students will become prepared to become future scientists and critical thinkers in society.

SHARED GOALS



If you teach this unit successfully,

- *Students will be able to feel like doctors of science working to verify notions by using the "scientific method".*
- *Students will increase their ELA grades through better writing and communication skills.*
- *Teachers and families see the improvement in students observational and critical thinking skills.*

TIMELINE OF SKILLS

- *Students will develop observation and descriptive skills important to achieving academic success in middle school and beyond.*
- *Students will learn about the accessibility of many potential careers in the field of chemistry and food science.*
- *This apprenticeship will prepare readiness for students who wants to attend college and take up the science and/or medical field.*

IMPLEMENTATION NOTES

- *Most lessons require access to a computer, projector, and internet for videos.*
- *Video recording equipment is needed for Lesson 8, 9, and 10.*
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LESSON PLANS AT A GLANCE

Week	Lesson Objectives	Activities	WOW! Prep
1	▪Define and give examples of a hypothesis ▪ Ask a clear question and form a hypothesis that connects to it	Hook: Human Barometer Mini-Lesson: ISYS Expectations Activity 1: Scientific Method Activity 2: Stinky Cheese Activity 3: Milk and Curds Check for Understanding: SWBAT make detailed observations.	Learn about the scientific method and hear about their WOW!
2	▪Define and give examples of a hypothesis ▪ Ask a clear question and form a hypothesis that connects to it	Hook: Milk + Colors Mini-Lesson: Good Questions Activity 1: Milk's Story Activity 2: Fatty Butter Activity 3: Density Do's Check for Understanding: SWBAT make hypotheses based on detailed observations.	Students learn to make hypotheses and ask questions for their WOW! video.
3	▪ Ask a clear question and form a hypothesis that connects to it ▪Conduct tests of a hypothesis and gather data	Hook: Viscosity Race Mini-Lesson: Stuff that Sticks Activity 1: Waterdrop Game Activity 2: Miniscule Molecules Activity 3: Speedy Molecules Check for Understanding SWBAT explain how to collect data that connects to hypotheses and questions.	Students learn to collect real data and results that can be used for WOW! Video.
4	▪Explain the methods(s) by which a hypothesis can be tested ▪Explain the role a hypothesis and data play in learning about a phenomena	Hook: Energizer Mini-Lesson: Energetic Molecules Activity 1: Hot Ice and Cold Fizz Activity 2: Thermometers Activity 3: Alien Situation Check for Understanding SWBAT explain how their data supports or negates their hypothesis.	Students collect more data and draw conclusions that can be used for WOW! video.

LESSON PLANS AT A GLANCE			
Week	**Lesson Objectives**	**Activities**	**WOW! Prep**
5	▪Explain the role a hypothesis and data play in learning about a phenomena ▪Conduct tests of a hypothesis and gather data	Hook: Moving molecules Mini-Lesson: Atoms and Molecules Activity 1: Exploring States of Matter Activity 2: Fondue Fun Activity 3: Solute Intervention Check for Understanding SWBAT explain how their data supports or negates their hypothesis.	Students conduct mini-experiments and draw conclusions.
6	▪Explain the role a hypothesis and data play in learning about a phenomena ▪Conduct tests of a hypothesis and gather data	Hook: Milk Trivia Challenge Mini-Lesson: History and Development 1: Ice Cream classroom 2: Exploring Floats 3: Mapping and Synthesis Check for Understanding: SWBAT generate questions and hypotheses about ice cream.	Students synthesize and practice the scientific process. They will get excited about the WOW!
7	▪Identify the technology to be used and the product being created ▪ Give examples of how their technology will assist with the creation of their product	Hook: Science Caricature KWL Conference Role Play Scripting Check for Understanding SWBAT identify how they can use video to deliver information.	Students identify WOW! Topic and roles, brainstorm script ideas, and begin writing their script.
8	▪ Identify the technology to be used and the product being created ▪ Give examples of how their technology will assist with the creation of their product	Video Analysis Team Conference Role Play Check for Understanding: SWBAT describe several ways videos can engage audiences.	Students finalized scripts and begin recording WOW! Video.

LESSON PLANS AT A GLANCE			
Week	**Lesson Objectives**	**Activities**	**WOW! Prep**
9	▪Use digital technologies, communication/networking tools and/or social networks appropriately to access and create information ▪Use new technology by both following steps and experimenting or innovating	Video Analysis Conference Video Making Check for Understanding: SWBAT define and evaluate high quality videos.	Students finalized scripts and begin recording WOW! Video.
10	▪Use new technology by both following steps and experimenting or innovating ▪Evaluate their skill in use technology to create the desired product	Watch Clips Rubric Evaluation 1: Revise and Peer Review/ Panel Preparation 2: Practice/Record 3: Dress Rehearsal/Premier Check for Understanding: SWBAT use media to share scientific information with audiences.	Students refine and finish their WOW! Video (and panel).

Lesson Elements

Ritual –

Assessment- *Exit Ticket surrounding the objectives of the day.*

Structures- *Science journals and clean-up/set-up roles.*

Procedures – *Set-up and clean-up time limits and safety procedures. Collaboration strategies and principles.*

High Quality WOW!

Criteria	1	2	3	4	5
High Quality Question	Question is not authentic and/or cannot be disproved				Question is falsifiable, relevant and interesting to the students and public
Demonstration of Scientific Method	No hypothesis given or hypothesis does not relate to observations; data disconnected from hypothesis				Articulates rational hypotheses based on detailed observation; data collect will support or disprove the hypothesis
Use of Technology	Students present ideas in one setting and one style; poor editing				Students use various settings and props to demonstrate their scientific process.
Video Performance	Students are hard to hear or see; information is not presented clearly				Students are easy to understand and engages audience with their message.

CS Sees, CS Questions

In this lesson, students will get a sense of the apprenticeship and participate as scientists in understanding various phenomena. Students will begin developing their skills in observation by conducting simple experiments with milk.

Lesson Objective

- Define and give examples of a hypothesis
- Ask a clear question and form a hypothesis that connects to it

Lesson Agenda

10 MIN	**Hook**
10 MIN	**ISYS Expectations**
15 MIN	**The Scientific Method**
20 MIN	**Stinky Cheese**
30 MIN	**Milk and Curds**
5 MIN	**Assessment**

Lesson Preparation

- **Space:** tables to do experiments on
- **Group:** Students split up into groups of 3-4 for lab
- **Resources:**

Standards for Unit

- Citizen Schools students will create and test a hypothesis.
- Citizen Schools students will demonstrate how to use technology to produce a desired product.

Connections

Students undergo and internalize the scientific method, helping them learn the essential method to succeed in science classes. They will also become better thinkers and students, which is foundation to their ability to succeed in the 21st century.

Materials

1. Flipchart/markers
2. Computer/Projector
3. Science Journals
4. Expectations Visuals
5. Paper Towels
6. Name tags
7. Barometer signs
8. Milk: skim, 1%, 2%, whole
9. glasses/cups
10. vinegar or lemon juice
11. Spoons/stirrers
12. coffee filters
13. rubber bands

Objective: Define and give examples of a hypothesis
Ask a clear question and form a hypothesis that connects to it

Barometer 10 Minutes

▪Introduce CTs and TL as Dr. __. "We look forward to getting to know you and your interests."
▪Point out the "strongly agree" and "strongly disagree" at the two ends of the room. Explain the rules of Barometer [a statement will be read and students will move to the place along the continuum that reflects their opinion].
▪Demonstrate an example and then answer student questions.

▪Read off a statement at a time. Allow students to move, then have students notice where other people are. They should introduce themselves to someone near them and say why they are where they are. Then have 1 or 2 students share if appropriate.

▪Welcome each student and have students make doctor name tags.
▪Ask for food allergies and potential lactose tolerance. Record these.

Transition
▪Thank them for their participation in the game and the apprenticeship.

ISYS Expectations 10 Minutes

▪Share the objectives/agenda of the day: introduce the apprenticeship and the basic skills students will be developing.

▪ "Good afternoon, doctors." Explain that each of them are doctors of science, Ph.D. graduates with expertise in various phenomena of life.

▪Emphasize that they will be practicing to be doctors throughout the apprenticeship and will demonstrate their professionalism at the WOW (may have to explain what the WOW is to 6th graders). Highlight what they will be doing at the WOW and what they will do in lessons to prepare for the WOW. Include what they can expect to learn in between.

▪Focus on the goals: Give students post-its to write down what they are most excited to learn from the apprenticeship. Read these out loud and share your own goals about what students will learn.

▪"In order to get to all these things you want to learn, we have to make sure that this is a safe, comfortable, and caring learning environment for everyone."

▪Go over apprenticeship expectations and guidelines in detail. Have students give specific examples of what each expectation might look like. Be able to fill in with your own examples and emphasize why each expectation is important to the success of the apprenticeship!

Student Says…

Potential Statements:
" I like to eat.
"I love ice cream"
"Science is fun"
"Being a scientist is a great career"
"Being a chef/cook is a great career"
"I like working in groups"
"I am good at asking questions"
"I have cooked a lot before"
etc….

Closer Look!

Sample expectations:
-Respect people and materials
-Be sophisticated and professional
-Ensure your own and others safety
-Listen and learn from each other's ideas
-Work together often and ask questions
-Get value stars and other incentives (food) for exemplary behaviors (CTs/TL)

Use visuals to help students see their own examples/ideas visually. Could have CTs/TL not speaking record student comments on the flipchart.

Objective: Define and give examples of a hypothesis
Ask a clear question and form a hypothesis that connects to it

The Scientific Method — 15 Minutes

▪Explain that science journals containing what they do in the apprenticeship will be displayed at the WOW! Hand out pre-made science journals or have students bring out their own.
▪Emphasize the importance of documenting everything! Let them know when journals will be checked.
▪Have them make a 'vocabulary' and 'key ideas' page.

▪Emphasize the importance and pervasiveness of detailed observations. Give several examples of inventions and key findings (i.e. hot air balloons, glasses/bifocals, peanut butter, popsicles, etc). Use these examples to demonstrate the use of the scientific method.

▪Explain and have them write down the scientific process on "key ideas" page: question, hypothesis, data collection, and conclusion. Define and give examples of these vocabulary words on a large visual and have students write it down in their science journals.
▪Have students do a quick teach back of the scientific method. Let them know they will have time to practice this over the apprenticeship.

▪ **Transition:** "Please open your journal to a new page for a new experiment. We will practice making observations."

Stinky Cheese — 25 Minutes

▪"Before you can develop your own experiments, you need to develop your observation skills." Remind them observations include all senses.

▪Split the students into groups of 3-4 students and assign supervisor roles. Then introduce the experiment:
▪Materials (per group): whole milk, 2 glasses, 2-3 tsp of vinegar or lemon juice, spoon, coffee filter, rubber band.
▪Procedure: put the vinegar or lemon juice in the glass of milk and mix. Have students observe and record observation. Put coffee filter and rubber band on 2nd glass and filter out the curds from the whey.
http://www.thenakedscientists.com/HTML/content/kitchenscience/exp/co
or http://www.youtube.com/watch?v=m9sIBgfIlFs
▪More about cheese making:
http://www.sciencebuddies.org/science-fair-projects/project_ideas/FoodS
▪Have students clean up (keep their curds!) and finish writing observations. Under their observations, ask them to write a conclusion and a question they have about milk.

