

Course of Study:
5th-Grade STEM



Course of Study STEM - [APRIL 2023]

STEM Grade 5

Strand: Steps of the Scientific Inquiry Process

<p>Learning Standard: Nature of Science Grades 3-5 (source pg. 9) Scientific Inquiry, Practice and Applications</p> <ul style="list-style-type: none">- Observe and ask questions about the world that can be answered through scientific investigations.- Design and conduct scientific investigations using appropriate safety techniques.- Use appropriate mathematics, tools and techniques to gather data and information.- Develop and communicate descriptions, models, explanations and predictions.- Think critically and ask questions about the observations and explanations of others.- Communicate scientific procedures and explanations.- Apply knowledge of science content to real-world challenges. <p>5.MD.2 Display and interpret data in graphs (picture graphs, bar graphs, and line plots) to solve problems using numbers and operations for this grade</p>	<p>How Taught? Scientific Inquiry Process</p> <p>Student guided notes</p>
<p>Materials: Scientific Inquiry Process</p> <p>Student guided notes</p>	<p>How Assessed?</p> <ul style="list-style-type: none">- Class discussions- Completion of guided notes <p>How Re-Taught?</p> <ul style="list-style-type: none">- Students will be formatively assessed and retaught as they apply the steps in future scientific investigations

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Strand: Reaction Speed Experiment: Arm Length vs. Reaction Speed

<p>Learning Standard: Nature of Science Grades 3-5 (source pg. 9) Scientific Inquiry, Practice and Applications</p> <ul style="list-style-type: none">- Observe and ask questions about the world that can be answered through scientific investigations.- Design and conduct scientific investigations using appropriate safety techniques.- Use appropriate mathematics, tools and techniques to gather data and information.- Develop and communicate descriptions, models, explanations and predictions.- Think critically and ask questions about the observations and explanations of others.- Communicate scientific procedures and explanations.- Apply knowledge of science content to real-world challenges. <p>5.MD.2 Display and interpret data in graphs (picture graphs, bar graphs, and line plotsG) to solve problems using numbers and operations for this grade</p>	<p>How Taught? Arm Length vs. Reaction Speed Experiment</p> <p>Group discussion - what were flaws in the experiment</p>
<p>Materials: Arm Length vs. Reaction Speed Experiment</p> <p>Student experiment sheet</p>	<p>How Assessed? Student experiment sheet</p> <p>How Re-Taught? - Students will be given feedback and apply it during future scientific investigations.</p>

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Strand: Table Tennis Surfaces Experiment

<p>Learning Standard: Nature of Science Grades 3-5 (source pg. 9) Scientific Inquiry, Practice and Applications</p> <ul style="list-style-type: none"> - Observe and ask questions about the world that can be answered through scientific investigations. - Design and conduct scientific investigations using appropriate safety techniques. - Use appropriate mathematics, tools and techniques to gather data and information. - Develop and communicate descriptions, models, explanations and predictions. - Think critically and ask questions about the observations and explanations of others. - Communicate scientific procedures and explanations. - Apply knowledge of science content to real-world challenges. <p>5.MD.2 Display and interpret data in graphs (picture graphs, bar graphs, and line plotsG) to solve problems using numbers and operations for this grade</p>	<p>How Taught?</p> <ul style="list-style-type: none"> - Go over Team Group Roles - Table Tennis Experiment Introduction
<p>Materials: Table Tennis Experiment Introduction</p> <p>Go over Team Group Roles</p> <p>Student experiment sheet</p>	<p>How Assessed?</p> <ul style="list-style-type: none"> - Student experiment sheet <p>Student experiment sheet</p> <p>Group discussion - what were flaws in the experiment</p> <hr/> <p>How Re-Taught? Group discussion - what were flaws in the experiment - Discuss how future experiments could be modified to have less flaws</p>

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Strand: Introduction to the Engineering Design Process

<p>Learning Standard: 3-5-ETS1-1 - Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost 3-5-ETS-1-2 - Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem 3-5-ETS-1-3 - Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved</p>	<p>How Taught? - Students fill out a guided note sheet while teacher leads discussion of: Engineering Design Process - 5th grade presentation</p>
<p>Materials: Engineering Design Process - 5th grade presentation</p>	<p>How Assessed? - student note sheet - formative assessment of student conversations</p> <p>How Re-Taught? - Students will be given feedback and correction as they apply the steps in future engineering projects</p>

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Strand: Engineering Design Process - Air Powered Rocket Design

<p>Learning Standards:</p> <p>5.PS.1 The amount of change in movement of an object is based on the mass of the object and the amount of force exerted.</p> <p>Nature of Science Grades 3-5 (source pg. 9)</p> <ul style="list-style-type: none">- Design and conduct scientific investigations using appropriate safety techniques.- Use appropriate mathematics, tools and techniques to gather data and information.- Develop and communicate descriptions, models, explanations and predictions.	<p>How Taught?</p> <ul style="list-style-type: none">- Teacher reviews rocket requirements and discusses how rockets work using: https://blogs.nasa.gov/Rocketology/2015/07/09/designing-a-rocket-in-six-easy-steps/- Teacher presents rocket requirements and constraints: Rocket Slideshow
<p>Materials:</p> <p>Rocket Slideshow It's Rocket Science https://blogs.nasa.gov/Rocketology/2015/07/09/designing-a-rocket-in-six-easy-steps/</p>	<p>How Assessed?</p> <ul style="list-style-type: none">- Accuracy of mass, length, and distance measurements- Graph and analyze data from various rocket designs- Draw conclusions of the ideal rocket design using data as evidence <p>How Re-Taught?</p> <ul style="list-style-type: none">- Teacher provides feedback for students to modify prototypes as they build

