**Reviewer Name\_Regina Callegari, Sean Gordon & Nicole Carilli\_\_\_\_ Grade: 4/5\_Lesson/Unit Title: Oobleck\_\_\_\_\_\_\_\_\_\_\_\_\_**

**I. Alignment to the NGSS**

The lesson or unit aligns with the conceptual shifts of the NGSS:

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| Criteria | Specific evidence from materials and reviewers’ reasoning | Suggestions for improvement |
| A. Grade‐appropriate elements of the science and engineering practice(s),disciplinary core idea(s), and crosscutting concept(s), work together tosupport students in three‐dimensional learning to make sense ofphenomena and/or to design solutions to problems.i. Provides opportunities to develop and use specific elements of thepractice(s) to make sense of phenomena and/or to design solutions toproblems.ii. Provides opportunities to develop and use specific elements of thedisciplinary core idea(s) to make sense of phenomena and/or to designsolutions to problems.iii.Provides opportunities to develop and use specific elements of thecrosscutting concept(s) to make sense of phenomena and/or to designsolutions to problems.iv.The three dimensions work together to support students to make senseof phenomena and/or to design solutions to problems. | 1. **Evidence of opportunities for students to develop and use the practices include:**
* Students will be working with Oobleck (model) and describing the properties of this substance as they relate to solids and liquids in Activity 1 .
* Students will be engaging in arguments from evidence and communicating information in Activity 2 when they are attending the Science Convention and come up with the Law of Oobleck.
* Students will be developing and using models when they design a spacecraft to land on Oobleck.in Activity 3 this is part of engineering desigin.
* Students will be obtaining, evaluating and communicating information in Activity 4 when they are asked to list the ways they have acted like scientists. They also learn about the Mars Rover mission and how engineers worked to land it safely on Mars. Students also read about how scientists also engaged in argument from evidence, came up with different explanation, did further testing and then came to an improved understanding of the “blueberries” found on Mars.
* Students are then able to plan and carry out an investigation of their choice pertaining to Oobleck.
1. **Evidence of opportunities for students to develop and use the DCIs include:**
* Students will be looking at states of matter when investigating the Oobleck. Students will be discussing and identifying when does Oobleck act like a liquid or a solid.
* Students will be designing a spacecraft to land on a sea of Oobleck. They will also be given the opportunity to fix or change their spacecraft just as engineers improve existing technologies or develop new ones to increase the benefits.
1. **Evidence of opportunities for students to develop and use the CCCs include:**
* Students will look at the causes and effects of tweaking their spacecrafts to make their landings and take off s successful.
* Students will be able to conduct their own investigation on Oobleck with the opportunity to change or see how the mixture is affected by changes such as temperature, or adding more cornstarch .etc.

iv. Each of the three dimensions work in an integrated manner to support students as they make sense of phenomena. Evidence of this exists in Activity 3 when students must use what they know about the properties of Oobleck to land and lift their spacecrafts. Also in Activity 5 students are given the opportunity to formulate a question, design and conduct an investigation to attempt to answer a question, draw a conclusion from the results, and finally share their conclusion with others.  | To make the practice of studying the properties of Oobleck easier for the students , they should be given the opportunity to first work with and investigate the properties of solids, liquids, and gas in order to build background knowledge. Students could also draw and act out the behavior of the molecules for solids, liquids, and gas in a science journal before working with Oobleck. Students can also be shown video clips on space exploration before starting activity 4 and learning about the Mars Rover mission.Students that cannot come up with a question to investigate further in Activity 5 can be assigned a question to investigate.  |

A unit or longer lesson will also:

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| Criteria | Specific evidence from materials and reviewers’ reasoning | Suggestions for improvement |
| B. Lessons fit together coherently targeting a set of performance expectations.i. Each lesson links to previous lessons and provides a need to engage inthe current lesson.ii. The lessons help students develop proficiency on a targeted set ofperformance expectations.C. Where appropriate, disciplinary core ideas from different disciplines areused together to explain phenomena. D.Where appropriate, crosscutting concepts are used in the explanation ofphenomena from a variety of disciplines.E. Provides grade‐appropriate connection(s) to the Common Core StateStandards in Mathematics and/or English Language Arts & Literacy inHistory/Social Studies, Science and Technical Subjects. | B i. Investigation 1 introduces the students to Oobleck and they get to investigate its properties. Investigation 2 the Scientific convention allows the students to discuss and use evidence to create a “Law of Oobleck” In investigation 3 students use the information they know about the properties of Oobleck to design a spacecraft that will land and take off from sea of Oobleck. The last activity allows them to investigate further a question they might have about Oobleck. ii. The lessons help students develop proficiency toward the targeted PE as evidenced by the examples above. Students will develop and use three dimension to complete this unit C. The Unit touches on both a physical science DCI and an engineering DCI. You could also tie this unit to ELA CCCS RI 5.7 which is reading informational text. This occurs when students are presented information to read and discuss the Mars Rover missions. D. In Activity 5, depending on the questions students want to investigate about Oobleck, it could be tied to math standards in which students can depict a graph to display results of their investigation that can include patterns, cause and effect. E. ELA W5.4 Produce clear and coherent writing Math students can create charts, graphs or line plots to display information of their results depending on the question that they wanted to investigate further on Activity 5 Math CCCS 3.MDA.2 measurement and data3.MD.B.3 Measurement and data represent and interpret data (picture graph, bar graph, tally charts) |  Students should be reading and making the literature connections by reading text that is fictional and informative text, such as, “Bartholomew and the Oobleck” as well as reading books on Mars to further deepen their understanding of Mars exploration. These activities should also be implemented while you are implementing the unit. Students can also use creative writing and assign the students the task of drawing and describing what an “Oobleckian” would look like.  |