▪Hold a discussion about what they think happened. What did they make? What does this tell them about milk? What else can they test?
▪Explain milk is a mixture of fats and liquids. Introduce new vocabulary words to describe what they saw: curds (solid), whey (liquid), casein protein, coagulate, cottage cheese. Draw pictures as needed!

▪During the discussion, allude to the upcoming experiment…

Missing Parts…

Don't monopolize the conversation! Let students give examples and make connections themselves about the scientific method and their lives.

History of various inventions:
http://inventors.about.com/od,

CTs and TL should discuss ahead of time how to split up the logistics, including who keeps track of journals and supplies and when.

Additional Notes

Lab expectations should be written out and posted in the classroom.

Supplies manager- responsible for knowing where all supplies are
Procedure checker- Responsible for making sure procedure is followed correctly
Cooperation wizard- making sure all group members are working together toward goal
Data tracker- responsible that data is written down to avoid re-doing trials
Environment Protector- ensure space and area is clean and back to original state at the end
Remind them that everyone does these tasks, but roles are just an extra precaution.

Objective: Define and give examples of a hypothesis
Ask a clear question and form a hypothesis that connects to it

Milk and Curds — 30 Minutes

▪Post up the experimental question: How does the amount of fat in milk affect the amount of cheese created?

▪"You may have an idea about how the experiment will turn out- your hypothesis- so let's write it down and see if you are right!"
▪Show them an example journal entry with headings. Explain the need for proper journal entries to their professional life as a researcher (need for others to read).

▪Introduce the experiment (same as Stinky Cheese, except now with glasses of skim, 1% and 2%). Make sure students have a hypothesis before starting the lab.

▪After the lab, have students clean up and write a conclusion sentence that connects to what they wrote as a hypothesis.

▪Tally the results (which type of milk created more cheese?). Discuss with the students why they got their result (including why they have discrepancies). What were their conclusions? What do they know about milk? Were their hypotheses correct? Why or why not?
▪Encourage them to use the vocabulary words they just learned (that are still posted on the wall).

✔ Assessment — 5 Minutes

▪Thank the doctors for their hard work today.

▪Express your excitement over their progress today. Share one or two specific behavior or experience that exemplified professional scientist behavior (Don't forget to hand out a value star for that 'doctor'!). Tell them how much you look forward to hearing their wonderful ideas throughout the apprenticeship.

▪Excite them about the cool experiments next week!

▪Explain to students that they will get an exit ticket at the end of each apprenticeship to 1) reinforce what they learned and 2) help teachers make lessons better the next week.

▪Exit Ticket:
10.List 3 parts of the scientific method.
11.Write down two observations you made today and one question you still have about milk.

▪Have the students clean up and reassemble the room as needed.

Field Tips

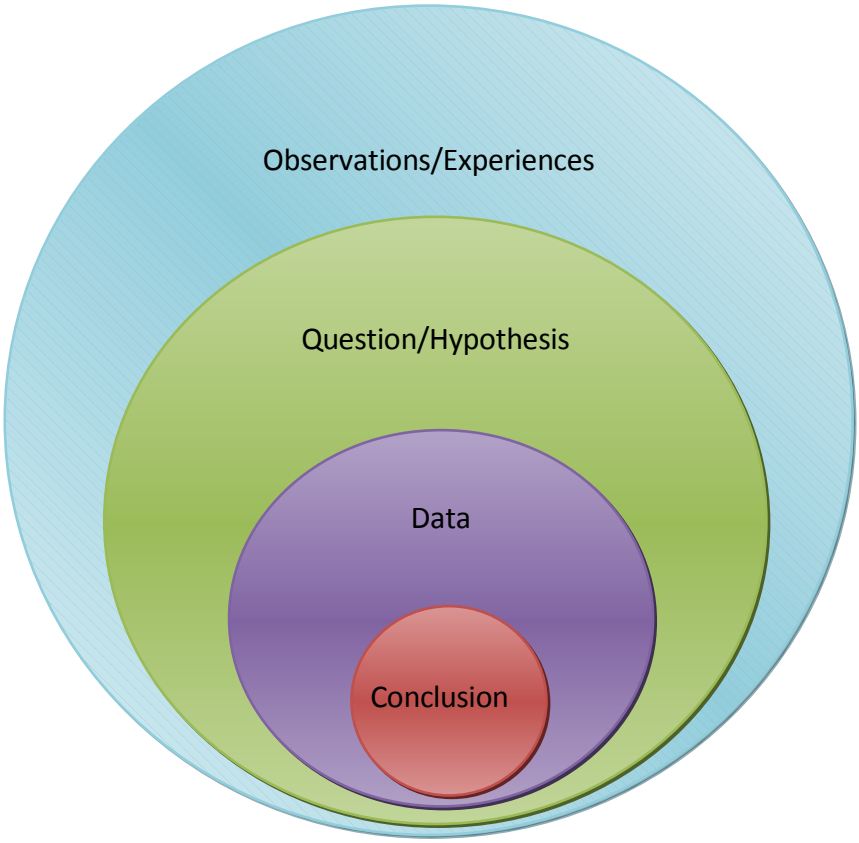
Science journals should have dates, titles, and headings for each section (hypothesis, conclusion, etc.)

To aid the students, make a table for the students to copy in their data collection section.

Future Plans

They will learn more about milk by making butter and trying other delicious and exciting experiments.

***Note**: A lot is covered in each lesson- it's more important that students understand skills and ideas than get through it all. CTs/TL should discuss and re-evaluate the needs and progress of the students weekly. Experiments and concepts may have to be revised or skipped to ensure students fully understand the concepts and skills covered. Don't forget about the 21st century skills and science skills!*


Observations/Experiences
Question/Hypothesis
Data
Conclusion

CITIZEN SCHOOLS

Milk Madness

In this lesson, students learn more about the properties of milk while learning about density and states of matter. They will conduct several experiments to learn about milk and other substances.

Lesson Objective

- Define and give examples of a hypothesis
- Ask a clear question and form a hypothesis that connects to it

Lesson Agenda

5 MIN	**Milk Magic**
15 MIN	**Good Question**
20 MIN	**Story of Milk**
20 MIN	**Fatty Butter**
25 MIN	**Density Do's**
5 MIN	**Assessment**

Lesson Preparation

- **Space:** tables to do experiments, space for PowerPoint and videos
- **Group:** Students split up into groups of 3-4 for lab
- **Resources:** YouTube videos, lots of supplies for this day—may need to coordinate with campus and contacts.

Standards for Unit

- Citizen Schools students will create and test a hypothesis.
- Citizen Schools students will demonstrate how to use technology to produce a desired product.

Connections

Students undergo and internalize the scientific method, helping them learn the essential method to succeed in science classes. They will also become better thinkers and students, which is foundation to their ability to succeed in the 21st century.

Materials

1. Flipchart/markers
2. Computer/Projector
3. Science Journals
4. Expectations Visuals
5. Paper Towels
6. Plate/wide rimmed bowl
7. Milk (chocolate)
8. Food coloring
9. Dish soap
10. Latex/plastic glove
11. Cups/glasses
12. Whipped cream
13. Spoon/Stirrer
14. Nalgeens/clear jars
15. Bread
16. Knives
17. Various materials for density lab (see activity 3)

Objective: Define and give examples of a hypothesis
Ask a clear question and form a hypothesis that connects to it

Milk Magic — 5 Minutes

- **Do Now / Warm Up**
- Have students take out their science journals and gather around an empty plate.
- "Please write down observations and a hypothesis for this experiment." Ask a students to teachback the definitions for those terms.

- Perform the Milk and colors experiment: http://www.youtube.com/watch?v=fJCVLG3YNJk

- "What do you observe and why do you think that is happening? Take 1 minute to write in your journal." …"now turn to your shoulder partner to share for 1 minute"… Ask three students to share. (Think-pair-share).

- **Transition:** "Thank you for your detailed observations and ideas. We are going to learn more about milk today and maybe your questions will be answered."

Good Question — 15 Minutes

- Share objectives/agenda of the day: develop questioning and hypothesis making skills.

- Emphasize the importance of questions and inquiry to the scientific community. "Scientists want to test all these questions, but they have to be careful because not all questions can be so easily tested." Give examples of slow scientific exploration (i.e. light bulb, drug testing, etc).

- "Do you think there are science questions?" [Maybe] Ask for some examples of questions vs. science questions and read questions from exit tickets last week.

- "The kind of questions we want to ask in science comes from observations and have a goal in mind." Give examples of how questions indicate prior observations and a purpose in mind.
- Have students teachback why that is important. [because those questions are grounded in observations and can be tested.]
- Connect to hypothesis [based in observations, specify conditions tested.]

- "Let's make sure that you all have good science questions about milk before we learn more about it. Please write one science question you have about milk or another food/drink in your journal. You can choose and change from a questions that you heard earlier from other student. Remember we are learning from each other- our community of scientists." Give students 1 minute. "Please write a hypothesis for your question." Ask some students to share.

- **Transition:** "To help you understand milk, we are going to learn about where it comes from."

Student Says…

Try to not answer questions for students. You can remind them about what happened last week.

See what students believe is happening and link it to the activities of the lesson. Keep the magic alive, at least for a little while.

Closer Look!

Example Science Questions:
- *What makes milk turn sour? (this question shows we know milk turns sour and seeks a specific thing that can be tested)*
- *What if we add baking soda instead of baking power?*
- *Why is ice cream cold?*
- *Can you melt green beans?*
- *Where does salt go when it melts/dissolves in water?*

Objective: Define and give examples of a hypothesis
Ask a clear question and form a hypothesis that connects to it

Milk's Story — 20 Minutes

▪Ask students to teach back what they learned about milk last week (milk is a mixture of solids and liquids that can be separated by an acid). Put these ideas on a visual.

▪"Where does milk come from?" [cows, goats..] "A long time ago farmers would milk the cows by hand. Now it is done by machines that act like a vacuum. This way the milk never touches air or human hands. The milk is immediately cooled to 38-45F. Then it is tested for it's grade – Grade A for human consumption, or Grade B. It's also then determined the percentage of fat – whole=4%, 2%, or 1%"
▪*Milking Cow Demonstration*: Have milk filled gloves that students will hold above a cup. They will begin to 'milk' the finger tips after they are punctured with a pin.

▪"The milk is then **homogenized** to break the butterfat particles into tiny, uniform globules. Homogenizing ensures that the butterfat particles are uniformly distributed throughout the milk"
▪*Homogenizing Demonstration*: have a clear bottle or cup with some chocolate milk in it, put some whipped cream on top…showing that it starts off separate because fat floats (less dense), then stir the whipped cream in and show how then it becomes uniform. .
▪"If the milk wasn't homogenized, the cream would rise to the top. So you would have to shake or stir the milk before serving."
▪"Then the milk is **pasteurized**. This is done by quickly heating it to 161F for 15 seconds and then rapidly cooling it. This kills any bacteria and makes the milk last longer."
▪Have students teachback the story of milk with the proper vocab.

Fatty Butter — 20 Minutes

▪"We mentioned butterfat earlier in the story- butterfat is homogenized into the liquid milk. Let's get it to come out of the liquid and turn into butter."

▪Demonstrate how to make the butter (until shaking phase). See video. "You will experiment with whole milk and cream. Please turn to a new page in your journal and write the question: Does whole milk or cream have more butterfat? Then write a hypothesis. "

▪Give students some cream and milk. Have them start shaking their jar in groups of 3-4 (they can alternate every minute).
▪After they shake butter out of the cream, show them the filtering process. Make sure they write down observations.

