

What's that Matter!

Band level: Years 5 to 6 (Beginner level activities)

Description: Students will explore the types of reactions in matter using Augmented Reality and the Merge Cube. This lesson is a deeper look into the **Types of Reactions** section of the **Merge Explorer** app. Here students can explore atoms and molecules and how matter can change.

Resources:

- iPad, (no internet required)
- Merge cubes
- Mega Merge Cube (optional)
- MERGE Explorer app
- Worksheet



Prior Student Learning: Merge Cube Magic lesson one

What is Augmented Reality? Augmented reality is using technology to superimpose information such as sounds, images and text onto real world objects that we see. It works by adding the digital content onto a live camera feed, making that digital content look as if it is part of the physical world. This could be anything from making your face look like a dinosaur to overlaying digital directions onto the physical streets around you.

What is a Merge Cube? The Merge Cube is a spongy, dense black foam cube with silver markings on all six sides in patterns similar to QR codes. The patterns provide an Augmented Reality trigger that launches when any of the Merge apps are pointed at the cube. It provides a powerful interactive experience in a real world environment where an object (the cube) is enhanced by a 3D digital-generated image that comes to life by using the camera on a digital device.

What is the Merge Explorer App? With the MERGE Explorer app students will learn about topics such as earth science, life cycles, the solar system, anatomy, properties of matter, weather and climate, ecosystems and more. The app provides students with an interactive experience in which digital images, sounds and text can be seen on the Merge Cube. Students can investigate a volcano, examine inside the human body, and hold the earth in the palm of their hands. They can even dissect a frog (humanely)!



Curriculum Links:

Band/Year Level	Digital Technologies Achievement Standard By the end of Year 6, students explain the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. Students define problems in terms of data and functional requirements and design solutions by developing algorithms to address the problems.
Year 5 to Year 6	
	Content Descriptions: Digital Technologies: Knowledge and Understanding Examine the main components of common digital systems and how they may connect together to form networks to transmit data (ACTDIK014) Digital Technologies: Process and Production skills Define problems in terms of data and functional requirements drawing on previously solved problems (ACTDIP017)
Year 5 & Year 6	Science Achievement Standard By the end of Year 5, students classify substances according to their observable properties and behaviours. By the end of Year 6, students compare and classify different types of observable changes to materials. Content Descriptions: Science Understanding: Solids, liquids and gases have different observable properties and behave in different ways (ACSSU077) Changes to materials can be reversible or irreversible (ACSSU095)
Level 4	General Capabilities ICT Capabilities <ul style="list-style-type: none"> ● Locate, generate and access data and information ● Select and use hardware and software ● Understand ICT systems Critical and creative thinking <ul style="list-style-type: none"> ● Locate, generate and access data and information ● Imagine possibilities and connect ideas



Whole class activity: Explore Phase

The teacher introduces the students to the Human Body through Augmented Reality and using the **Types of Reactions** section of the **MERGE Explorer** app (see Attachment A). Explain how the AR happens through the camera of the device and superimposes the image onto the cube. This could be done using the Mega Cube for the whole class to see (see Merge Cube magic Lesson One).

Group work activity: Play Phase

1. Divide the students into pairs or groups and provide an iPad and merge cube to each.
2. Open the **Merge Explorer** app and navigate to the **Types of Reactions** section.
3. Read through the topic card information and allow students to explore how matter changes.
4. Interact with each AR activity to explore, discover and learn.
5. Students should be able to answer the following questions.

<p><i>Rewind that</i> Reversible matter?</p> <p>Students explore the 3 different states of water: solid, liquid and gas. They observe the effects of energy on molecules through heating and cooling. Describe the changes that occur.</p>	<p><i>Burning fire</i> What is chemical change?</p> <p>Students investigate chemical reactions that change substances. The module will visualize the transformation that cannot be reversed. Let students watch the chemical change take place in their hand.</p>
<p><i>Strong Bonds</i> How do atoms stay together?</p> <p>Students investigate the strength of bonds in a water molecule. Why do they stay together? How does heat bind them and what does it take to split them again? Let students explore the reaction chamber to make and break covalent bonds.</p>	<p><i>3-2-1 Blast Off!</i> What makes the rocket move?</p> <p>Students learn the importance of chemical reactions, and how they create energy. Change the amount of substances the increase or decrease the possible explosion to launch the virtual rocket.</p>



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Types of Reactions

Essential Questions

- What are the three states of matter?
- What is an example of a reversible change?
- What is an example of a change that is not reversible?
- In what states of matter can water be found?
- What happens during a chemical change?

Activity

1. Today we are going to perform all kinds of science experiments using your Merge Cube. You'll explore different types of state changes and reactions, make a water molecule, and even build a bottle rocket. Let's get started!
2. Open the Merge Explorer app, and find the Types of Reactions topic card and read the introduction. Some of the concepts in the activities may be a review for you, while others may be brand new for you to learn about - and they are all super fun!
3. Go to Activity One and read the description. What are the 3 different states of any matter? If a solid turns to a liquid, can that liquid be turned back into a solid? Press play to see what happens to the ice as the temperature gets hotter. What happens when the temperature cools down again? What can you conclude about changes caused by heat?
4. Have you ever seen wood burning in a fireplace or a campfire? Once wood is burned, do you think it can be turned into wood again? Read the description for Activity Two, then press play to see what happens to the oak log as heat in the form of fire is applied to it. What happened to the oak log? This is a chemical change, which cannot be reversed! Was a new substance formed from the wood burning?
5. Read the introduction for Activity Three. Let's take a closer look at what water is made of! What is the chemical formula of water? You will need 2 Hydrogen atoms and 1 Oxygen atom. Now press play to mix hydrogen and oxygen. What new substance is created from mixing these elements?

6. Read the description for Activity Four. In this activity, you will add heat to these atoms to bond them together to make water, then electricity to break the covalent bond in the Reaction Chamber! Press play to test it out for yourself.
7. Now go to Activity Five and read the description, then press play to make your own bottle rocket! You will mix together vinegar and baking soda to create a chemical reaction! Use the slider to adjust the amount of vinegar and baking soda needed to power your rocket, and then press launch! How far did your bottle rocket go? Keep trying to find the best combination for the farthest launch. What type of ratio made the rocket travel the farthest?

Assessment

1. **Video recording:** Record a video describing what happened during the bottle Rocket experiment in Activity 5. What type of reaction occurred, and how do you know?
2. **Science Notebook:** Answer the Essential Questions in your science notebook.

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