Module Three: Modelling Matter

Teacher Notes

Welcome to the third module of our series! This series of modules is intended to help Grade 5 teachers introduce ideas about models and about the particulate nature of matter to their students. Module 3 begins with asking children to think about what they have already learned about the macro-properties of solids, liquids, and gases through their hands-on explorations in your classroom. They are also asked to recall from Module 1 that all models are ‘good enough’ models featuring both strengths and limitations. Children revisit the idea that solids, liquids, and gases are comprised of small, unseen particles and that it is important to think about the movement and arrangement of these particles in matter. Students are provided with the opportunity to visit a Virtual Classroom and click on common objects to view models of small, unseen particles related to these objects. Students are supported to think about how everything (even their own bodies!) is comprised of small, unseen particles. Important to this module is to help students understand that the models of small, unseen particles help to explain the properties of solids, liquids, and gases that they have already explored in class.

Note: The script for the module is included at the end of these Teacher Notes.

Links Between Module Three and the Alberta Elementary Science Program

As you teach the expectations that are listed for Classroom Chemistry in the Alberta Elementary Science Program, your students will be encountering examples of solids, liquids, and gases. The properties of solids and liquids and gases can be explained by referring to the arrangement and movement of the small, unseen particles that comprise matter. In order to begin to understand the behavior and arrangement of small, unseen particles, scientists (and teachers) must use a variety of models. In this third module, students are asked to think about the movement and arrangement of small, unseen particles in solids, liquids, and gases and how this can be used to explain the properties of matter.

Tips for using Module Three with your Grade 5 Class

Note: If you want to retain a record of your students’ thinking about the ideas in this module, please photocopy the worksheet included in these Teacher Notes and distribute the worksheet prior to beginning viewing.

- Progress through the module using the forward arrow.
- If necessary, use the back arrow to return to a previous page.
- While reading questions, keep the cursor outside the question box.
- Discuss possible answers and consider reasons for your answers.
- Roll the cursor back over the question to reveal an answer.
- At anytime you can click on Home to return to the beginning.
Big Ideas (Concepts) Featured in Module Three – Modelling Matter

- A model (e.g., a picture, an animation, a scale model) is a representation of an object, an event, or an idea.
- All models have strength and limitations; models are ‘good enough’ for explaining some ideas about the real thing.
- All matter is comprised of small, unseen particles that are in constant motion (yes, even solids!).
- Small, unseen particles make up everything in our world and in the universe.
- Solids feel hard and keep their shape. Liquids are able to flow and take the shape of their container. Gases can spread out in all directions.
- The properties of solids, liquids, and gases can be explained by thinking about the arrangement and movement of small, unseen particles.

Background Information about the Particle Nature of Matter

A basic understanding of chemistry is necessary in order to understand our world around us. The study of chemistry includes:

1) the composition of matter (matter is made up of small unseen particles called atoms).
2) the observable properties of matter (mass, odor, color, temperature, solubility, etc.).
3) how matter can be transformed (either physically or chemically).

We use models to help us explain our observations about the world of matter. Key features of the particle nature of matter are:

1) all matter is comprised of small, unseen particles that are in constant motion (yes, even solids!).
2) there are attractive forces between small, unseen particles.
3) there are empty spaces between the small, unseen particles (e.g., there is empty space between each and every water molecule).
Module 3: Modelling Matter
Student Worksheet

Names: _________________________________________________________________

1. Talk with another student and write down how solids, liquids, and gases are different from each other.

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

2. Talk with another student about what could be used to model the arrangement and movement of these small, unseen particles. Record your ideas.

We could use ___________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

Why did you choose these things? _________________________________________
_______________________________________________________________________
_______________________________________________________________________

3. Talk with another student and write down what else in your room is made of small, unseen particles.

_______________________________________________________________________
_______________________________________________________________________
4. Talk with another student and write down what you think you would have seen if you could have clicked on a person in the classroom.

5. Think back to the pop can and the small, unseen particles. Draw arrows below to show small, unseen particles in the air (a gas), the pop can (a solid), and the pop (a liquid):
6. Is the picture below a solid, liquid or gas? ______________

We made this choice because _______________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

What would this feel or look like? _________________________________________
_______________________________________________________________________
_______________________________________________________________________

7. Is the picture below a solid, liquid or gas? ______________

We made this choice because ________________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
What would this feel or look like? __________________________________________

_______________________________________________________________________

_______________________________________________________________________

_______________________________________________________________________

8. Is the picture below a solid, liquid or gas? ________________

We made this choice because _______________________________________________

_______________________________________________________________________

_______________________________________________________________________

What would this feel or look like? __________________________________________

_______________________________________________________________________

_______________________________________________________________________

9. Do you think small, unseen particles have different colours? No     Yes (circle one)

Why do we use different colours when modelling small, unseen particles?