▪Have students share their observations and questions. Pass out bread and let them enjoy their butter while they watch: Making Butter: http://www.youtube.com/watch?v=oropJD0CUxI

▪Have them write conclusions and discuss what they know about milk (add to the visual). Make sure to discuss other science ideas: fat is less dense. Less dense objects float to the top.

Missing Parts…

Add vocab words to a visual and have students teach back the terms at the end.

Additional Notes

Whole milk will likely not create any butter. Leave the cream and milk out the night before for better results.
Choose heavy whipping cream that is not ultra pasteurized (short shelf life).

Cream turns into milk pretty fast, especially if they shake hard, don't let them over shake it! Check every 1-2 minutes.

Coordinate with CT/TL to figure out how to set up demonstrations/experiments/ supply distribution beforehand.

Bring some salt to give some flavor to the butter!

Objective: Define and give examples of a hypothesis
Ask a clear question and form a hypothesis that connects to it

Density Do's — 25 Minutes

▪Post questions: What objects are the most dense? What is density?

▪Lay out materials (suggested limit: 7, including water)on a table and have students put items in the order of least to most dense (their hypothesis).

▪Give each group a glass/jar of water. "This will serve at your measure. We will measure in terms of less dense or more dense than water." Warn students about liquids mixing. If liquids do mix, they should record this down in their data. Also warn students about giving enough time for materials to settle. Make sure they write a conclusion.

▪After students clean up, tally up the results on a large class visual.
▪Decide as a class which materials are denser and which are less dense. Have students try to explain why.

▪Explain the concept of molecule spacing (try to use real life examples, like ball pits, pool, etc.).

▪Show a molecule simulation if possible. Let them know they will talk about molecules more next week.

✔ Assessment — 5 Minutes

▪Answer any remaining questions about the lesson of the day.
▪Thank the doctors for their hard work and cooperation today. Highlight an exemplary behavior you observed (with a value star).

▪Excite them about the experiments next week!

▪Have the students clean up and reassemble the room as needed.

▪Exit Ticket
8.What is milk made of? What can we find in milk?
9.Why are some things more dense than others?
10.Write one question you have about density, liquids, or milk.

Field Tips

Potential materials to test (make sure to include solids, liquids, and gases):
-water
-corn syrup
-raisins
-marshmallow
-butter
-Hershey Kiss
-oil
-little plastic bag with air
-soda

Could also show them this fun density trick:
http://michael-jung.suite101.con

Future Plans

They will learn about liquids and molecules.

Viscosity Races

In this lesson, students discover the flow of liquids and factors that affect that flow. They will learn about molecules and molecule movement by doing little experiments, making hypotheses, and collecting data.

Lesson Objective

- Ask a clear question and form a hypothesis that connects to it
- Conduct tests of a hypothesis and gather data

Lesson Agenda

5 MIN	**Viscosity Racetrack**
15 MIN	**Stuff that Sticks**
10 MIN	**Waterdrops Game**
20 MIN	**Miniscule Molecules**
35 MIN	**Speedy Molecules**
5 MIN	**Assessment**

Lesson Preparation

- **Space:** tables to do experiments on, space for PowerPoint and videos
- **Group:** Students split up into pairs for game, then groups of 3 or 4 for lab
- **Resources:** videos

Standards for Unit

- Citizen Schools students will create and test a hypothesis.
- Citizen Schools students will demonstrate how to use technology to produce a desired product.

Connections

Students undergo and internalize the scientific method, helping them learn the essential method to succeed in science classes. They will also become better thinkers and students, which is foundation to their ability to succeed in the 21st century.

Materials

1. Flipchart/markers
2. Science Journals
3. Computer/Projector
4. Splash of Milk, Water, Honey, Ketchup
5. Tray/aluminum foil
6. Barometer signs
7. Popsicle sticks
8. Wax paper/aluminum foil
9. Videos/simulations
10. ~13 tall, clear glasses/cups
11. Stopwatch(es)
12. Food coloring
13. Oil, honey, water

Objective: Ask a clear question and form a hypothesis that connects to it
Conduct tests of a hypothesis and gather data

Viscosity Racetrack — 5 Minutes

▪Have students take out their science journals and gather around an empty tray. "Welcome to the Liquids only racetrack! Today you get to bet on your favorites. The contenders are: 1) honey, 2) water, 3) ketchup, and 4) milk. Place your bets now. Write down your name and your choice on a post-it, then give it to Dr. __ who is betting commissioner. [During this time, put bits of liquid on the tray]…Alright! Who's voting for 1) honey? 2) water?... Wonderful! Let the races begin!"

▪Tilt the tray and let liquids slide down. "And…the winner is…[water]!" Congratulations to those who won, you have won some pride for yourself as doctors." (could also give out prizes if possible).
▪"Please sit down and write down three observations and questions you have. I will know you are ready when you have your eyes on me and your pencil is down next to your journal." Ask two students to share their observations. Clean up during this time.

▪"Hope you enjoyed that race, we are going to talk about the science behind that race today."

Stuff that Sticks — 15 Minutes

▪Share objectives/agenda of the day: practice making hypotheses and collecting data.
▪"Let's think about what happened during that race. Close your eyes and imagine you are swimming in water. Not too bad now, but you would get tired after a while. Now you are swimming through honey. It's super sticky and you have to really work your muscles to move around. How does else does it feel?" Push students: "Why does it feel different? What is different about the liquids?"
▪Repeat for milk and ketchup. Afterwards, give students 1 minute to write down a hypothesis for why liquids like honey are so thick while others like water are thin. Ask several students to share their hypothesis.

▪"Imagine walking through cooked pasta. Pretty easy, you just put the pasta aside… but now think about mac and cheese. It's harder now because the cheese keeps the pasta stuck together. Same with different types of liquids. There is something more to honey."
▪Things that are sticky= high viscosity "If they stick to you, they will stick to each other. In kitchens, they describe high viscosity as 'thick' and low viscosity as 'thin'" Things that are sticky or high viscosity are also the things that come off the spoon or bottle slower (demonstrate with honey and water)

▪Students write in their vocabulary page: Viscosity= resistance to flow
▪Now let's see what's more or less viscous. Show the barometer signs(high viscosity v. low viscosity). Give each student a food/substance and 2 minutes to move in order of high to low viscosity.
▪Have students teach back what viscosity is and give examples of high and low viscosity substances.
▪"Today we will think about what makes things more viscous, but first let's learn a bit more about liquids. "

Student Says…

For best results, bring a flat cookie sheet, but a large binder or clipboard will also work.

Try to make sure the liquids don't run into each other! Set up lanes if possible. (you can use a utensil organizer as the race track if liquids run together)

After students share, ask other students if they wrote down the same thing. If they didn't, they should write it down!

Closer Look!

With new vocabulary, post it up on a vocabulary wall and check for understanding! Ask for teachbacks and ask students questions about the term.

Barometer activity examples:
Peanut butter
Milk
Chocolate syrup
Strawberry jello
Fog
Clouds
Soda
Blood
Corn Oil
Ketchup
Oxygen
Mashed potatoes
Etc.

Objective: Ask a clear question and form a hypothesis that connects to it
Conduct tests of a hypothesis and gather data

Waterdrop Game — 15 Minutes

▪Pair students up and give each pair a popsicle stick and a piece of wax paper with about a tablespoon of water in the middle.
▪"Your first challenge is to use your popsicle stick to divide the water into 4 parts. They do not have to be equal parts. You have 2 minutes."
▪"Now divide each of those 4 parts into 2 or 3 parts. You should have at least 8 parts of water. You have 3 minutes."
▪"Now you must take the part nearest the top left of your paper [hold up a piece point to that corner]and unite it with the part nearest the bottom right of your paper [point again] without moving the other parts or uniting it with other parts. So you must move it all the way across the paper without touch other parts on your paper. You only have 2 minutes. Go."

▪Celebrate if students accomplish this. (It should be really difficult because if they get near other water droplets, the water would run together quickly.)
▪Debrief the students: why was this difficult? What did you observe about the water? Did it want to separate or unite with each other?
▪Key Points: liquids can be broken down into smaller and smaller pieces; water is attracted to each other– maybe there's something attracting each other[molecules!]

Miniscule Molecules — 20 Minutes

▪Show students popping "Water Balloon" video. Before viewing slow motion, have the students share their hypotheses of what will happen. http://www.middleschoolchemistry.com/multimedia/chapter1/lesson1#part
▪Show students "Particles of a Liquid" Ask students for their observations of the water molecules and connect to what they observed about water as a droplet.

▪Define molecule and atom. Emphasize how small atoms are: "In about 1 tablespoon of water, there are about 600 billion trillion water molecules. If you count 1 million water molecules every second, it would take about 20 thousand million years to count all the molecules in that one tablespoon. Atoms and molecules are huge in number and incredibly small in size."

▪Explain that water molecules are always have energy and are in motion. Pour water into different containers- "the water molecules are like a city of people- everyone trying go their own way and do their own thing around other people, but they like being in the city and being with the people in their city. Let me show you that molecules really are bumping into each other all the time."

▪Set out a glass of water and a bottle of food coloring. Ask students write down observations. Put a few drops of food coloring in the water. The food coloring should slowly spread until it is even. Point out bumping molecules. Ask students to draw what they think is happening on the molecular level.

Missing Parts…

Alternative supplies:
Popsicle stick-Pencil, pen, or toothpicks
Wax paper- aluminum foil

Since this experiment does not include food in the experiment- offer food as a prize. Or have a small snack for them as they watch videos in the next activity.

Additional Notes

This is the time to help students get accustomed to writing in their journals and keeping their journals neat, organized, and detailed.

Remind them that journals are written not only for them, but for the scientific community to learn from. Connect to the WOW, and the scientists that will visit their table and view their journals. They need to write in enough detail such that the scientists can understand what they see and what they learned.

Objective: Ask a clear question and form a hypothesis that connects to it
Conduct tests of a hypothesis and gather data

Speedy Molecules — 30 Minutes

▪Have several students teachback about molecules (moving randomly, bumping into each other, attracted to each other.)

▪"Great observations about the movement and characteristics of water. We will now do an experiment to learn even more about molecules." Remind them the definition of viscosity- "We will now measure the flow of each liquid. Split students into groups of 3-4. Introduce the experiment and procedure. Make sure students write down their headings (title, etc) with a hypothesis of what will happen for their experiment.

▪Warn students about proper controls for their experiment (Do we need the same amount of liquid in each cup: Yes; Do we use the same amount of food coloring in each cup: Yes; Do we put the food coloring in at the same time: Yes)
▪Remind students of lab norms. Circulate and coach during lab time. Ask students questions about their understanding.

▪Make sure students write a conclusion to their lab. What did they discover about molecules movement?

▪Leave at least 5 minutes for a discussion: make sure students understand the link between molecule movement, viscosity, and molecule characteristics.

✓ Assessment — 5 Minutes

▪Clean up and reset room as needed.

▪Thank students for their professionalism and cooperation. Excite them about the experiments next week!

▪**Exit Ticket:**
6.Define viscosity and name 1 highly viscous liquid.
7.Define atom and molecule. Name 1 characteristic of molecules.
8.Write a hypothesis for how molecules move in milk.

Field Tips

Make some visuals for key points that you want students to take away. These can be posted each lesson to give students reminders (and are helpful for teachbacks).

