

Simple Machines

Title of Unit	Forces and Simple Machines	Grade Level	5
Subject	Science	Time Frame	6-8 weeks

Big Ideas

What are the enduring **understandings** your students will be able to remember and apply throughout their lives?

- Machines are devices that transfer force and energy.

Enduring Questions/Hook/Inquiry

What provocative questions will foster inquiry into the content and the Catholic Worldview?

- How do machines (natural and man-made) transfer energy?

- What machines can you find in your local environment?

- How/where do you use simple machines in your daily life?

- How can we combine simple machines to make a compound machine?

- How have simple machines been used throughout history? Can you think of a story from the bible that would have used simple machines?

Where do you find simple machines in nature? How has God created simple machines for nature to use?

Catholic World View

Principles of Catholic Education:

- **(C)** CHRIST-CENTERED – Catholic Education fosters a personal relationship with Jesus Christ in the family of the Church; our faith in Christ is evident and permeates all facets of the educational environment.
- APOSTOLIC – Catholic Education is founded on and guided by the truth of the Gospel, beginning with the apostles and handed on by the Pope and bishops.
- **(T)** TRADITION – Catholic Education guides us in the selection of excellent content, pedagogy and resources for the transmission of the faith in the Catholic Intellectual Tradition.
- **(H)** HOLY – Catholic Education draws upon scripture, the sacraments and prayer to help us to respond to the universal call to holiness.
- **(O)** ONE – Catholic Education responds to Christ's desire "that they may all be one" (John 17.21) in our belief of one body, one faith, one baptism, one God and Father of all.
- **(L)** LOVE – Catholic Education calls us to witness that God is love; and therefore, recognizes the inherent dignity of every human person, especially the marginalized and most vulnerable.
- INALIENABLE* – Catholic Education promotes that "the right and the duty of parents to educate their children are primordial and inalienable" and "parents have the first responsibility for the education of their children" (CCC 2221, 2223).
- **(C)** COMMUNION / COMMUNITY – Catholic Education is inclusive and welcoming where every student is nurtured in developing a right relationship with God and others.

Christian Education-based focus

Catholic Vision for Teaching and Learning

How will the Catholic Worldview and Principles of Education take students on an exploration into the Catholic faith?

Talk about how simple machines in nature – God's creation.

Draw upon stories from the scripture to guide discussion on ancient simple machines.

Working together to complete activities and experiments. Final project will focus on both individual work and supporting one another in what their classmates have done.

Core Competencies

<p><u>Communication</u></p> <ul style="list-style-type: none"> • Connect and Engage with Others • Acquire, Interpret, and Present Information • Collaborate to Plan, Carry Out, and Review Constructions and Activities • Explain/Recount and Reflect on Experiences and Accomplishments 	<p><u>Creative Thinking</u></p> <ul style="list-style-type: none"> • Novelty and Value • Generating Ideas • Developing Ideas <p><u>Critical Thinking</u></p> <ul style="list-style-type: none"> • Analyze and Critique • Question and Investigate • Develop & Design 	<p><u>Social Responsibility</u></p> <ul style="list-style-type: none"> • Contributing to Community and Caring for the Environment • Solving Problems in Peaceful Ways • Valuing Diversity • Building Relationships 	<p><u>Positive Personal & Cultural Identity</u></p> <ul style="list-style-type: none"> • Relationships and Cultural Contexts • Personal Values and Choices • Personal Strengths and Abilities <p><u>Personal Awareness & Responsibility</u></p> <ul style="list-style-type: none"> • Self-Determination • Self-Regulation • Well-Being
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Developing Competency Growth Through Reflective Thinking

Choose 3 Reflective Thinking Strategies

<http://www.rcsthinkfromthemiddle.com/thinking-routines.html>

<p><u>Reflective Log</u></p> <p>Students to keep a log that contains regular entries, detailing their experiences and emotions with regard to their learning process.</p>	<p><u>Zoom In</u></p> <p>Close examination of a portion of an image to build a deeper understanding.</p>	<p><u>Headlines</u></p> <p>This routine draws on the idea of newspaper headlines as a vehicle for summing up and capturing the essence of an event, idea, concept, topic,</p>
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Core Competencies in Action

Use this list as a process to show how you will develop Core Competency learning in your lesson:

- Introduce the learning target for the lesson and discuss with students how they will use the core competency to attain the learning target.
- Share with students how the competency learning is relevant to real-world situations.
- Refer students to the 'I can statements' on the competency posters.
- Engineer effective classroom discussions, activities, and tasks that elicit evidence of the competency.
- Challenge students to apply the competency 'I statements' to examples during the lesson.
- Use questioning strategies throughout instruction and or inquiry to prompt **REFLECTIVE THINKING**.
- Use the 'Notice It, Name It' Strategy.