_______________________________________________________________________

_______________________________________________________________________
Module 3: Modelling Matter
Module Script

As you work through this module, pay attention to the questions. After trying to come up with answers on your own, you can roll over each question with your mouse to see if you are right. To listen to the text, click the play button.

**Thinking About Your Existing Ideas**

In Module Two, you thought about solids, liquids, and gases. Talk with another student and write down how solids, liquids, and gases are different from each other.

Scientists think that we can explain the properties of solids, liquids, and gases if we believe that all matter is made up of small, unseen particles. Talk with another student about what could be used to model the arrangement and movement of these small, unseen particles. Record your ideas.

**Everything is Matter!**

It is important to remember that everything is matter. Solids, liquids, and gases are types of matter. The properties of solids, liquids, and gases can be explained by thinking about their small, unseen particles.

**Models of Small, Unseen Particles**

In Module Two, we used building blocks, dancing leprechauns and coloured spheres to model small, unseen particles. These models show that a bigger object can be made of smaller objects. Although the building blocks did not move, the leprechauns and the coloured spheres did move.

These models help us to think about the movement and arrangement of small, unseen particles that make up solids, liquids, and gases. They help us because we can see them and they show that a bigger thing can be made up of an arrangement of smaller things.

**Exploring the Small, Unseen Particles That Make Up Everything**

What would a classroom look like if we modelled the small, unseen particles of everyday items? On the next page you will see a very special classroom. Click on the objects and watch closely.

**Thinking About What You Observed**

As you clicked on objects in the classroom, you observed good enough models of the small, unseen particles that make up various solids, liquids, and gases.
Talk with another student and write down what else in your room is made of small, unseen particles.

Talk with another student and write down what you think you would have seen if you could have clicked on a person in the classroom.

Think back to the pop can and the small, unseen particles.

Talk with another student about the different ways the small, unseen particles move and are arranged in the air (a gas), the pop can (a solid), and the pop (a liquid). The small, unseen particles in the aluminum can hold tightly to each other, and vibrate. The small, unseen particles in the air are very far apart and don't hold onto each other. The small, unseen particles in pop hold less tightly than the solid, and move freely past one another.

Drag the small, unseen particle videos to their matching states. Try again. If you need to, go back to the virtual classroom and review the differences in particle movement and arrangement. That's right. Good job matching the small, unseen particle models with their matching state. Congratulations! You have correctly matched all of the videos. Let us take a closer look at the different small, unseen particles that make up a pop can.

**Solids**

Watch closely. Solids, such as the pop can, feel hard and keep their shape. Our model explains these properties by showing the small, unseen particles in the aluminum can holding tightly to each other and vibrating.

**Liquids**

Watch closely. Liquids, such as pop, are able to flow and take the shape of their container. Our model explains these properties by showing the small, unseen particles holding less tightly to each other than in the solid and moving freely past one another.

**Gases**

Watch closely. Gases, such as the gas inside pop bubbles, can spread out in all directions. Our model explains this property by showing the small, unseen particles in the gas very far apart and not holding onto each other.

What else can we learn about particles from these models? Why does the model use different colours and shapes for the particles that make up the pop can, pop, and bubbles? Real particles are not actually coloured. These models are different shapes and colours to show that different kinds of matter can be made of different kinds of particles.
What do you think is in between the particles? There is only empty space between the particles that make up solids, liquids, and gases. The spaces are not filled with air, liquid, or any other kind of stuff. There is nothing between the particles.

**What Have You Learned?**

Is this a solid, liquid, or gas?

Talk with another student and then write down your choice. Explain why you made this choice.

Remember our model of a solid? The small, unseen particles hold tightly to each other and vibrate.

Remember our model of a liquid? The small, unseen particles hold less tightly to each other than a solid and move freely past one another.

Remember our model of a gas? The small, unseen particles are far apart and don't hold on to each other.

What is your choice? solid liquid gas

Correct, Now talk with another student and write down what you think a solid would feel or look like.
Correct, Now talk with another student and write down what you think a gas would feel or look like.
Correct, Now talk with another student and write down what you think a liquid would feel or look like.

Talk with another student and write down what you think something made of small, unseen particles which behave like this would feel or look like.

**Conclusion**

Everything is made of matter. Solids, liquids, and gases are types of matter. Small, unseen particles make up all matter. Models help us to picture the small, unseen particles. The arrangement and movement of small, unseen particles can help explain the properties of solids, liquids, and gases.

**What Have You Learned?**

Do you think small, unseen particles have different colours?

Why do we use different colours when modelling small, unseen particles?
Looking Ahead

We hope you enjoyed thinking about the small, unseen particles that make up everything. In the next module (Module Four), you will get to think more about small, unseen particles and how they can be used to explain physical change.
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