Experiment setup:
In what liquids are the molecules fastest?
•2 groups—viscosity
•3 cups of liquids: water, honey, cooking oil.
5 drops of food coloring are dropped into each cup, stopwatch started after the first drop.
Make sure cups are labeled!

Future Plans

They will learn more about molecules and how they move due to different temperatures.

Heat Exploration

In this lesson, students will learn about the effect of heat energy on molecule movement. They will conduct a study they designed to investigate the effects of solute on melting and boiling points.

Lesson Objective

- Explain the methods(s) by which a hypothesis can be tested
- Explain the role a hypothesis and data play in learning about a phenomena

Lesson Agenda

5 MIN	**Energizer**
15 MIN	**Energetic Molecules**
20 MIN	**Hot Ice and Cold Fizz**
15 MIN	**Thermometers**
30 MIN	**Alien Situation**
5 MIN	**Assessment**

Lesson Preparation

- **Space:** tables to do experiments on, space for PowerPoint and videos
- **Group:** Students split up into pairs, then lab groups
- **Resources:** YouTube videos

Standards for Unit

- Citizen Schools students will create and test a hypothesis.
- Citizen Schools students will demonstrate how to use technology to produce a desired product.

Connections

Students undergo and internalize the scientific method, helping them learn the essential method to succeed in science classes. They will also become better thinkers and students, which is foundation to their ability to succeed in the 21st century.

Materials

1. Flipchart/markers
2. Science Journals
3. Computer/Projector
4. Food coloring
5. Microwave/stove
6. Tall, clear glasses
7. Ice cubes
8. Baking soda
9. Citric acid (lemon juice)
10. Thermometer
11. Hot ice solution
12. Balloon
13. rubber band
14. 2 empty water bottles
15. Molding clay
16. Straw
17. Sugar
18. Spoons
19. Stopwatch
20. Pin/Tube

Objective: Explain the methods(s) by which a hypothesis can be tested
Explain the role a hypothesis and data play in learning about a phenomena

Energizer — 5 Minutes

- Set up 2 glasses with equal amounts of water, but one will be room temperature or colder and one will be hot. Do not let students touch the glasses.
- Tell students you will put in food coloring and ask for student hypotheses about what will happen. Put 5 drops of food coloring in each glass.
- Have students write down their observations and guess what is different about the two glasses. Let two students touch the glasses.

- Have students think-pair-share about what they saw and how it relates to what they have learned (i.e. molecule movement).

- Ask them to think in terms of heat, molecules, and energy. Key point: higher heat=higher energy=higher molecule movement.

- "We are going to talk about the concept of energy today, an extremely important topic to many scientists."

Energetic Molecules — 15 Minutes

- Share objectives/agenda of the day: making hypotheses and drawing conclusions

- "First, let's brainstorm what we all know about molecules" Assign a scribe and hold a short discussion with the students. Add to their list of understandings from last week as needed.

- "Let's do a quick game, I mean, demonstration. Could I have two 'energetic' volunteers please? And 1 'sensitive' volunteer?"
- Two energetic students rub their hands together for 1 minute as fast as they can. Then they each place one of their hands on one of the sensitive judge's cheek. The judge decides who is more energetic. Keep the energetic volunteer up front. Thank all volunteers.

- Put one ice cube on the table/desk and one in the energetic student's hand. Ask for students hypotheses about which ice cube will melt first and why.
- Have them observe and discuss what is happening on a molecular level. Map out the movement of the energy and heat (verbally and/or visually).

- Show the Bill Nye video: http://www.youtube.com/watch?v=f1eAOygDP5s&feature=related
- (Optional) Demonstrate the swan experiment in video by using ice cubes and a match.
- Define heat energy and temperature.

- Key Point: Everything has energy! (hands, table, etc.). Energy can move from one place to another.
- "Today we are going to look at what energy can do."

Student Says…

Alternatively, show students the video:

Energy demonstration: food coloring diffusion in hot and cold water
http://www.youtube.com/wa
Stop at each question and have students answer before watching the rest of the video

Closer Look!

Be careful to choose very similar shaped and sized ice cubes.

Heat = hotness of matter, as determined by the movement of molecules
Temperature = measure of heat

Objective: Explain the methods(s) by which a hypothesis can be tested
Explain the role a hypothesis and data play in learning about a phenomena

Hot Ice and cold fizz — 20 Minutes

▪Explain the procedure to make the hot ice. Bring out hot ice (prepared night before). Initiate the ice. Let students feel the ice and make observations.

▪Split students into pairs and have them perform the cold fizz experiment. Let students feel the cup, write observations, and collect temperatures as data.

▪Discuss as a class what they observed.

▪Define endothermic and exothermic reaction. Emphasize the systems and heat flow. Ask for teachbacks about the terms.

▪Have students list examples of endothermic and exothermic reactions and occurrences [ice cubes melting, freezing food, baking cupcakes, etc.]

▪"What can energy do? What can you do to change heat energy?" [can move, be stored, gain/lost].

Thermometers — 15 Minutes

▪Set up a tub of hot water. Have a student measure the temperature of the water.

▪Meanwhile, make a liquid thermometer: http://www.ehow.com/how_4867474_make-thermometer-kids.html and a air thermometer (place a slightly inflated balloon over an empty bottle with rubber band). Have students hold these in the hot water carefully and observe what happens. Ask for hypotheses based on their understandings of heat energy and molecule movement.

▪Have students explain why the water level increased and balloon expanded.

▪Set up a cold water tub (or bring out lots of ice for hot water tub).
▪Have students now place the thermometers in the cold water and make hypotheses and observations.

▪Discuss the findings and conclusions. As a teachback, have a student explain the mercury thermometer (if you have one).
▪Key Point: heat increase molecule movement and expands.

▪Discuss why understanding this finding is important to the world (overflowing dams, balloon delivery, highway construction, food manufacturing and delivery)

Missing Parts…

Cold fizz:
http://chemistry.about.com/cs,

Might not feel cold, but should be cold on thermometer.

Hot ice:
http://chemistry.about.com/oc
Show video if needed:
http://www.youtube.com/wat

Additional Notes

If possible, show them the ball and ring demonstration:
http://www.middleschoolchemist
. Try to find alternatives, such as key ring and metal teaspoon.

Objective: Explain the methods(s) by which a hypothesis can be tested
Explain the role a hypothesis and data play in learning about a phenomena

Alien Situation — 30 Minutes

▪Have students teachback how molecules are affect by heat. Remind students that molecules move faster and mix faster when in hotter liquids.

▪Ask students: the rules of heat apply when it's just one substance, but what if it's not a pure substance like water? "A lot of liquids look like it's just one things, but if you read the label, you know there are a lot of ingredients in there. Introduce the terms: solution, solute, solvent. Give examples of solutions: Gatorade, milk, coffee, etc. Ask for teachbacks.

▪Pose situation: Two aliens, Bobzie and Billen, like to drink warm sugar water in the morning. Bobzie boils water and sugar together, while Billen boils the water and then puts sugar in. They both think their method is faster. What do you propose for them?
▪Have students vote on which alien they think is right. Then have students share their rationale (based on detailed observations of their own).

▪As a group, decide on the experiment they want to run. Make sure students can share why they think this experiment will prove one of the aliens wrong.
▪Have all students write out the hypothesis and methods in their science journals. Let students know they will do an experiment like this on solutes and solvents next week.

Assessment — 5 Minutes

▪Clean up and reset room as needed.

▪Thank students for their professionalism and cooperation. Excite them about the experiments next week!

▪**Exit Ticket:**
6.Define heat and temperature.
7.What are 2 ways that heat affect molecule movement?
8.Write one question you have about heat, molecules, or the experiments you observed.

Field Tips

While this situation seems basic, connect to potential decisions that large manufacturing corporations make: when to add materials, time and money that might get wasted by inefficient decisions.

Remind students of expectations.
Encourage more quiet students to speak up.

Future Plans

They learn more about energy and how heat can change the matter that they see!

Atom Investigations

In this lesson, students will learn about the three states of matter through understanding the movement of molecules and energy.

Lesson Objective

- Explain the role a hypothesis and data play in learning about a phenomena
- Conduct tests of a hypothesis and gather data

Lesson Agenda

5 MIN	**Moving Molecules**
10 MIN	**Atoms and Molecules**
20 MIN	**Exploring States of Matter**
20 MIN	**Fondue Fun**
30 MIN	**Solute Intervention**
5 MIN	**Assessment**

Lesson Preparation

- **Space:** tables to do experiments on, space for PowerPoint and videos
- **Group:** Students split up into pairs, then lab groups
- **Resources:** YouTube videos

Standards for Unit

- Citizen Schools students will create and test a hypothesis.
- Citizen Schools students will demonstrate how to use technology to produce a desired product.

Connections

Students undergo and internalize the scientific method, helping them learn the essential method to succeed in science classes. They will also become better thinkers and students, which is foundation to their ability to succeed in the 21st century.

Materials

1. Flipchart/markers
2. Science Journals
3. Computer/Projector
4. Paper Towels/garbage bags
5. colored/suited cards
6. Barometer signs
7. Graphic organizers
8. Ice cubes
9. Glass of water
10. Wax paper
11. Chocolate chips
12. Bowl
13. Treats to dip
14. Microwave/pot and stove
15. Toppings (optional)
16. Salt
17. Stopwatches

Objective: Explain the role a hypothesis and data play in learning about a phenomena
Conduct tests of a hypothesis and gather data

Moving Molecules — 5 Minutes

- Hand each student a number/letter/playing card as they walk in.
- "We are going to put together some of the ideas you have learned in the past few weeks." Move students to separate areas according to their card: representing water (most), salt (few), heat (1 or 2), ice pack(1 or 2)

- "Ok, water molecules, pretend you are in a cup, doing your thing. And then the salt comes in. What should be going on?"
- "Great, I like how the salt slowly works its way through the water so that now they are spread out all over just like in all solutions."
- "Now what if you are honey instead of water?...I like how you are linking up making it more difficult for the solute (salt) now"
- "Oh, here comes the ice pack, what is the solution doing now?"
- "Great job being less energetic and then coming together."
- "Now here's the heat, you are getting really hot, what happens now? … Now you are boiling!"
- "Great job spreading out."

- Have students debrief and explain what happened to the cup of water.

Atoms and Molecules — 10 Minutes

- Share objectives/agenda of the day: collecting data and confirming conclusions.

- "We talked about temperature last week and how it affects molecules. Who can show me a strong silent hand and then give me a teachback on how the liquid thermometers works?."
- "Right, higher the temperature, more space molecules need, more bumping, collisions, or movement in the molecules. We are going to look at what might happen when they get really close or really far from each other.
- "Today, we will talk about the three states of matter that you see around you: solids, liquids, and gases. Remember how the ice cube melts in your hand, especially if it was more energetic?" Make a mini barometer on a table or on the floor with 'cold' and 'hot' on the ends.
- "Ice melting a physical change of the water from solid (ice) to liquid (water) when you heat it. [Put a solid sign near cold and liquid sign in the middle of barometer]. You can also change it back from liquid to solid by putting it in the refrigerator-making it colder[gesture from liquid sign to solid sign]."

- Hold up the gas sign. "How do you turn solid or liquid into a gas?"
- Take students ideas about how water turns into steam. Place gas sign near hot end of barometer. "Remember, temperature is just a measure of heat- what we are talking about is the amount of heat energy" Relate the temperature scale to the amount of heat energy.

Student Says…

Have students share what they think should happen.

