



Wizards of Wright

Lesson: Matter and Atoms

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| <p>Background Info for Wizards:</p> | <p>Atoms are the basic building blocks of matter. In this lesson the students will gain a better understanding that all things are made of matter and have a brief introduction to atoms and molecules. Students will mainly focus on the 3 states of matter.</p> <p><i>Our final activity will get messy. Have students lay newspaper or plastic tablecloths down and have paper towels ready. Remind teachers that “art shirts” would be a good idea. Discuss the possibility of doing this activity outside with the teacher.</i></p> |
| <p>Materials:</p> | <p>1 magnifying glass for each student 1 tray for each group items to look at through the magnifying glass</p> <ul style="list-style-type: none">- (rocks, leaves, pieces of fabric, seeds, flowers, pieces of bark, coins, buttons, beads, clay) <p>Poster of an atom. A battery. All About Atoms Worksheet (one for each student)</p> <p>3 plastic jars for States of Matter demonstration</p> <ul style="list-style-type: none">- each jar has bouncy balls and/or beads in them- one will be filled all the way, one will be filled part way, and one will be barely filled <p>for each group:</p> <ul style="list-style-type: none">- tray to work on- spoon for stirring- 1 cup of cornstarch- 1 plastic bowl- 1 cup of water- baggies for storage- food coloring (optional)- newspaper or plastic tablecloths <p>Paper towels to share.</p> |



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| <p>Lesson Time: 95 minutes</p> | <p>Introduction: 10 minutes Guided Lesson #1: 5 minutes Student Activity #1: 10 minutes Guided Lesson #2: 10 minutes Student Activity #2: 10 minutes Guided Lesson #3: 10 minutes Wizard Demonstration #1 and Student Activity #3: 10 minutes Student Activity #4: 10 minutes Student Activity #5: 15 minutes Conclusion: 5 minutes</p> |
| <p>Learning Targets:</p> | <p>Students will understand that atoms are the building blocks of matter.</p> <p>Students will be able to define and explain matter.</p> <p>Students will understand that matter is made of atoms and molecules.</p> <p>Students will be able to explain the 3 states of matter and what makes them different.</p> |
| <p>Introduction for Students: 10 minutes</p> | <p>Say to the students: Today we are going to talk about matter and the molecules and atoms that make up matter.</p> <p>First, let's define matter.</p> <p>Ask the students: Can anyone tell me what matter is? - Anything that takes up space.</p> <p>Say to the students: Matter is anything that takes up space. Let's list some examples of matter.</p> <p>Ask the students: Is air matter? (yes) Is water matter? (yes) Are rocks matter? (yes)</p> <p>Say to the students: I'm going to give you just a minute, to turn to someone near you and come up with 3 things to add to our list. Hopefully, we can all come up with different things.</p> <p>After a minute, start calling on groups to list at least one thing they came up with that is matter. (Write the list on the board. You will refer to it later. Guide them so that we make sure there are solids, liquids, and gases on the list.)</p> <p>Ask students: Let's say that we are making pizza for dinner. What would we need?</p> |



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| | <ul style="list-style-type: none"> - dough - cheese - sauce - toppings <p>Ask students: Let's break it down even further. Does anyone know what dough is made of?</p> <ul style="list-style-type: none"> - flour - yeast - water - salt <p>Ask students: Let's break it down even more. Does anyone know where the flour in the dough comes from?</p> <ul style="list-style-type: none"> - Flour comes from grinding up a grain. <p>Say to the students: Why are we talking about pizza? I want you to be able to think about something large, and then see that we can break it down into the smaller pieces that make up that original thing. Just like our pizza example, all things in the universe are made of smaller parts.</p> <p><i>You can give other examples, or the students might be able to give examples of their own. (Start large and break it into the smaller parts.)</i></p> <p><i>Country – States – Cities – Neighborhoods</i> <i>Book – Chapter – Paragraph – Sentence</i> <i>Sentence – Word - Letter</i></p> |
| <p>Guided Lesson #1: 5 minutes</p> | <p>Say to the students: All matter is made of atoms.</p> <p>An atom is the basic building block that everything else is made of. There are many kinds of atoms, with different names and sizes.</p> <p>Atoms are very tiny. The largest one would be about 200,000 times <u>smaller</u> than the width of a human hair. Because they are so small, atoms can't be seen without special microscopes.</p> <p>So far scientists know of about 118 different kinds of atoms. You've probably already heard of some of them. For example, helium, oxygen, and gold are each made up of one single kind of atom.</p> <p>Say to the students: Let's look at the list we made earlier. All the objects on the board may seem very different from each other, but they also all share an important similarity. The main similarity is</p> |