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**Evidence that Disciplinary Core Ideas (DCIs), Science and Engineering Practice (SEP) and Crosscutting Concepts (CCCs) were included in this lesson.**

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| **Disciplinary Core Ideas (DCIs) Activity 1** | **Element** | **Evidence** |
| **5-PS1-3.****Make observations and measurements to identify materials based on their properties.** **5-PS1-4.****Conduct an investigation to determine whether the mixing of two or more substances results in new substances** | * Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1)
* The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)
* Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)
* When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)
 | * **Students will record the properties of the Oobleck in their science journals**
* **Students will describe the mass of the Oobleck changes in the different state of matter.**
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| **Crosscutting Concepts (CCCS) Activity 1** | **Element** | **Evidence** |
| **Cause and Effect** | **Cause and effect relationships are routinely identified and used to explain change. (5-PS1-4)** | * **Students applied force to the Ooobleck causes the liquid to become solid.**
* **Student describe what happens when more force is applied and when less force is used.**
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| **Disciplinary Core Ideas (DCIs) Activity 2**  | **Element** | **Evidence** |
| **5-PS1-1.****Develop a model to describe that matter is made of particles too small to be seen.****5-PS1-2.****Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.**  | **Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)** | * **Students use models to describe the matter in Oobleck.**
* **Students used model to show the type of changes occurs when force is applied**
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| **Science and Engineering (SEP) Activity 2** | **Element** | **Evidence** |
| Obtaining, Evaluating, and Communicating Information | * [Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.](http://www.nap.edu/openbook.php?record_id=13165&page=54)
* [Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem](http://www.nap.edu/openbook.php?record_id=13165&page=74)
 | * Students will be communicating and drawing parallel between what scientists and engineers do and what they have done in investigating Oobleck, conducting a scientific convention.
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| **Crosscutting concepts (CCCS) Activity 2** | **Element** | **Evidence** |
| **Patterns** | **Use models to describe phenomena. (5-PS1-1)****Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4)****•Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)** | **Students used observations to communicate with fellow students****Students used investigation to prove their explanation of the phenomenon.**  |

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| **Disciplinary Core Ideas (DCIs)** | **Element** | **Evidence** |
| **Activity 3****Spacecraft Design**  [3-5-ETS1-2 Engineering Design](http://www.nextgenscience.org/pe/3-5-ets1-2-engineering-design)[3-5-ETS1-3 Engineering Design](http://www.nextgenscience.org/pe/3-5-ets1-3-engineering-design)   | [Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.](http://www.nap.edu/openbook.php?record_id=13165&page=204)[At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.](http://www.nap.edu/openbook.php?record_id=13165&page=206)  | * Students will draw and build a spacecraft that will land safely on the Oobleck and take off again.
* Students will label the parts or features of their spacecraft that allowed it to land and take off without sinking or getting stuck in the Oobleck.
* Students will critique their own spacecraft and, listing any advantages and drawbacks to their design.
* Students will build a three-dimensional spacecraft model from various materials such as straws, toothpicks, balloons, meat trays, paper, styrofoam cups, packing materials, etc.
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**Evidence that Disciplinary Core Ideas (DCIs), Science and Engineering Practice (SEP) and Crosscutting Concepts (CCCs) were included in this lesson**

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| **Science and Engineering Practice (SEP)** | **Element** | **Evidence** |
| [3-5-ETS1-1 Engineering Design](http://www.nextgenscience.org/pe/3-5-ets1-1-engineering-design)Developing and Using ModelsAsking questions and Defining problemsCommunicating Information  |  [Asking Questions and Defining Problems](http://www.nap.edu/openbook.php?record_id=13165&page=54)[Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.](http://www.nap.edu/openbook.php?record_id=13165&page=54)* [Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.](http://www.nap.edu/openbook.php?record_id=13165&page=54)
 | * After drawing a model of their spacecraft students will be critiquing their own spacecraft and, listing any advantages and drawbacks to their design.
* After taking account feedback and communicating on their designs, students will build a three-dimensional spacecraft model from various materials such as straws, toothpicks, balloons, meat trays, paper, styrofoam cups, packing materials, etc.
* After seeing the results of their spacecraft landings and lift off, students will be allowed to improve their spacecraft designs.
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| **Crosscutting Concepts (CCCs)** | **Element** | **Evidence** |
| [3-5-ETS1-1 Engineering Design](http://www.nextgenscience.org/pe/3-5-ets1-1-engineering-design)Cause and Effect Structure and Function | * [Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.](http://www.nap.edu/openbook.php?record_id=13165&page=54)
* [People’s needs and wants change over time, as do their demands for new and improved technologies.](http://www.nap.edu/openbook.php?record_id=13165&page=212)
* [Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.](http://www.nap.edu/openbook.php?record_id=13165&page=212)
 | * Students will be building landing their spacecrafts for five seconds, and then be able to “take off” without sinking or getting stuck in the sea of Oobleck .
* Students will communicate what caused their spacecraft to land or not land and take off safely.