Heat and ice pack students can do some coaching.

If students do not know what should happen remind them of viscosity and how they see liquids working.

Don't forget: Remind them about solution, solutes, and solvents!

Could arrange desks or some string to resemble a cup.

Closer Look!

You can also make a 3 bags: ice, water, and air to go with the states of matter signs for the barometer/

After defining solid, liquid, gas, melting point, boiling point, freezing, melting, boiling, condensation (in this and the next activity) place these words on the barometer with arrows for the changes.

Make sure students teachback these terms and can offer examples!

Objective: Explain the role a hypothesis and data play in learning about a phenomena
Conduct tests of a hypothesis and gather data

Exploring states of matter — 20 Minutes

▪Make a visual just about solids, liquids, and gases in order of heat energy. Ask students to give several examples of each state of matter. With the students, list several properties of each state of matter. Have students teach back what the molecules in each state look like.

▪Put an ice cube in a student's hand and show them melting ice video:h ttp://www.middleschoolchemistry.com/multimedia/chapter2/lesson5#mel
"What are the molecules doing? Can you explain it?"
▪Have students teachback what boiling land freezing ooks like, and then add melting, boiling, and freezing to vocab and barometer.
▪Set out a glass of ice water. Put some salt in the glass. Once condensation forms, have students describe and explain what the condensation is. Add condensation to vocab terms and barometer.
▪Ask several (or all) students to play the part of molecules. Call out changing states and make sure students are moving accordingly. Cold call students often to ask what molecules are doing and why.

▪Pair up students and hand out the worksheet (attached). "You have 10 minutes to work with your partner to 1.) fill out blanks 1 through 5 on page 1(make sure that the terms match the barometer we have here)You can also draw in molecules to help you understand each state in the boxes. Then 2.) on page 2, identify what change is happening or what state the item is in. Use page 1 to help you. 3.) Then you will raise silent hands so that I can come check your answers. The first pair to finish the worksheet correctly will get a delicious treat."

Fondue Fun — 20 Minutes

▪Show students a bowl of chocolate chips. Ask for the phase/state.
▪Then melt the chocolate, either by boiling or microwave. (If by boiling, start this process earlier in the lesson so that it will be ready by the time students come by). Ask for the phase/state.
▪Bring out some treats to put in the chocolate: apples, bananas, long pretzels, strawberries, bread, etc. Have students line up and dip their choice in the chocolate and then lay it out on the wax paper. Could also have toppings such as sprinkles. Have them write their names next to their creation.

▪While they are waiting for their chocolate to cool, talk to students about gas- one of the hardest to understand as a state of matter because they cannot see it. Make sure they understand they can boil the chocolate chips to the point that it becomes a gas.

▪Show them the cold fizz experiment (or just baking soda and vinegar), but this time use a bottle and put a balloon over it. Make sure they understand the air can take up space and has mass, just like liquids and solids. It is affected in the same way (remind them of the balloon thermometer.
▪When their treat cools, ask for the state of the chocolate and then let them enjoy the now reshaped chocolate.

Missing Parts…

States of matter properties:
http://www.chem.purdue.edu/

Students may have a hard time imagining what the molecules are like. Have students draw pictures and show them simulations. Ask other students to explain why these models and simulations make sense.

Additional Notes

This may be an extremely messy experiment. Coordinate between CTs/TL how to organize students and set up/ boiling/microwaving of food. Have wet towels on hand. Cover tables with garbage bags. Have skewers for fruit so that students get minimal amounts of chocolate on themselves.

Objective: Explain the role a hypothesis and data play in learning about a phenomena
Conduct tests of a hypothesis and gather data

Solute Intervention — 30 Minutes

▪Have students turn to the experiment they created last week. They will now test how solutes affect changing states of matter.

▪Explain that they will be working with ice and salt instead of boiling water and sugar because they do not have ways to boil the water in class. Ask students to adjust their procedure accordingly.
▪Have students first check over their hypotheses and procedures from last week with their lab groups so that everyone is on the same page.

▪Ask for students that changed their hypotheses to share why.
▪Pass out materials and help students set up their experiment. For example, recording the time it takes to melt 1) ice, 2) ice with salt sprinkled on top, 3) ice with lots of salt sprinkled on top

▪Make sure students record their data and cooperate. Use student supervisor roles.

▪As students finish up, remind them to write a conclusion in their journals. Hold a discussion to share results, conclusions, and questions about states of matter and the effect of solutes. Introduce term: freezing point depression.

✔ Assessment — 5 Minutes

▪Clean up and reset room as needed.

▪Thank students for their professionalism and cooperation. Excite them about the experiments next week!

▪**Exit Ticket:**
6.What are the three states of matter?
7.Define condensation and give an example of condensation.
8.How do solutes affect the freezing point of liquids?

Field Tips

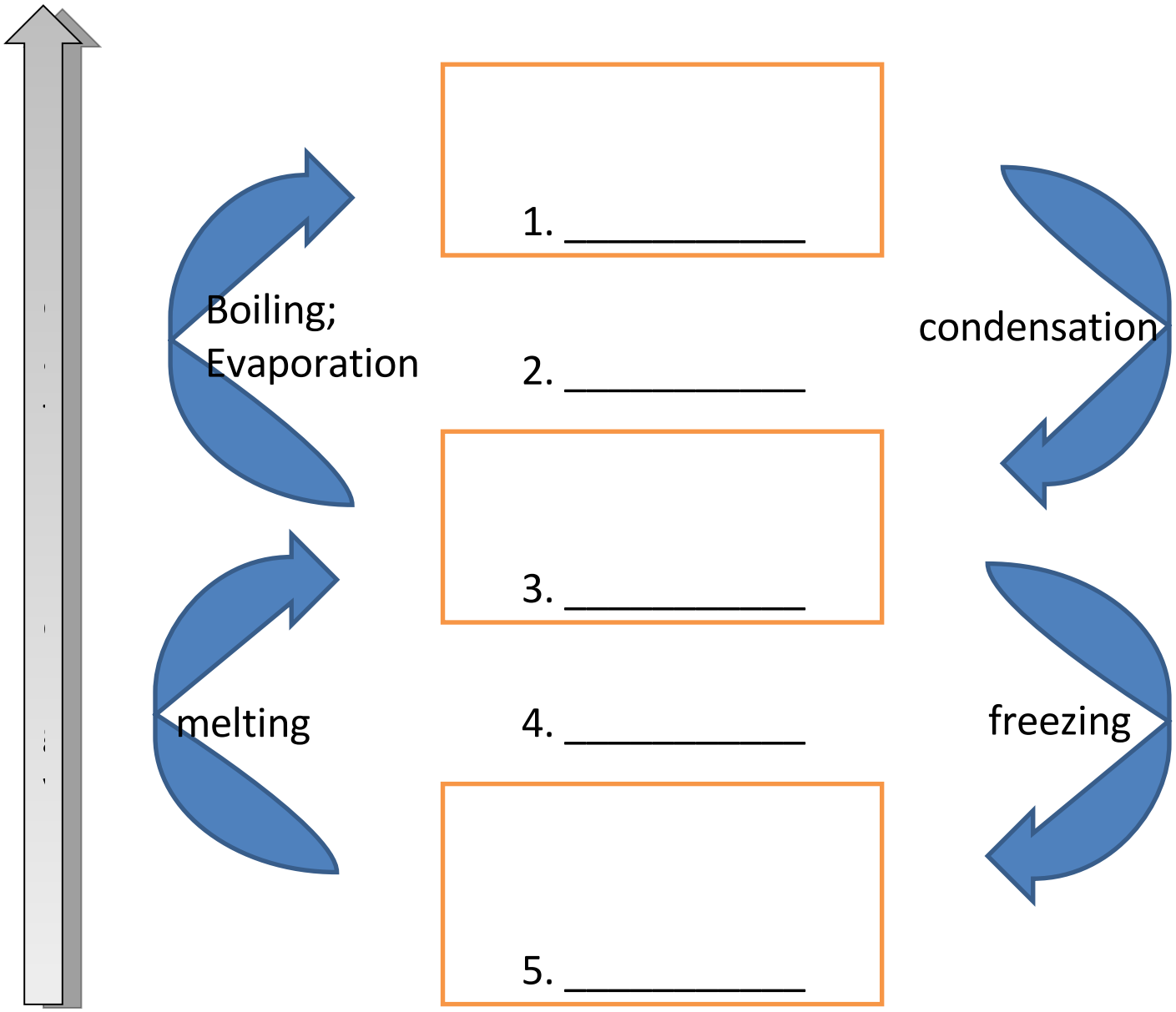
Circulate between groups and ask students questions to check their understanding about the ongoing changes at the molecular level.

Have students draw pictures of the salt molecules interacting with the water molecules as a part of their experiment.

Future Plans

They learn all about ice cream and put together all the chemical ideas they have learned!!

States of Matter Worksheet



Word Bank

- Boiling point
- Melting point
- Solid
- Liquid
- Gas

States of Matter Worksheet

1. A popsicle or ice melting _____
2. Baking cakes _____
3. Ice Cream (in freezer) _____
4. Exhaust from a car _____
5. Syrup or honey _____
6. Candle wax when burning a candle _____
7. Rain _____
8. Clothes in drying machine _____
9. Boiling water _____
10. Mist or Fog _____
11. Sugar _____
12. M&Ms in your pocket or hand _____
13. Chocolate chips _____
14. Kettle or pot of water bubbling _____
15. Windows fogging up on the bus or car _____
16. Chocolate sauce _____

Word Bank

- Boiling point
- Melting point
- Solid
- Liquid
- Gas
- Freezing
- Boiling
- Condensation
- Melting

I Scream for Ice Scream!

In this lesson, students make and eat ice cream! They learn about the history of ice cream and do a bit of experimenting with floats. They will practice the full scientific method and synthesize their understandings of food science surrounding ice cream.

Lesson Objective

- Explain the role a hypothesis and data play in learning about a phenomena
- Conduct tests of a hypothesis and gather data

Lesson Agenda

5 MIN	**Milk Trivia Challenge**
15 MIN	**History and Development**
15 MIN	**Ice Cream Classroom**
25 MIN	**Exploring Floats**
25 MIN	**Mapping and Synthesis**
5 MIN	**Assessment**

Lesson Preparation

- **Space:** space to do experiments and see the projector/visuals.

- **Group:** Students work in pairs or groups for brainstorming and experimenting. CTs/TL should figure out what groups work best.

- **Resources:** Researched materials about ice cream (see links); Fun facts to share with students!

Standards for Unit

- Citizen Schools students will create and test a hypothesis.
- Citizen Schools students will demonstrate how to use technology to produce a desired product.

Connections

Students undergo and internalize the scientific method, helping them learn the essential method to succeed in science classes. They will also become better thinkers and students, which is foundation to their ability to succeed in the 21st century.

Materials

1. Flipchart/markers
2. Science Journals
3. Blank paper/scrap paper
4. Materials about history and development of ice cream
5. Lots of (crushed ice)
6. Rock salt
7. Sugar
8. Milk
9. Vanilla
10. Quart-size freezer bags
11. Containers for ice bath or gallon-size freezer bags
12. spoons
13. Different sodas (root beer, coke, diet coke)
14. (Tall, clear) glasses
15. Fun facts about ice cream

Objective: Explain the role a hypothesis and data play in learning about a phenomena
Conduct tests of a hypothesis and gather data

Milk Trivia Challenge — 10 Minutes

▪Welcome the students with a game show host voice. "Today you are on a trivia game show- all about milk!"
▪Post a fill in the blank visual (sample attached) for students to answer.
▪Group students into 2 or 3 groups, depending on the number of students in the class. Give each group a dry erase board and marker. Assign a scribe for each team.