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Strand: 3D Design and Printing Using CAD

<p>Learning Standard: <u>Next Gen Science Standards (NGSS) 3-5 Engineering Design:</u></p> <p>3-5-ETS1-1 - Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost 3-5-ETS-1-2 - Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem</p>	<p>How Taught?</p> <ul style="list-style-type: none">- Students are guided through a tutorial on basic shapes, lifts, rotations, and grouping in Tinkercad- Students create: 3D printed Lanyard Charms to be printed
<p>Materials: www.TinkerCad.com</p> <p>3D printed Lanyard Charms</p>	<p>How Assessed?</p> <p>Slide 11 of: 3D printed Lanyard Charms</p> <p>How Re-Taught?</p> <ul style="list-style-type: none">- If what a student creates is not printable, students are provided feedback and given the opportunity to make changes and try to re-print



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Strand: Engineering Design Process - Planetary Lander

<p>Learning Standard: Nature of Science Grades 3-5 (source pg. 9) Scientific Inquiry, Practice and Applications</p> <ul style="list-style-type: none">- Design and conduct scientific investigations using appropriate safety techniques.- Use appropriate mathematics, tools and techniques to gather data and information.- Develop and communicate descriptions, models, explanations and predictions. <p>Science is a Human Endeavor</p> <ul style="list-style-type: none">- Scientists often work in teams.- Science requires creativity and imagination. <p>3-5-ETS-1-2 - Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem</p> <p>3-5-ETS-1-3 - Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved</p>	<p>How Taught?</p> <ul style="list-style-type: none">- As a class, teacher guides students through: Soft Touchdown Lander slides- Students work in teams to prototype a soft lander
<p>Materials: Soft Touchdown Lander slides</p> <p>Discussion Questions https://www.jpl.nasa.gov/edu/teach/activity/ touchdown/</p>	<p>How Assessed?</p> <ul style="list-style-type: none">- Teams present landers and answer the Discussion Questions- Teams do a demonstration of their lander <p>How Re-Taught?</p> <ul style="list-style-type: none">- Teacher provides feedback for students to modify prototypes as they build

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Strand: Mars Rover Sensors - Supporting a claim with evidence

<p>Learning Standard: Nature of Science Grades 3-5 (source pg. 9) Science is a Human Endeavor</p> <ul style="list-style-type: none">- Scientists often work in teams.- Science requires creativity and imagination. <p>5.ESS.1 The solar system includes the sun and all celestial bodies that orbit the sun. Each planet in the solar system has unique characteristics</p> <p>W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.</p>	<p>How Taught?</p> <ul style="list-style-type: none">- Share and discuss the purpose of NASA missions to Mars <p>https://mars.nasa.gov/mars2020/</p> <ul style="list-style-type: none">- Provide students the the list of possible sensors on a new Mars Rover: Payload descriptions
<p>Materials: https://mars.nasa.gov/mars2020/</p> <p>Journal #3 Mars Rover</p> <p>Payload descriptions</p>	<p>How Assessed? Journal writing rubric</p> <p>How Re-Taught?</p> <ul style="list-style-type: none">- Students are provided feedback to apply to future journal writing

Strand: Journal on the Importance of Learning STEM

<p>Learning Standard: 18. Workers can improve their ability to earn income by gaining new knowledge, skills and experiences.</p> <p>W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.</p> <ul style="list-style-type: none">a. Introduce a topic or text clearly, state an opinion, and create an organizational structure in which ideas are logically grouped to support the writer’s purpose.b. Provide logically ordered reasons that are supported by facts and details	<p>How Taught?</p> <p>Journal #1 Required or Optional STEM class</p>
<p>Materials: Journal #1 Required or Optional STEM class</p>	<p>How Assessed?</p> <ul style="list-style-type: none">- Journal Rubric <p>How Re-Taught?</p> <ul style="list-style-type: none">- Students are provided feedback to apply to future journal writing

Strand: 3D Printed Product Design and Investment Pitch

<p>Learning Standard: 3-5-ETS1-1 - Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost</p> <p>Ohio Social Studies Standards Grade 5: 18. Workers can improve their ability to earn income by gaining new knowledge, skills and experiences</p>	<p>How Taught? - Product Pitch Template</p> <p>- Students discuss examples of everyday products that are made out of plastic</p>
<p>Materials: Product Pitch Template</p> <p>Product Pitch Requirements</p>	<p>How Assessed? - Students present their product pitches and are assessed using: Product Pitch Requirements</p>
	<p>How Re-Taught? - Students are provided formative feedback over the course of a week as they develop and refine their prototype products</p>

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Strand: Animal Habitat Research and Design

<p>Learning Standard: Science is a Way of Knowing</p> <ul style="list-style-type: none">- Science is both a body of knowledge and processes to discover new knowledge.- Science is a way of knowing about the world around us based on evidence from experimentation and observations. <p>3-5-ETS1-1 - Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost</p> <p>5.LS.1 Organisms perform a variety of roles in an ecosystem.</p>	<p>How Taught?</p> <ul style="list-style-type: none">- Teacher leads the first day through: Elephant Habitat Project- Student teams research the needs of elephants and complete student sections.
<p>Materials: Elephant Habitat Project Elephant observation playlist</p>	<p>How Assessed? Elephant Habitat Project</p> <p>How Re-Taught?</p> <ul style="list-style-type: none">- Teams are provided formative feedback on their maps and make corrections before building- Teams are given feedback as they build to make adjustment to their habitats