

Teacher Notes- “Candlelight Journey Through The 3 States Of Matter”

Teaching the states of matter doesn't have to be difficult. It can indeed be easy and even pleasant, as this activity demonstrates. In it students will observe a lit candle in total silence and write their observations. Then each student will share an observation. And those you will build on, gradually introducing them to the states of matter.

The emphasis in this lesson is on energy, which is constantly entering and leaving atoms, causing them to speed up and slow down. You can use it anytime during your chapter on the states, but it's a perfect chapter opener.

Materials per group of 4 students:

1-candle and holder

Additional Teacher Materials:

Lighter/matches

Beforehand:

1. Decide how many candles to light:
 - a. If you aren't sure if candles are allowed in your building, ask your principal. But before going in to talk, be ready to explain the need for them, as well as precautions you'll take. Some buildings don't allow *decorative* candles, but allow them for purposeful lessons like this.
 - b. If you aren't comfortable with candles right in front of students, you can get by with just one large one at the front or center of the room, though there are obvious drawbacks. To see if this will work for you, light a candle and walk around your darkened classroom to see how well every student would be able to see. You may also come up with another idea in the process.
 - c. Putting each candle in a plastic box or on something non-flammable will reduce risk and waxy mess.
2. Prepare yourself:
 - a. Close all window blinds.
 - b. Remind yourself and students where the running water, the fire extinguisher, and other emergency items are around your room, should anything go wrong.
 - c. If you have exhaust fans, turn them on. When all the candles get blown out there's going to be some smoke.
 - d. Think ahead about what *could* go wrong, and then decide what you would do if anything were to happen. Plan on speaking to your students about getting



- anything too close to the flame. Books should be removed from the table top. Hair and loose clothing kept back.
- e. Put matches or lighter in your pocket, or in an accessible place student's can't get to.
 - f. Set out candles and stands *the day before*. Leave yourself time to realize you're missing something, research something or even make a change. In the morning read through the notes one last time. Relax and have fun along with your students. Remember- you're only as effective as your plan.

Procedure:

1. Ask students to take out a sheet of paper and title it "Candle Observations". If candles are not yet out, have students get them now. Also have students remove everything else from their table top or desk except their paper and pencil.
2. Before turning out the lights and lighting the candles, introduce the lesson and talk to students about what is about to happen, and the purpose of this activity.
3. Turn off the lights and light candles. As you do, remind students how much you trust them by doing this. Be specific with your warnings so they know you've thought about this ahead of time and realize the danger:

"Students- keep everything, and that means EVERYTHING, at least 2 feet away from the flame. And please don't blow at the flame either since it interferes with the purpose of this lesson (*and annoys everyone else*).

(*and since most students like to please, also throw in...*) Be a responsible person today so I won't get called into my principal's office and have to explain how one of you burned yourself in my class. **Any silliness at all, and your candle will be immediately blown out (be ready to enforce this!).**"

Caution: Keep flammables, loose clothing, hair, and hands well away from the flame. Locate all fire safety equipment and be familiar with their operating procedure BEFORE class begins. Comply with all fire codes in your building. Keep matches and lighters out of student reach. Blow out candles as soon as the lesson is over.

4. If you want, this would also be an ideal time to talk about using candles safely at home. Most students aren't aware that the flame is over 1,000° F. Candles are beautiful, soothing, and aromatic. But keep them away from curtains, papers, and anything else flammable.
5. Now on to the lesson:

"We are starting a chapter on solids, liquids, and gases today. They are all around us, and right now it is also happening right in front of you. All 3 states of matter, solid, liquid, and gas, are occurring right now around your candle.

We will now take 5 quiet minutes and observe the candle. Study it. Let your mind go, and notice things you never have before. As you notice things write them down on your paper.

The reason I want you to observe for 5 minutes is because for the first minute or two you'll be noticing things you've always noticed about candles, and the last minute or two you'll notice some new and interesting things. There's no certain number of things I want. Just a good list.

When the 5 minutes are up, you will each share one observation. I'll mark the time on my watch right now. You may begin observing and writing."

6. Note what time the class began their 5 minute observation period. During the 5 minutes, stay seated and observe your students. That tells them that you think this is the most important thing going on, and they can't get away with anything silly like they could if you were distracted with busywork. While students are observing the flame for 5 minutes, you'll also have a chance to watch them being enthralled with the movements of the flame, and struggle to put their thoughts into the right words.
7. When the 5 minutes are up, tell students to choose one observation they wrote and be ready to share it when called on. It's ok if they share one that's already been said. When you're speaking at this point, use a soft voice because it fits the mood and sets a tone of respect. Ask students to speak up when it is their turn, as if they're talking to the person sitting furthest from them.
8. With the lights still off, call on students for their observations. As they share, listen to every word they say. If they have a very soft voice repeat what they said for others to hear. Be appreciative of each thought, and make it a point early on to build on the thoughts of a student not typically successful.
9. When leading the discussion, do more listening than speaking. Although there are some ideas you need to eventually get across (see step 11), it may be best to let your teacher notes go. That will seem scary at first, but the discussion always turns out better when it originates from the students.
10. Here are a few observations that you'll likely hear from students:
 - The candle got smaller the longer it burned
 - Some of the liquid wax ran down the side and turned back into a solid
 - My candle is red
 - The flame is blue on the bottom, then yellow, and red on top
 - There is a small "halo" about an inch around the flame
 - The top of the flame is brightest
 - The middle of the flame is brightest
 - There is a shadow dancing at the bottom of the candle holder
 - The flame moves with the air currents
 - The top of the candle stick is glowing
 - The end of the wick glows orange
 - The area just around the burning wick is black

(end of Teacher Notes preview)

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Additional Teacher Materials:
Lighter/matches

Procedure:

1. Ask students to take out a sheet of paper and title it "Candle Observations".
2. Light each candle. Warn students to not act silly around the flames, and to keep all hands, hair, clothing, books, and paper at least 2 feet away.
3. Turn off classroom lights.
4. Tell students that for the next 5 minutes they will quietly study the flame and record observations about it on their paper, and to be ready to share one observation at the end of the 5 minutes.
5. When the 5 minutes are up, go around the room calling on each student to share one of their observations about the flame.
6. As students share, and in your talk afterwards, emphasize that the wax never changed chemically, and that the energy from the flame is what caused the solid to melt into a liquid.

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