▪Announce the rules of the game:
▪1 student will be selected at random to read from the beginning to the blank (and continue to the end of the sentence if the blank is in the middle).
▪Both teams will have 1 minute to confer with their team, write down their answer, and hold it up towards the CT/TL at the visual. Both answers will be read and correct answers added to the visual.
▪Each team gets a point for a correct answer. If neither team gets it correct, they will get a small hint and another chance to guess the correct answer.
▪After a blank is filled, another reader will be chosen to read the next part with a blank.

▪At the end, award the winning team with a small treat or cheer.

History and Development — 15 Minutes

▪ Share objectives/agenda of the day.

▪"You already know a lot about milk, so let's learn about ice cream!"
▪ Split students into two groups. Have one group go to the history station, where they hear and read about the history of ice cream.
▪Print out the various stories about the beginnings of ice cream and post them on the walls and have students walk through and read each like a gallery and vote on which one is right. Or a timeline can be made and developed by the students (give them the pieces and have them construct it)

▪Another group goes to the development station, where they learn the composition of ice cream and the process to make it.
▪Describe or have the students read the process of making ice cream (can include historical methods). Have them guess the components of ice cream and the percentage of each. Ask them what is surprising and expected. Ask them for the properties that each part contributes to the taste and texture of ice cream.

▪Then the students switch and go to the other station.

▪"Now that you know all about ice cream, let's make the best ice cream ever! I'm looking for students that show me they are ready for ice cream.."

Student Says…

If the students would not like the game show format, you can print out the visual with the blanks and ask them to fill it out individually or in groups.

Could substitute post-its or scrap paper with the dry erase board. Then you should also assign a designated runner.
You can have a rotating scribe to make sure all students are participating, but this takes more time.

For the composition of milk blanks: this will just be a round of guess and check, so might want to transition to students just shouting out their answers.

Closer Look!

History of ice cream facts and myths:
http://whatscookingamerica.n

Comprehensive website:
http://www.foodsci.uoguelph.

Have a CT/TL at each station.

If all CTs/TL are at stations, set up materials beforehand or during hook.

Objective: Explain the role a hypothesis and data play in learning about a phenomena
Conduct tests of a hypothesis and gather data

Ice Cream Classroom — 15 Minutes

▪Demonstrate and explain the procedure (show a visual). Have students teachback why certain parts are important to the process using the science concepts they learned (heat transfer, freezing, etc).

▪Split students into lab groups and hand out supplies. "When I say go but (not yet), begin assembling the materials for your ice cream baggie and ice bath. Make sure everyone at your table has enough materials."

▪Let them have fun rolling around their container. Put on some music or do some class cheers to keep the energy up as they will be losing some to the ice cream!

▪When the ice cream is ready, pass out spoons and just let students have a taste. "You will have a chance to make more in a bit- let's use this now for an experiment with root beer or soda floats, aka ice cream sodas. "

Exploring Floats — 25 Minutes

•Pose situation: "I love floats, but I don't like the foam that happens when you make them, so let's do some experiments to figure out the best way to reduce it for me."

•Explain the procedure and have students write hypotheses: ½ of the students get cups with various types of soda (according to preference) and put their ice cream into the soda. The other ½ get empty cups and pour soda over the ice cream. They can pour it at whatever speed they want.

•Ask students for what they observe. Have students attempt to explain what they observed. (Why does the ice cream float? Why are there bubbles? What are the bubbles? Why does adding soda second cause more bubbles? Etc.)

•Have students identify various states of matter existing in the float.

▪Have students share their tips on how to decrease foam.

▪(Ask students to share and debate the best way to enjoy a float for fun: http://www.wikihow.com/Consume-a-Root-Beer-Float)

▪**Transition:** Have students clean up the room and the tables.

Missing Parts…

Ice Cream recipe (one of many o

Finding nalgeens/ containers might be tough, so start locating the week before large metal, plastic, or glass containers large enough to hold ice and the bag with the ice cream materials (i.e. coffee can, tupperware, etc.).

This is a good class to bring a camera to, record the students shaking and explaining what they know about ice cream!

Additional Notes

About:
http://en.wikipedia.org/wiki/Ic

Answer to foam questions:
http://thehappyscientist.com/s
(Could use their tips for foam on a short brochure to hand out at WOW!)

Other extensions: What causes brainfreeze?; If more expensive ice cream (more milkfat and less water) is used instead, how would that change the foam?

Objective: Explain the role a hypothesis and data play in learning about a phenomena
Conduct tests of a hypothesis and gather data

Mapping and Synthesis — 25 Minutes

▪Make sure all students clean up their food and their areas. Have them bring out their science journals.

▪"We are going to map out what we have learned so far about chemistry and science. This is a KWL worksheet. Under the K column, write down what you think you know. For example, you can write 'ice cream is cold' or 'how to make butter.' Under the W column, write down what you still want to learn. We don't have much more time, but we might be able to do one more experiment or answer one more question. Under the L column, write down what you have learned, things you will take forward with you. For example, you might have learned how molecules move, what milk is made of, etc. You have 10 minutes to fill this out in detail. Use your journals and the visuals around the room to remind you about the last 6 weeks. I will use this document to help me understand what you can do and want to do for the WOW."

▪Once students are satisfied with their KWL, have them turn it in to CTs/TL. Ask students to share what they loved learning the most.

▪Let students make a second ice cream. Bring toppings and mixes if possible. (As they eat, read them ice cream fun facts: http://www.ice-cream-freaks.com/facts-on-ice-cream.html)

Assessment — 5 Minutes

▪Thank the doctors for their hard work. Tell them the next part of their work will be getting their ideas shared with the world.

▪Get them excited for the video they are making for their WOW! And preview next week's lesson.

▪Exit Ticket
6.Why do you put salt in the ice outside of the ice cream bag?
7.What happens to the water in milk when you make ice cream?
8.Why do ice cream floats create foam and what is one way to prevent this from happening?

Field Tips

Take this time to remind and excite students about the preparations for the upcoming WOW!

Push students to put down a few things for the W column if they get done early.

Ask students for details and specifics about what they know or have learned. They might just be copying down words from their journals or the visuals instead of drawing from their own understandings.

Future Plans

They will be looking at all the questions they have generated from the Question Corner, do some experiments, and starting to think about their WOW! Video.

Milk Trivia Game

Milk is a solution of the solid solute, curd, and the liquid solvent, whey. I can separate the solid and liquid by adding acid, which makes cheese from the fatty solid. If I leave milk out on the counter for 1-2 days, it will separate naturally. If I take milk from a cow, I can let it separate into the less fat milk part and the fatty cream, from which I can shake to make butter from the butterfat. The fat floats because it is less dense than the less fatty liquid. To avoid separation, dairy farmers homogenized the milk so that the fat particles break into little uniform bits that are evenly spread in the milk.

Milk is made of 3.6% of proteins, 4.9% of carbohydrates (lactose), 0.7% of minerals, 1% to 5% of fat, and the rest is water.

K-W-L Worksheet

K *What we know*	**W** *What we want to learn*	**L** *What we learned*

Video Prep

Students will have the chance to synthesize what they have learned over the apprenticeship and identify their WOW! Video topic. They will get their roles and start developing their script for the video.

Lesson Objective

- Identify the technology to be used and the product being created
- Give examples of how their technology will assist with the creation of their product

Standards for Unit

- Citizen Schools students will create and test a hypothesis.
- Citizen Schools students will demonstrate how to use technology to produce a desired product.

Lesson Agenda

10 MIN	**Science Caricatures**
15 MIN	**KWL**
15 MIN	**Conference**
20 MIN	**Role Play**
20 MIN	**Script**
5 MIN	**Assessment**

Lesson Preparation

- **Space:** Classroom space.
- **Group:** groups of 3 to do experiments with.
- **Resources:** Youtube videos

Connections

In this lesson, students will learn about ways to use media to communicate their message. It will be related to storytelling and public speaking. Students will connect their script with the writing they might do in ELA classes and media studies. Students will also think about the ways in which media engage audiences, which will help them become better communicators.

Materials

1. Flipchart/markers
2. Science Journals
3. Computer/DVD player projector
5. Paper to draw on
6. Crayons/markers/pencils

Objective: Identify the technology to be used and the product being created; Give examples of how their technology will assist with the creation of their product

Science Caricatures — 10 Minutes

- Welcome students and give them a numbered/lettered/named card as they enter such that they can be split into 2 even groups.

- Give student a piece of printer/scrap for a drawing.

- Ask one group to: "Please draw a scientist." The other group: "Please draw a science classroom." Provide markers/crayons if possible.

- When all students are done, have them set up/tape up their drawing on the chalkboard/one wall. Have all students gather around the drawing and silently compare for a minute. Then ask for reactions from the students. Ask students why they drew drawing in certain ways.

- Have students generate a list for "What is a scientist?" and "What is science?" Emphasize that science can be a broad term for research.

- "I just wanted to help you all see what you think when you think of science, both good and bad. I do hope that you do see yourself as the scientist in the future. Remember you can be scientists in the kitchen, the laboratory, or anywhere!"

KWL — 20 Minutes

- Share objectives/agenda of the day: communicating their ideas with others

- "Remember science is in everyday objects and experiences. As doctors of science you have a lot to offer because many people have not gotten the chance to learn about things they interact with every day. You also know how to do science-how to ask questions, make predictions/hypotheses, collect data, draw conclusions, and make recommendations from them. This is what science is, let's use it to help others."

- Bring out the students' KWL from last week. Share with students some of the themes and trends you saw about what students learned or want to learn.

- Go over concepts and skills they have learned and how they relates to various careers.
- "In most science conferences and gathering, you have a meeting of the minds- people from all kinds of disciplines and specialties getting together to tackle problems. So if we have some dairy specialists and some heat energy specialists with some experimental scientists get together, we can make great things with simple objects and substances."

- "Let's gather in our own science conference to talk about our video."

Student Says…

Assure students that they don't have to be works of art.

Closer Look!

Consider bringing in handouts about different careers that students can pursue in relation to food science and chemistry.

Objective: Identify the technology to be used and the product being created; Give examples of how their technology will assist with the creation of their product

Conference 15 Minutes

▪"We are going to make a video to teach other's about science, especially science people can do in their own kitchens! In the video you will get to show off what you know and what you can do with science."
▪Introduce the WOW video rubric and the criteria that their WOW video will be graded on. Explain why each criteria leads to a better video.
▪ Have students take out their science journals to observe some videos. Suggested: Misconceptions and a clip of Mythbusters

▪Ask students to share what they learn from these videos.
▪Have students share the best ways to communicate information.

▪"Think about what you would want to share with your friends and family. We are going to figure out how to put that into our video."
▪Ask students to share what they want to communicate through the video (they can use the KWL): what the apprenticeship is, what they do, what they've learned, what they want to teach others. Ask students to share how they want to present science and scientists. Draw from the list from the hook.
▪Remind them that they will likely not get to do everything in a short video.

Role Play 20 Minutes

▪ **Connections:** Share that as scientists, they have a lot to share, but they need to be able to communicate it effectively, which means following a style that people are used to and can understand easily.