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| | <p>exactly why we added them to our list. Everything up here is matter. Everything up here is made of atoms.</p> |
| <p>Student Activity #1: 10 minutes</p> | <p>(Students will be working in small groups for this activity. Groups should be just 2-3 students. Ask the teacher if the groups have already been created. If not, wait while he or she does this.)</p> <p>Show students a magnifying glass. Explain that magnifying glasses make objects appear larger because their curved lenses bend the light. In a way, magnifying glasses trick our eyes into seeing something differently than it really is.</p> <p>Give each group a tray of items to examine and give each student a magnifying glass. Tell them that they will have a few minutes to look at each item through the magnifying glass.</p> <ul style="list-style-type: none">- Tell them that besides the items on the tray they can examine things around them without leaving their seats.- They might want to compare the fabric on the tray to the fabric used for their clothes.- They can also look at things in their desks like the tip of a pencil, or the writing in a book.- They should also check out their fingerprints or maybe a strand of hair. (We don't want them pulling out their hair, so they can ask a friend if they can look at their hair.) <p>After a few minutes of examination, collect all the materials. Have a few students share what they observed.</p> <p>Say to the students: You have just seen some of the small parts of these objects. However, all matter is made of even tinier particles that can't be seen, even using a high-powered microscope.</p> <ul style="list-style-type: none">- All matter is made of tiny particles called atoms.- Everything from the list we put on the board earlier, and all matter is made of atoms. |
| <p>Guided Lesson #2: 10 minutes</p> | <p>Say to the students: As we now know, atoms are the basic building blocks of matter that make up everyday objects. A desk, the air, and even people are made up of billions and billions of atoms.</p> <p>But did you know that atoms are made up of even smaller parts? They are electrons, protons, and neutrons.</p> <p>Hold up the poster of an atom and name each of the parts. Hang it on the board if you can.</p> |



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| | <p>Ask the students: Have you heard any of these words before? (If they have, they might want to share a few things they already know.)</p> <p>Say to the students: The protons and electrons that make up an atom have electrical charges.</p> <ul style="list-style-type: none">- The protons and neutrons are in the center of the atom, the nucleus.- The electrons are on the outside of the atom. <p>Ask the students: Can you tell me what you already know about an electric charge? Or where you might have seen something where the positive end and negative end are marked?</p> <ul style="list-style-type: none">- If they don't mention it, take a moment to talk about static electricity and how it feels when they get "shocked". This happens from a buildup of electrons in one place.- Also talk about (and show) the positive end and negative end of a battery.- Ask if anyone has had to change the battery in their game controller or remote. Have they noticed the + and -? Have they ever put in a battery the wrong way? <p>Say to the students: Just like that battery, the parts of an atom have opposite charges.</p> <ul style="list-style-type: none">- Protons have a positive charge.- Electrons have a negative charge.- Neutrons are neutral – they have no charge. |
| <p>Student Activity #2: 10 minutes</p> | <p>(Students will be working in small groups for this activity. Groups should be just 2-3 students. Ask the teacher if the groups have already been created. If not, wait while he or she does this.)</p> <p>Say to the students: I want to give you the opportunity to label the parts of an atom that we just talked about.</p> <p>Pass out the All About Atoms worksheet to everyone and encourage them to talk to their group as they fill it out. Give the students about 5 minutes to work.</p> <p>Take a few moments to go through the answers with them.</p> |



Guided Lesson #3:

10 minutes

Say to the students: You have now been able to explain to me that matter is everything around us.

We've also discussed that matter is made of atoms.

When atoms join or bond together molecules are formed. For example, you might have heard someone call water "H₂O". That's because two hydrogen(H) atoms and one oxygen(O) atom combine to make a water molecule.

Ask the students: Have you ever heard the phrase "States of Matter"? (Depending on the answer from the class, you can either explain the different states of matter, or ask the students for some examples.)

There are three main states of matter.

Ask the students: Do you know what the states of matter are?

- Solid
- Liquid
- Gas

Say to the students: The state that matter is in is based on its molecules.

Say to the students:

Solid

Molecules are tightly packed together.

Solids have a definite shape.

Ask the students: Can you name some things that are solids?

Examples: rocks, ice, books

Say to the students:

Liquid

Molecules are not tightly packed.

Liquids don't have a definite shape. They take the form of the container they are in. (*Example: If I fill a cup with milk, and then pour the milk into a bowl, the water takes the shape of the item it is in.*)

Ask the students: Can you name some things that are liquids?

Examples: lava, water, oil

Say to the students:

Gas

Molecules are very spread apart.