 * After seeing the results of their spacecraft landings and lift off, students will be allowed to improve the structure of their spacecraft designs.
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| **Disciplinary Core Ideas (DCIs)** | **Element** | **Evidence** |
| **Activity 4 What Scientists Do**  **5-PS1 Matter and Its Interactions** | Measurements of a variety of properties can be used to identify materials.[ETS1.A: Defining and Delimiting Engineering Problems](http://www.nap.edu/openbook.php?record_id=13165&page=204)* [Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account](http://www.nap.edu/openbook.php?record_id=13165&page=204)
 | * Students will be discussing ways they acted like scientists during the lab session when investigating the properties of the Oobleck.
* Students will be generating a list of how they acted like scientist during the “Convention” There lists can include things like the following: talked disagreed, argued, explained our experiments, voted, etc.
* After students are informed and read about the Mars Rover missions students can list design challenges and how engineers and scientists worked together to land the Mars Rover safely on Mars.
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| **Science and Engineering Practice (SEP)** | **Element** | **Evidence** |
| Obtaining, Evaluating, and Communicating Information | * [Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.](http://www.nap.edu/openbook.php?record_id=13165&page=54)
* [Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem](http://www.nap.edu/openbook.php?record_id=13165&page=74)
 | * Students will be communicating and drawing parallel between what scientists and engineers do and what they have done in investigating Oobleck, conducting a scientific convention, and designing spacecraft.
* After students are informed and read about the Mars Rover missions students can list design challenges and how engineers and scientists worked together to land the Mars Rover safely on Mars.
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| **Crosscutting Concepts (CCCs)** | **Element** | **Evidence** |
| **Cause and Effect** | [**Influence of Science, Engineering, and Technology on Society and the Natural World**](http://www.nap.edu/openbook.php?record_id=13165&page=212)* [People’s needs and wants change over time, as do their demands for new and improved technologies.](http://www.nap.edu/openbook.php?record_id=13165&page=212)
* [Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)](http://www.nap.edu/openbook.php?record_id=13165&page=212)
 | * Students will read and learn about Mars exploration.
* Students will read and learn about the technology involved in getting the Mars rovers to land safely.
* Students can create a cause an effect chart for Mars rovers journey and how engineers and scientists worked together to land the Mars Rover safely on Mars.
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| **Disciplinary Core Ideas (DCIs)** | **Element** | **Evidence** |
| **Activity 5** **Full Investigation**  [5-PS1-3 Matter and Its Interactions](http://www.nextgenscience.org/pe/5-ps1-3-matter-and-its-interactions)**5-PS1-2 Matter and Its Interactions** |  * [Measurements of a variety of properties can be used to identify materials](http://www.nap.edu/openbook.php?record_id=13165&page=106)
 | * Students will be measuring cornstarch, water and food coloring to make more Oobleck for their new investigations.
* Students will be given an opportunity to further investigate the properties of Oobleck by conducting their own experiment.
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| **Science and Engineering Practice (SEP)** | **Element** | **Evidence** |
| **Planning and Carrying Out an Investigation****Asking questions and Defining Problems****Analyzing and Interpreting Data****Constructing Explanations****Communication Information**  |  * [Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.](http://www.nap.edu/openbook.php?record_id=13165&page=59)

  | * Students will be generating their own questions about Oobleck that they will further want to investigate.
* Students will be investigating questions: such as comparing and contrasting properties of solids and liquids, temperature effects, proportions of ingredients, Viscosity.
* Students will be asking questions, designing, conducting, and sharing the results of their investigation.
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| **Crosscutting Concepts (CCCs)** | **Element** | **Evidence** |
| **Scale, Proportions, and Quantity** **Cause and Effect**  |  [Scale, Proportion, and Quantity](http://www.nap.edu/openbook.php?record_id=13165&page=89)* [Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.](http://www.nap.edu/openbook.php?record_id=13165&page=89)

  | * Students will be investigating one of their questions about Oobleck: such as comparing and contrasting properties of solids and liquids, temperature effects, proportions of ingredients, Viscosity.
* Students will be designing, conducting, and sharing the results of their investigation in which they can share any cause and effect relationships found in their investigations.
 |