Learning Standards

<p>Curricular Competencies <i>Students are expected to DO the following...</i></p>	<p>Lesson # where it will be taught</p>	<p>Content Covered in this Unit <i>Students are expected to KNOW the following</i></p>
<p>Questioning and Predicting: - Make observations in familiar or unfamiliar contexts - Identify questions to answer or problems to solve through scientific inquiry.</p> <p>Planning and Conducting: - Choose appropriate data to collect to answer their questions</p>	<p>L 1, 3, 5, 10 L 3, 9, 10</p> <p>L 5, 9</p> <p>L 3, 5, 9, 10</p>	<p>- Properties of simple machines and their force effects - Machines: - constructed - found in nature - Power: The rate at which energy is transferred.</p>

<p>- Observe, measure, and record data, using appropriate tools, including digital technologies. - Use equipment and materials safely, identifying potential risks.</p> <p>Processing and analyzing data and information: - Construct and use a variety of methods, including tables, graphs, and digital technologies, as appropriate, to represent patterns or relationships in data. - Identify patterns and connections in data. - Demonstrate an openness to new ideas and consideration of alternatives.</p> <p>Evaluating: - Evaluate whether their investigations were fair tests. - Demonstrate an understanding and appreciation of evidence.</p> <p>Applying and innovating: - Transfer and apply learning to new situations - Generate and introduce new or refined ideas when problem solving.</p>	<p>L 3, 5, 8, 9, 10</p> <p>L 3, 5</p> <p>L 3, 5 L 4, 6, 10</p> <p>L 3, 9</p> <p>L 3, 7</p> <p>L 2, 6, 8, 10 L 4, 7</p>	
<p>Assessment Evidence:</p> <p>Formative Tasks (assessment for learning): What formative assessment strategies will you use to assess student learning?</p> <p>Reflection/Self-Assessment (assessment as learning): What opportunities will there be for students to reflect on their thinking and feelings as part of their learning (self/peer evaluations, partner talk, goal setting, journaling, etc.)?</p>		

<p>Confidence Indicator – Windshield Wiper Used to have students check their own understanding of a concept just taught in a lesson. Using the analogy of a windshield, students will decide which of the following best describes what they know about the concept: CLEAR = I get it! I thoroughly understand the concept. BUGGY = I understand it for the most part, but a few things are still unclear. MUDDY = I don't get it at all</p>	<p>Hand Signals Ask students to display a designated hand signal to indicate their understanding of a specific concept process or skill. (Thumbs up, sideways, or down)</p>	<p>Idea Wave Each student lists 1-2 ideas about an assigned topic. One volunteer begins the "idea wave" by sharing his idea. The student to the right of the volunteer shares one idea; the next student to rights shares one idea, etc.,</p>	<p>Pair Share Students formulate individual ideas and share these ideas with another student. It is a learning strategy developed to encourage student classroom participation.</p>	<p>Clipboard Cruising As students are engaged in meaningful skill tasks, circulate and collect specific evidence of student skill performance.</p>
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<p>Postcards to a _____ – students write a postcard to about what they have learned</p>	<p>See – Think – Wonder During Centres, students will engage in different provocation stations and fill in an accompanying activity sheet that asks the following: - What do you see? - What do you think about it? - What do you wonder about it?</p>	<p>Reflective Journal – 5 minute writes</p> <ul style="list-style-type: none"> - Show me what you have learned today in pictures and in words - What's missing? - How do you know that this is right? Can you give me an example? - What might happen if... - Apply and transfer – think about what we learned today. Where can we apply that in real life?
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Assessment Evidence: Summative Tasks (assessment of learning)
How will students demonstrate their understanding of the curricular connections listed above (performance task, project, portfolio, test, etc.)? How will the assessment criteria be communicated to or created with students?

- Start your engines – Creating a race car (compound machine) using a variety of simple machines – Explain their design choices and text to see if it works.
- Small experiments and data collection throughout the unit. – A variety of experiments throughout unit to show/demonstrate how the simple machines work.
- Mini test at end of unit.

First Peoples Principles of Learning
<https://firstpeoplesprinciplesoflearning.wordpress.com/>
 What opportunities have you provided for integrating the First Peoples Principles of Learning?
 What are the implications of the FPPL for teaching and learning?