Gases have no definite shape, but spread out to fill the container they



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| | <p>are in. Ask the students: Can you name some things that are gases? Examples: oxygen, hydrogen, steam, or water vapor</p> |
| <p>Wizard Demonstration #1: Student Activity #3: 10 minutes</p> | <p>Say to the students: Let's take our discussion about molecules a little further.</p> <p>Say to the students: As we've said, the 3 states of matter are solid, liquid, and gas and the state that matter is in is based on its molecules. Let me show you what that means.</p> <p>Say to the students: Let's do a couple of activities to show the difference between solids, liquids, and gases – and how their molecules act.</p> <p>Ask the students: I have these 3 jars. What is different about them?</p> <p>Say to the students: This jar (hold up the one where the items inside are packed full) represents a solid. The molecules inside are tightly packed together, and when I shake it (shake the jar) there's not a lot of room for them to move around.</p> <p>Let's pretend that our fists are the molecules that make up our 3 states of matter. I want you to make fists with both of your hands and push your fists together. Right now, your molecules are packed tightly together.</p> <p>Ask the students: How does this represent a solid?</p> <p>Say to the students: Solids hold their shape because of the closeness of their molecules. There's no space for them to move around or change.</p> <p>Say to the students: This jar (hold up the one where the items inside are packed half full) represents a liquid. The molecules inside are not packed as tightly as in the solid, and when I shake it (shake the jar) there's a little more room for them to move around.</p> <p>Now, let's use your fists again. Gently roll them around in a slow circular motion.</p> <p>Ask the students: How does this represent a liquid?</p> <p>Say to the students: These molecules have room to move around. Because of the placement and flow of the molecules, liquids can take the shape of whatever container they are in. (At this time, you may hold up a cup of water or your jug of water to demonstrate that the water takes the shape of the container.)</p> |



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| | <p>Say to the students: This jar (hold up the one where the items inside are loosely packed) represents a gas. The molecules inside are not packed tightly at all, and when I shake it (shake the jar) there's a lot of room for them to move around. Gas molecules move freely and quickly.</p> <p>Ask the students: Assuming that your fists are still molecules, how would you represent the movement of gas molecules? (Let the students try to show you, then demonstrate by moving your fists around in random patterns.)</p> |
| <p>Student Activity #4: 10 minutes</p> | <p>(Students will be working in groups of 3 for this activity. Ask the teacher if the groups have already been created. If not, wait while he or she does this.)</p> <p>Explain that you will need 3 volunteers to demonstrate this activity. Have the 3 students stand next to each other with their shoulders touching.</p> <ul style="list-style-type: none">- Explain that standing like this, makes them molecules in a solid. (Refer to the jar again.)- Ask them how much they should be able to move around as molecules of a solid?- Have them slightly shrug their shoulders. <p>Have the same 3 students take a step away from each other.</p> <ul style="list-style-type: none">- Ask them which state of matter they are representing now?- Ask them how much they should be able to move around as molecules of a liquid?- Have them slightly move their bodies. <p>Have the same 3 students move an arm's length away from each other.</p> <ul style="list-style-type: none">- Ask them which state of matter they are representing now?- Ask them how much they should be able to move around as molecules of a gas?- Have them move around. <p>Now, invite all students to stand around the room in their groups of 3. Give them instructions to be a solid. Give them instructions to be a liquid. Give them instructions to be a gas.</p> <p>Go though it a couple of times, and then have the students take their seats again.</p> |



Student Activity #5:

15 minutes

Ask students: Did you know that you can change matter?

What happens when salt is added to an icy road during the winter?

- It makes the snow and ice melt faster.

Ask students: How about boiling an egg? How does the egg change once it is cooked?

In both of our examples, we see the state of matter change. Now it's your turn to do just that. You are going to make something called Oobleck.

(Students will be working in small groups for this activity. Groups should be just 2-3 students. Ask the teacher if the groups have already been created. If not, wait while he or she does this.)

This activity will get messy. Have students lay newspaper or plastic tablecloths down and have paper towels ready. Remind teachers that "art shirts" might be a good idea. (Consider going outside if able.)

Go over the Facts About Ooblek on the student sheets before beginning.

You may want to mix a batch first as a demonstration for the students.

1. Put 1 cup of cornstarch in a bowl.
2. Slowly stir in small amounts of water until the mixture is thick like syrup.
3. Add a few drops of food coloring if you choose.
4. Squeeze the gooey mixture between your fingers.

Pass out materials and give students a direction sheet. As they are working move around the room guiding and helping.

- What happens?
- Can you shape it into a ball?
- Hold the ball on your flat palm. What happens?
- What happens when you pour the mixture into another container?

Conclusion:

5 minutes

Review with students:

- What is matter?
- What is matter made of?
- What are the 3 states of matter?



- How are the 3 states different from each other?

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