3.Decide on the topic.
4.Write the cue to cue of the video and divide into parts. (What will happen in each part? What's the message of each part?) See sample attached.
5.Bring a list of roles that students can play (host, narrator, lead scientist, home scientist, experimental scientist, dairy expert, etc.) Have students brainstorm some of their own roles. Try to keep students in one part/scene so that they can work together with other students in smaller groups.
6.Brainstorm props and locations for the video. See what's within reach of the budget and their families and friends.

▪Assign roles to students and make it clear how their roles connect with the whole story. (Keep it short! Each student may only have a few lines to write a practice.)
▪Post up the details so students can refer to it.

▪Ask students to teach back what happens in their scenes. Make sure they have a vision of their role and scene before writing!

Missing Parts…

Ideas for videos to model after: Bill Nye; Mythbusters
Misconceptions of condensation: http://www.youtube.com/watch?
Mythbusters- Walking on 'water': http://www.youtube.com/watch?
Might need to separate into smaller groups depending on the size of the class and the number and preferences of CTs and TL. Making two or three videos would allow all students more participation time.

Additional Notes

Sample Storyline:
2)Someone poses a question
3)Ask a few people what they think the answer is
4)Scientists puzzle over the question,
5)Ask experts for help,
6)And do experiments to figure out question
7)Then they report the conclusion
Suggested topics: ice cream creation, milk mysteries

Have different parts, a home scene, a laboratory scene, and a field scene, so students can separate their parts. Experts can just have a scene.

Objective: Identify the technology to be used and the product being created; Give examples of how their technology will assist with the creation of their product

Scripting — 25 Minutes

▪Ask students to bring the props they can bring from home. Next week will be practice with the props and their scripts.

3)Have students gather with the other students working on the same part.
4)Each group write/type a script containing all of their lines and directions about visuals/voices/movement/etc. Students should also practice their lines with their team members to make sure the lines flow and work together.
If a student is doing a solo scene- perhaps giving a report from the field or giving expert opinion, pair these students up to review each other's work.
▪Make sure students are on task and getting the help they need with writing and brainstorming.
▪Remind them what message they are sharing and how it connects to the whole video.

▪After 10 minutes, gather the students up and have each group share what they have written. Make sure the story line matches up and address changes that need to be made.

▪Give students more time to write their scripts. They will run through it next week.

Assessment — 5 Minutes

Exit Ticket:
2. *What do scientists do?*
3. *What is one message you want to share in the WOW video?*
4. *What is your role in the WOW video?*

- Thank the doctors for their hard work. Tell them how much you look forward to hearing their wonderful ideas being shared to the public. Get them excited for the WOW!

- Preview next week's lesson.

Field Tips

Would be good to have a full script for the students. Consider collecting all scripts (to also make sure they don't lose it) and then typing it up for all the students to have a copy of the whole script.

Future Plans

Preparing for recording.

CITIZEN SCHOOLS

Name:
Topic:
Role: HOSTS

Hi my name is _____ and this is -_____. We will be your hosts this evening bringing to you the I SCREAM YOU SCREAM apprenticeship. Some questions we will answer tonight include:

- •Where does MILK come from?
- •Why is Ice Cream so cold?

AND

- •How does Ice Cream get creamy?

We know you all love ice cream. (Ask your co-host) What is your favorite ice cream?
(co host answers) umm I love all kinds of ice cream but my favorite is _____.
Today we hope that you will learn to love ice cream even more and understand it as a science. Our milkologists are ready to report where ice cream comes from. Milkologists take it away.

STOP! STOP! STOP! STOP!

INTRODUCING SCIENTISTS

Thank you milkologists for informing us on the JOURNEY of MILK. Let's give them a 1.2.3 (NICE)
(asking co-host) Did you know cows were that important in making ice cream?
(co-host answers) Yes they are. Even what they eat helps cows produce milk. But you know what Im still unsure about? How does milk become ice cream? I mean why do they have different textures? Our temperatologists and we matter teams can answer these questions for us. But first let's have our scientists explain a few scientific concepts.

STOP! STOP! STOP! STOP!

INTRODUCING THE WE MATTER TEAM

Thank you scientists for your excellent presentation about the scientific method. That was a lot of information. Let's give our viewers a quick TEACH (everyone in the background screams BACK) about the scientific method:

- •You always start with a QUESTION.
- •A HYPOTHESIS is an educated guess to that question.
- •Then you follow a PROCEDURE to an experiment that will give you results.
- •Use results to make a conclusion.

Now that we have that knowledge, let's have our "we matter" team further discuss the different states of matter of the different ingredients.

INTRODUCING TEMPERATOLOGISTS

-Let's give our we matter team a 4,5,6 (SWEET – from people in the background). Finally, our temperatologists can finish off by explaining how temperature affects the ingredients of ice cream

CLOSING

And that folks is I scream you scream. Im _____and Im _____ and we want to give you a 7,8,9 (Kool – Aid) for being a great audience. Hope you all enjoyed the show.

CITIZEN SCHOOLS

Ice Cream Scientist		
What did you learn about ice cream?	States of Matter	Heat
What are the different states of matter?		
How do you make ice cream?		
Why do you use salt		
What are some Careers?	Food Scientist	Chef
	Nutritionist	
What do Food Scientists do?		
What do Chefs do?		
What do nutritionist do?		
What are some Majors?	Food Science	Culinary Arts
	Nutrition	

WOW! Practice

In this lesson, students will refine their WOW! Video. The time will be focused on finishing and polishing scripts so that students can be recorded.

Lesson Objective

- Use digital technologies, communication/networking tools and/or social networks appropriately to access and create information
- Use new technology by both following steps and experimenting or innovating

Lesson Agenda

5 MIN	**Video Analysis**
20 MIN	**Team Conference**
60 MIN	**Role Play and Recording**
0 MIN	
0 MIN	
5 MIN	**Assessment**

Lesson Preparation

- **Space: Room for students to spread out to write and practice their scripts. Recording space.**
- **Group: Script/scene working groups.**
- **Resources: Youtube videos**

Standards for Unit

- Citizen Schools students will create and test a hypothesis.
- Citizen Schools students will demonstrate how to use technology to produce a desired product.

Connections

In this lesson, students will learn about ways to use media to communicate their message. It will be related to storytelling and public speaking. Students will connect their script with the writing they might do in ELA classes and media studies. Students will also think about the ways in which media engage audiences, which will help them become better communicators.

Materials

1. Flipchart/markers
2. Rubrics
3. Computer/DVD player
   projector
4. Science Journals
5. Video camera

Objective: Use digital technologies, communication/networking tools and/or social networks appropriately to access and create information
Use new technology by both following steps and experimenting or innovating

Video Analysis — 5 Minutes

▪Have students take out their science journals to observe several videos.

▪Show them Seasons and a clip of Mythbusters

▪Ask students to share what is engaging about the videos and what they want to take from these videos for their own video.

▪Connect videos to stories and movies. Have students brainstorm ways to use video to engage their audience.

▪ **Transition**
▪"Let's talk about what needs to be done to make our video engaging and complete our video . Please gather in a science conference."

Student Says…

Seasons:
http://www.youtube.com/wa
Misconceptions- density and sublimination:
http://www.youtube.com/wa
Mythbusters- Pie-Crete:
http://www.youtube.com/wa

Team Conference — 20 Minutes

▪ Share objectives/agenda of the day: developing an engaging video

▪ **Connections:** Share that as storytellers, they need to engage people so that they can impart their story and their message. They need to think about the advantages of the portable video recorder and what they can do as performers/actors.

▪Post and review the rubric, detailing the 4 criteria for a high quality WOW! Video. Hand out a copy to each student to review their own scripts.

▪Ask students to practice reading out their scenes in order. During some students are reading, the other students should rate and consider the flow of the story.

▪Discuss each criteria of the rubric and whether their video fulfills that criteria. Ask for suggestions to make the video more engaging and informational and generate a list of changes to be made.

▪Set goals for the end of the day (i.e. Have all lines memorized, have each group complete a full practice run without scripts, record a few parts if possible).

Closer Look!

Display the timeline of the video production and assign students to various roles surrounding the video making of various scenes/parts of the video.

Have a student write down roles so that students know who to find and work with.

Objective: Use digital technologies, communication/networking tools and/or social networks appropriately to access and create information
Use new technology by both following steps and experimenting or innovating

Role Play — 60 Minutes

▪Let students separate into various groups and roles to finish up their scripts, practice, and prepare for recording as appropriate.

▪Stop them 20 minutes after group work time to check student progress. At this point, the script should be complete.

▪Once the script is in working order and finalized, let students go back into their groups to practice and/or prepare props.

▪When students have practice their scenes at least twice, students that are ready may record in various spaces or work on making or setting up props.

▪Note: Students from other apprenticeships may be recorded. Coordinate with other teachers ahead of time.

▪Circulate to make sure students are on task and working together. Call "Freeze" if issues need to be addressed.

▪Might want to pause students in the middle to double-check students are progressing as needed.

Assessment — 5 Minutes

▪ **Transition**
▪Thank the doctors for their hard work, teamwork, and focus today. Get them excited for their WOW! Video.

▪Check the progress of the video and write down action steps as needed as a group.

Exit Ticket:
7.What are three ways that you can engage audiences with video technology?
8.Name 2 ways that our WOW video is engaging.

Missing Parts…

Students that need more structure and guidance can be given to-do/checklist or specific action steps.

TL and CTs should coordinate how to manage and help students in various groups. It would be helpful to hear each students' lines and give pointers before students are recorded.

Try to record some of the smaller, simpler parts today if possible!

Future Plans

Video recording and more WOW! preparation

WOW! Video

In this lesson, students will refine, complete, and reflect on the WOW! Video. The time will be focused on finishing and polishing scripts so that students can be recorded.

Lesson Objective

- Use digital technologies, communication/networking tools and/or social networks appropriately to access and create information
- Use new technology by both following steps and experimenting or innovating

Lesson Agenda

10 MIN	**Video Analysis**
15 MIN	**Team Conference**
65 MIN	**Video Making**
0 MIN	
0 MIN	
5 MIN	**Assessment**

Lesson Preparation

- **Space: Practice and Recording space.**
- **Group:**
- **Resources:**

Standards for Unit

- Citizen Schools students will create and test a hypothesis.
- Citizen Schools students will demonstrate how to use technology to produce a desired product.

Connections

In this lesson, students will learn about ways to use media to communicate their message. It will be related to storytelling and public speaking. Students will connect their script with the writing they might do in ELA classes and media studies. Students will also think about the ways in which media engage audiences, which will help them become better communicators.

Materials

1. Flipchart/markers
2. Rubrics
3. Computer/DVD player
   projector
4. Science Journals
5. Video camera

CITIZEN SCHOOLS

▪Objective: Use digital technologies, communication/networking tools and/or social networks appropriately to access and create information
▪Use new technology by both following steps and experimenting or innovating

Video Analysis — 20 Minutes

▪Remind students that they are creating a high quality video that shares a message and engages audiences (ask for a teachback).

▪Post the rubric, pass out student journals, and have students rate each video: Bill Nye, a boring speaker, a boring video.

▪Ask students to share what they liked or did not like about the videos as an audience. Ask them to think about what they want to take from these videos for their own video.

▪Define and refine rubric as needed through brainstorming. Have several students teach back why the rubric is important and what the objective of the video is.

▪Connect to the videos and scenes developed so far. Brainstorm and make changes if possible.