Highlight ONE of the principals of learning to focus on for the unit. Then go to the above link, click on that principal, and copy and paste the "implications for teaching and learning" bullets that apply to your unit into this template.

- Learning involves generational roles and responsibilities.
- Learning involves patience and time.
- Learning involves recognizing that some knowledge is sacred and only shared with permission and or in certain situations.
- Learning involves recognizing the consequences of one's actions.
- Learning is embedded in memory, history, and story.
- Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place)
- Learning recognizes the role of Indigenous knowledge
- Learning requires exploration of one's identity.
- Learning ultimately supports the well being of the self, the family, the community, the land, the spirits, and the ancestors.

Implications for Teaching and Learning

- Ensuring that learning is about understanding concepts, and the application of knowledge, rather than only memorization of information.
- Providing opportunities for multiple opportunities to access learning in different ways.
- Revisiting concepts multiple times, providing learners with opportunities to deepen their knowledge by layering their understanding (recursivity).

Universal Design of Learning

Highlight the UDL strategies that will form the foundation for differentiated instruction in your instructional unit. Indicate how they will be included in unit planning e.g. lessons will include strategies to support background knowledge, reflection, etc.,

Engagement	Representation	Action and Expression
<ul style="list-style-type: none"> • Promote expectations that optimize motivation e.g. lesson hooks, inquiry questions • Develop self-assessment and reflection • Foster collaboration and community • Provide ongoing, relevant feed back to students • Include inquiry ('voice and choice') 	<ul style="list-style-type: none"> • Support background knowledge e.g. Whip Around strategy, lesson hook. • Clarify vocabulary e.g. word splash strategy • Highlight critical features by providing multiple examples • Provide multiple media and formats • Offer adjustable levels of challenge through tiered assignments 	<ul style="list-style-type: none"> • Guide student goal setting and monitoring of progress • Optimize access to support tools and technologies • Offer flexible opportunities for demonstrating learning

