**Physical Science - Middle School**  
**Properties of Matter**

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Avatar(s) &amp; Environment</th>
<th>Suggested Learner Audience</th>
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</table>
| **Simulations for Secondary Science Teachers Conference**  
Shanna Hays  
Tori McPetrie  
Dr. Robert Moody  
Dr. Andrea Ridley  
**Mursion**  
Jessica Gasparolo | **Host Avatar(s)**  
Nina/Michael  
**Simulation Avatars**  
Savannah, Dev, Ava, Jasmine, Ethan  
**Environment [ML3z]**  
Middle School-8th Grade Classroom | ● Teachers  
● Non-credentialed Teachers  
● Pre-service Teachers |

**Delivery Mode(s) Available for Scheduling**  
1:1, Facilitated Group

This scenario was created in partnership with AACTE and the convening, Enhancing Science Education through Virtual Reality: A Conference to Design Simulations that Enhance the Clinical Preparation of Secondary Science Teachers, is funded by the National Science Foundation (NSF) 20-572 Discovery Research PreK-12, award #2040747.

**Learner-Facing Vignette:**

You are a middle school science teacher, and you are continuing a unit on the three properties of matter with your students. For today’s lesson, you will lead a class discussion beginning with the prompt question “Which is the densest: ice, water or steam?” During the class discussion, ask the students to reference the pre-loaded worksheet on their tablets, which details the molecular structures of the three properties of matter. Encourage the students to expand and build on their hypotheses as a group in order to come to a class consensus.

**Outcome:**

Your goal in this scenario is to use higher-order thinking questions to lead student discussion about the basics of molecular structure and density.

**Strategies/Best practices to consider:**

- Use higher-order thinking questions to engage the entire class critically on the topic
- Ask students to provide explanations for their assumptions
- Encourage students to engage in investigative planning

**Information about Intensity Range:**

- Low intensity sessions are meant to build confidence for the learner. This setting is recommended for first time learners.
**Supplemental Materials:**

**Students Prior Knowledge:**
The three properties of matter. Outside of this the students may have limited to no prior knowledge.

This scenario is gearing toward practicing the following of the [Next Generation Science Standards 8 Practices of Science & Engineering](https://ngss.nsta.org/practicesfull.aspx):¹

<table>
<thead>
<tr>
<th>Asking Questions &amp; Defining Problems</th>
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<td>A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and which can be empirically tested.</td>
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<th>Obtaining, Evaluating, and Communicating Information</th>
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<td>Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity.</td>
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Physical states

**Solid**
The molecules that make up a solid are arranged in regular, repeating patterns. They are held firmly in place but can vibrate within a limited area.

**Liquid**
The molecules that make up a liquid flow easily around one another. They are kept from flying apart by attractive forces between them. Liquids assume the shape of their containers.

**Gas**
The molecules that make up a gas fly in all directions at great speeds. They are so far apart that the attractive forces between them are insignificant.

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