▪Thank the students for their attention to detail and excitement about making their video engaging.

Team Conference — 15 Minutes

▪ Share agenda and objectives of the day: develop a quality video for a major audience.

▪Gather students in a science conference.
▪Have students share progress and action steps. Brainstorm ways to troubleshoot obstacles (props, recording location, still practicing scripts).
▪Discuss the scenes that need to be recorded today and ensure that the students in each scene have the script and structure set. Decide which scenes to record first and how/where/when as a group. Assign tasks to students that have already recorded their scenes (camera crew, sign maker, costume designer/manager, timekeeper, etc.) Most recording should be completed today if possible.

▪Connect students to the 4 criteria for a high quality WOW! Video on rubric. Let them know that they will be rating their own video tomorrow.

▪Ask students to teach back the message and purpose of the video.
▪Remind them that it's their audience that they should be thinking about. They should also have fun and show it!

▪ **Transition**
▪Let students separate into various groups and roles to finish up their scripts, practice, and record as appropriate.

Student Says…

Bill Nye:
http://www.youtube.com/wa
Video about hard candy (boring speaker):
http://www.youtube.com/wa

Closer Look!

Display the structure and timeline of the video development process.

Post up checklists, reminders, roles, and other important information that students may need to refer to.

Objective: Use digital technologies, communication/networking tools and/or social networks appropriately to access and create information
Use new technology by both following steps and experimenting or innovating

Video Making — 65 Minutes

▪Most students will be practicing their parts at this point. Help them speak in a more engaging way, being clear, loud, and enthusiastic. Have them practice with partners or group members.

▪Make sure students practice at least 3 times before recording, especially if they are interacting with others.

▪Some students may be recording in various spaces or setting up props.

▪Note: Students from other apprenticeships may be recorded for sound bites. Coordinate with other teachers ahead of time.

▪Circulate to make sure students are on task and working together. Call "Freeze" and have a short conference if issues need to be addressed.

▪Might want to structure a pause/"progress check" in the middle to double-check students are progressing as needed.

Assessment — 5 Minutes

▪*Check the progress of the video and write down action steps as needed.*
▪Thank the doctors for their hard work, teamwork, and focus today. Get them excited for their WOW! Video.

▪*Exit Ticket*
5.Why is a high quality science video important?
6.What are you doing to ensure a high quality video?

Missing Parts…

Students that need more structure and guidance can be given to-do/checklist or specific action steps.

TL and CTs should coordinate how to manage and help students in various groups. It would be helpful to hear each students' lines and give pointers before students are recorded.

Future Plans

Video evaluation and WOW! preparation

WOW! Refinements

In this lesson, students will refine, complete, and reflect on the video they have created. They will also prepare for the science conference panel so that they can present themselves as qualified scientists.

Lesson Objective

- Use new technology by both following steps and experimenting or innovating
- Evaluate their skill in use technology to create the desired product

Lesson Agenda

8 MIN	**Home Videos**
7 MIN	**Rubric Evaluation**
15 MIN	**Panel Brainstorm/Revision**
40 MIN	**Practice**
10 MIN	**Dress Rehearsal/Premier**
10 MIN	**Assessment**

Lesson Preparation

- **Space: Recording space if still recording.**
- **Group:**
- **Resources:**

Standards for Unit

- Citizen Schools students will create and test a hypothesis.
- Citizen Schools students will demonstrate how to use technology to produce a desired product.

Connections

In this lesson, students will learn to evaluate and reflect upon their own performance and process. The importance and usefulness of this and other aspects of communication skills for their futures are emphasized.

Materials

1. Flipchart/markers
2. Rubrics
3. Computer/DVD player
   projector
4. Science Journals

▪Objective: Use new technology by both following steps and experimenting or innovating
▪Evaluate their skill in use technology to create the desired product

Home Videos — 8 Minutes

▪ **Do Now / Warm Up**
▪Hand out or set out a rubric at each table.
▪Tell students to read the rubric as they sit down and show you when they are ready.
▪Ask for clarifying question and tell them they have some clips to evaluate.
▪Have them make a table in their journals for easy recording.

▪Put up clips that they have already recorded and have them rate each clip.

▪Give them 1 minute for silent reflection/observations in their journals and ask students share their thoughts.

▪ **Transition**
▪Thank them for their honesty and congratulate them on their keen eyes. Emphasize that science is a process and of course it won't be perfect, but the important part is to learn from each experience.

Student Says…

Students might have trouble with vocabulary words in rubric, so post definitions in preparation.

Students will probably laugh and giggle a lot. As long as they are attentive and able to evaluate (don't let them get too focused on how they look), have some fun!

Rubric Evaluation — 7 Minutes

▪ Share objectives/agenda of the day: developing and improving communication skills.

▪ **Connections:** Share that as scientists, they have a lot to share with their judges and audience, but they need to be able to communicate it effectively. After this experience, they will be much better prepared for many professions and experiences.

▪ Have students compare their evaluations with each other (first in a pair, then pair up again to a group of 4, then share with the class).
▪ Have a discussion about discrepancies in ratings and why we have them. Ask for a few specific examples.

▪Have students share progress and action steps. Brainstorm ways to troubleshoot obstacles (props, recording location, still practicing scripts).
▪Make action steps and assign roles for the day as needed.
▪Connect to rubric and the skills they need to demonstrate for a high quality product/presentation.

▪ **Transition**
▪Go over how this rubric will also be important to the panel or ask them how to start brainstorming revision ideas.

Closer Look!

Write down student responses so that all ideas can be viewed, possibly on post-its or on concept map so that ideas can be linked and moved around.

- Objective: Use new technology by both following steps and experimenting or innovating
- Evaluate their skill in use technology to create the desired product

Panel Brainstorm/Revision — 15 Minutes

- Assemble students in science conference and set the agenda
- Sample Agenda: Objective of Panel, Brainstorm, Focus Questions, Role Assignment, Action Steps, Assessment

- Have students teach back the objective of the panel.
- List out possible ways to present and hold the panel.
- Discuss what questions to ask and roles students should take on.

- Make sure that students know what their responsibilities are and how to accomplish them.
- Relate the panel back to the rubric.

- If recording is not yet complete, either allow recording to happen either in conjunction or instead of the panel discussion.

- **Transition**
- Check for understanding and progress of individual student roles. Allow them to transition to individual writing, practice, or recording.

Missing Parts…

Students would benefit from some videos or demonstrations of professional panels.

Have specific roles so that students can take responsibility for ensuring the success of the panel.

Practice — 40 Minutes

- Allow students to accomplish their roles. All students should be working with partners or small groups so they can get peer help.

- Make sure students are on task and getting the help they need.

- Post all necessary and relevant information in the classroom.

- **Note:** Consider the amount of work to be completed and the attention required from teachers. Set up structures/stations/etc. as needed for the work and the students.

Additional Notes

CT and TL will need to decide how to allow for enough time for practice and performance depending on what is being work on. They will also need to figure out how to supervise and aid students that need help.

May want to check in at the middle of the Practice time or check in with individual groups throughout the activity time.

- Objective: Use new technology by both following steps and experimenting or innovating
- Evaluate their skill in use technology to create the desired product

Dress Rehearsal/Premier — 10 Minutes

- Prepare a "stage" with chairs, name tags, and bottled water
- Gather students with popcorn and snacks
- If most students will be performing, leave the snacks for the debriefing period.
- Encourage students to take notes and use the rubric.
- After the performance, do a short reflection and debrief. Encourage all students to share a plus and delta if time permits.
- **Transition**
- Share your appreciation for the students' insights and hard work.

Field Tips

Remind the audience members that they are still participants and the same expectations from conference (i.e. active listening) are expected even if they are not speaking.

✔ Assessment — 10 Minutes

- Have students teach back several things they learned and appreciate from the apprenticeship. Thank the students for their reflective thoughts and share your own!
- Thank the doctors for their hard work throughout the apprenticeship. Tell them how much you look forward to hearing their wonderful ideas being shared to the public. Get them excited for the WOW! and hand out a certification of appreciation to each "doctor".

Future Plans

WOW!

Script for Businesses and Scientists

ALL STUDENTS		
Name		
Grade		
Name of Apprenticeship		
WOW! Role		
What do you want to be when you get older?		
What is this apprenticeship about?		
What did you learn in the apprenticeship?		
What is your favorite part of the apprenticeship?		
Ice Cream Scientist		
What did you learn about ice cream?	States of Matter	Heat
What are the different states of matter?		
How do you make ice cream?		
Why do you use salt		
What are some Careers?	Food Scientist	Chef
	Nutritionist	
What do Food Scientists do?		
What do Chefs do?		
What do nutritionist do?		
What are some Majors?	Food Science	Culinary Arts
	Nutrition	

ALL STUDENTS		
Name		
Grade		
Name of Apprenticeship		
WOW! Role		
What do you want to be when you get older?		
What is this apprenticeship about?		
What did you learn in the apprenticeship?		
What is your favorite part of the apprenticeship?		
BUSINESSMEN and BUSINESSWOMEN		
What did you learn about business?	Profit Plan	Cost-benefit Analysis
What is the profit plan?		
What is cost benefit analysis?		
What are some Business Careers?	Marketing	Entreprenuership
	Finance	Business Administration
What is Marketing about		
What is Finance about		
What is Entrprenuership		
What is Business Administration		
What are some Business Majors?	Marketing	Finance
	Entreprenuership	Business Administration

Host Script

Name:
Topic:
Role: HOSTS

INTRODUCTION
Hi my name is _____ and this is -_____. We will be your hosts this evening bringing to you the I SCREAM YOU SCREAM apprenticeship. Some questions we will answer tonight include:
Where does MILK come from?
Why is Ice Cream so cold?
AND
How does Ice Cream get creamy?

We know you all love ice cream. (Ask your co-host) What is your favorite ice cream?
(co host answers) umm I love all kinds of ice cream but my favorite is _____.
Today we hope that you will learn to love ice cream even more and understand it as a science. Our milkologists are ready to report where ice cream comes from. Milkologists take it away.
STOP! STOP! STOP! STOP!

INTRODUCING SCIENTISTS
Thank you milkologists for informing us on the JOURNEY of MILK. Let's give them a 1.2.3 (NICE)
(asking co-host) Did you know cows were that important in making ice cream?
(co-host answers) Yes they are. Even what they eat helps cows produce milk. But you know what Im still unsure about? How does milk become ice cream? I mean why do they have different textures? Our temperatologists and we matter teams can answer these questions for us. But first let's have our scientists explain a few scientific concepts.
STOP! STOP! STOP! STOP!

INTRODUCING THE WE MATTER TEAM
Thank you scientists for your excellent presentation about the scientific method. That was a lot of information. Let's give our viewers a quick TEACH (everyone in the background screams BACK) about the scientific method:
You always start with a QUESTION.
A HYPOTHESIS is an educated guess to that question.
Then you follow a PROCEDURE to an experiment that will give you results.
Use results to make a conclusion.
Now that we have that knowledge, let's have our "we matter" team further discuss the different states of matter of the different ingredients.

INTRODUCING TEMPERATOLOGISTS
-Let's give our we matter team a 4,5,6 (SWEET – from people in the background). Finally, our temperatologists can finish off by explaining how temperature affects the ingredients of ice cream

CLOSING
And that folks is I scream you scream. Im _____and Im _____ and we want to give you a 7,8,9 (Kool – Aid) for being a great audience. Hope you all enjoyed the show.