#	Learning Target	Assessment Formative & Reflective	Lesson Progression	Universal Design of Learning Include the UDL strategies from the chart, which will be used in individual lessons.
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1	<u>I can explain what motion is and identify the different types of motion.</u>	Formative: - Picture search and discussion. Reflective: - Headlines.	<p>Core Competency Focus (highlight)</p> <table border="1" data-bbox="661 100 1575 180"> <tr> <td>Communication</td> <td>Critical Thinking</td> <td>Creative Thinking</td> <td>Personal/Cultural Identity</td> <td>Personal Awareness and Responsibilities</td> <td>Social Responsibilities</td> </tr> </table> <p>Core Competency in Action: <i>Students will be told to focus on clear communication with partner when looking at picture and to use critical thinking skills to answer questions.</i></p> <p>Learning Target: Students will be able to explain what motion is and identify the different types of motion.</p> <p>Instructional Task - Follow Lesson One in Simple Machines Booklet. - Students will write a headline to explain what they have learned this lesson.</p> <p>Resources & Materials: - See Simple Machines Booklet lesson 1.</p>	Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities	<ul style="list-style-type: none"> Support background knowledge e.g. Whip Around strategy, lesson hook. Highlight critical features by providing multiple examples Optimize access to support tools and technologies
Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities					
2	<u>I can explain the difference between simple machines and compound machines and identify simple machines in my environment.</u>	Formative: - Simple machine search. Reflective: - Journal – What do you think life would be like without simple machines? Where in nature do we find simple machines? Do you think this intentional? Why?	<p>Core Competency Focus (highlight)</p> <table border="1" data-bbox="661 682 1575 761"> <tr> <td>Communication</td> <td>Critical Thinking</td> <td>Creative Thinking</td> <td>Personal/Cultural Identity</td> <td>Personal Awareness and Responsibilities</td> <td>Social Responsibilities</td> </tr> </table> <p>Core Competency in Action: <i>Students will work on using critical thinking to figure out where simple machines are found in their daily lives and the difference between types of machines.</i></p> <p>Learning Target: Students will be able to explain the difference between simple machines and compound machines and identify simple machines in different environments.</p> <p>Instructional Task - Discuss Noah's ark. What tools would he have used to make his ark. - See lesson 2 in Simple Machines booklet.</p> <p>Resources & Materials: - See Simple Machines booklet lesson 2.</p>	Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities	Support background knowledge e.g. Whip Around strategy, lesson hook <ul style="list-style-type: none"> Optimize access to support tools and technologies
Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities					
3	<u>I can explain the difference between the 3 types of levers and</u>	Formative/summative: - Experiment seeing which lever will send an object further.	<p>Core Competency Focus (highlight)</p> <table border="1" data-bbox="661 1331 1575 1411"> <tr> <td>Communication</td> <td>Critical Thinking</td> <td>Creative Thinking</td> <td>Personal/Cultural Identity</td> <td>Personal Awareness and Responsibilities</td> <td>Social Responsibilities</td> </tr> </table> <p>Core Competency in Action: <i>Students will work on communicating findings from experiment and refine critical thinking skills to explain why</i></p>	Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities	Support background knowledge e.g. Whip Around strategy, lesson hook <ul style="list-style-type: none"> Clarify vocabulary e.g. word splash strategy Highlight critical features by providing multiple examples
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	<u>what their functions are.</u>	<p>Reflective: - Why do you think the levers toss objects different distances?</p>	<p><i>the levers worked differently.</i></p> <p>Learning Target: Students will be able to explain the difference between the 3 types of levers and what their functions are.</p> <p>Instructional Task - Follow lesson 3 in simple machines booklet</p> <p>Resources & Materials: - See simple machines booklet lesson 3</p>							
4	<u>I can explain the types of pulleys, their functions and what happens when they are combined.</u>	<p>Formative: - Students will write an explanation of what happened when they used a pulley to raise a weight.</p> <p>Reflective: - Headlines</p>	<p>Core Competency Focus (highlight)</p> <table border="1"> <tr> <td>Communication</td> <td>Critical Thinking</td> <td>Creative Thinking</td> <td>Personal/Cultural Identity</td> <td>Personal Awareness and Responsibilities</td> <td>Social Responsibilities</td> </tr> </table> <p>Core Competency in Action: <i>Students will work on critical thinking skills to explain what functions a pulley has and how they are able to make work easier.</i></p> <p>Learning Target: Students will be able to explain the types of pulleys, their functions and what happens when they are combined.</p> <p>Instructional Task - Follow lesson 4 in simple machines booklet</p> <p>Resources & Materials: See simple machines booklet lesson 4</p>	Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities	<ul style="list-style-type: none"> Clarify vocabulary e.g. word splash strategy Highlight critical features by providing multiple examples
Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities					
5	<u>I can explain what an incline plane is, and measure how it helps using a spring scale.</u>	<p>Formative: - "Incline plane experiment data.</p> <p>Reflective: Why does changing the angle of the plane change the force on the object?</p>	<p>Core Competency Focus (highlight)</p> <table border="1"> <tr> <td>Communication</td> <td>Critical Thinking</td> <td>Creative Thinking</td> <td>Personal/Cultural Identity</td> <td>Personal Awareness and Responsibilities</td> <td>Social Responsibilities</td> </tr> </table> <p>Core Competency in Action: <i>Students will develop critical thinking skills when explaining the different effort/force on different incline planes.</i></p> <p>Learning Target: Students will be able to explain what an incline plane is, its function and be able to measure the force put on an object on different incline planes.</p> <p>Instructional Task - Follow lesson 5 in simple machines booklet</p> <p>Resources & Materials: See simple machines booklet lesson 5</p>	Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities	<ul style="list-style-type: none"> Clarify vocabulary e.g. word splash strategy Highlight critical features by providing multiple examples Develop self-assessment and reflection
Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities					

6	<p><u>I can explain the function and purpose of a wedge.</u></p>	<p>Formative: - Students explanation of why the wedge was easier to push through the rice.</p>	<p>Core Competency Focus (highlight)</p> <table border="1" data-bbox="663 100 1579 180"> <tr> <td>Communication</td> <td>Critical Thinking</td> <td>Creative Thinking</td> <td>Personal/Cultural Identity</td> <td>Personal Awareness and Responsibilities</td> <td>Social Responsibilities</td> </tr> </table> <p>Core Competency in Action: <i>Critical thinking will be developed when explaining how the wedge works.</i></p> <p>Learning Target: Students will be able to explain the functions and purpose of the wedge.</p> <p>Instructional Task - Follow lesson 6 in simple machines booklet</p> <p>Resources & Materials: See simple machines booklet lesson 6</p>	Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities	<ul style="list-style-type: none"> Clarify vocabulary e.g. word splash strategy Highlight critical features by providing multiple examples
Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities					
7	<p><u>I can identify characteristics, functions and places of use of screws. I can also create my own version of an Archimedes screw.</u></p>	<p>Formative: -Archimedes screw.</p> <p>Reflective: How do you think the screw was able to lift the objects out of the bowl?</p>	<p>Core Competency Focus (highlight)</p> <table border="1" data-bbox="663 620 1579 699"> <tr> <td>Communication</td> <td>Critical Thinking</td> <td>Creative Thinking</td> <td>Personal/Cultural Identity</td> <td>Personal Awareness and Responsibilities</td> <td>Social Responsibilities</td> </tr> </table> <p>Core Competency in Action: <i>Students will develop critical thinking skills to explain how an Archimedes screw works.</i></p> <p>Learning Target: Students will be able to explain what a screw looks like, where they can be found and different functions they have. They will also create their own Archimedes screw and explain how it works.</p> <p>Instructional Task - Follow lesson 7 in simple machines booklet</p> <p>Resources & Materials: See simple machines booklet lesson 7</p>	Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities	<ul style="list-style-type: none"> Clarify vocabulary e.g. word splash strategy Highlight critical features by providing multiple examples Develop self-assessment and reflection
Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities					
8	<p><u>I can explain what a wheel and axel are and how they work and where they are found in out lives.</u></p>	<p>Formative/Summative: - Wheel and axel demonstration questions.</p>	<p>Core Competency Focus (highlight)</p> <table border="1" data-bbox="663 1200 1579 1279"> <tr> <td>Communication</td> <td>Critical Thinking</td> <td>Creative Thinking</td> <td>Personal/Cultural Identity</td> <td>Personal Awareness and Responsibilities</td> <td>Social Responsibilities</td> </tr> </table> <p>Core Competency in Action: <i>Students will develop critical thinking skills to answer questions about the wheel and axel demonstration.</i></p> <p>Learning Target: Students will be able to explain how a wheel and axel work and what functions they have in our lives</p>	Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities	<ul style="list-style-type: none"> Clarify vocabulary e.g. word splash strategy Highlight critical features by providing multiple examples
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			<p>Instructional Task - Follow lesson 8 in simple machines booklet</p> <p>Resources & Materials: See simple machines booklet lesson 8</p>							
9	<p>I can explain what friction is and how different surfaces create different amounts of friction. I can also record my data in a variety of ways.</p>	<p>Formative/Summative: - Fast Friction experiment.</p>	<p>Core Competency Focus (highlight)</p> <table border="1"> <tr> <td>Communication</td> <td>Critical Thinking</td> <td>Creative Thinking</td> <td>Personal/Cultural Identity</td> <td>Personal Awareness and Responsibilities</td> <td>Social Responsibilities</td> </tr> </table> <p>Core Competency in Action: Students will work on effective communicating of their observations and critical thinking when explaining their results.</p> <p>Learning Target: Students will be able to explain what friction is and how it can change with different kinds of surfaces. They will also work on recording their observations in different forms.</p> <p>Instructional Task - Follow lesson 9 in simple machines booklet.</p> <p>Resources & Materials: See simple machines booklet lesson 9</p>	Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities	<ul style="list-style-type: none"> Clarify vocabulary e.g. word splash strategy Highlight critical features by providing multiple examples Develop self-assessment and reflection
Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities					
10	<p>I can use a variety of simple machines to create an effective self-propelling race car. I can observe results and make effective changes and choices to my design.</p>		<p>Core Competency Focus (highlight)</p> <table border="1"> <tr> <td>Communication</td> <td>Critical Thinking</td> <td>Creative Thinking</td> <td>Personal/Cultural Identity</td> <td>Personal Awareness and Responsibilities</td> <td>Social Responsibilities</td> </tr> </table> <p>Core Competency in Action: Students will develop creative thinking skills to create a race car using simple machines. They will also be able to test the product and decide (using critical thinking skills) on any changes to be made.</p> <p>Learning Target: Students will be able to apply knowledge of simple machines to create a compound machine (race car) that is effective.</p> <p>Instructional Task - Follow lesson 10 in simple machines booklet.</p> <p>Resources & Materials: See simple machines booklet lesson 10</p>	Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities	<ul style="list-style-type: none"> Develop self-assessment and reflection Include inquiry ('voice and choice')
Communication	Critical Thinking	Creative Thinking	Personal/Cultural Identity	Personal Awareness and Responsibilities	Social Responsibilities					

Teacher Reflection

What worked well?

Ideas for next time?

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