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**CODE/MOE/UOIT Makerspaces Project**

**Lesson Plan: Windmill, Landforms, Energy & Structures STEAM Challenge**

**School Board: Limestone District School Board**

**Grade(s): 1 & 3**

**Subject(s): Science & Social Studies**

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| **BIG IDEAS:*** **Landforms**
* **Climate**
* **Matter & Energy**
* **Structures & Mechanisms**

**Curriculum Expectations:****OVERALL:****Grade 1 Social Studies:*** **B1. Application: Describe some aspects of the interrelationship between people and the natural and built features of their community, with a focus on how the features of and services in the community meet people's needs.**
* **B2. Inquiry: Use the social studies inquiry process to investigate some aspects of the interrelationship between people and different natural and built features of their local community, with a focus on significant short- and long-term effects of this interrelationship.**

**Grade 1 Science:*** 1. assess the impact on people and the environment of objects and structures and the materials used in them;
* 2. investigate structures that are built for a specific purpose to see how their design and materials suit the purpose;
* 3. demonstrate an understanding that objects and structures have observable characteristics and are made from materials with specific properties that determine how they are used.

**Grade 3 Social Studies:*** A3. Understanding Context: identify some of the communities in Canada around the beginning of the nineteenth century, and describe their relationships to the land and to each other.
* B2. Inquiry: use the social studies inquiry process to investigate some of the environmental effects of different types of land and/or resource use in two or more Ontario municipal regions, as well as some of the measures taken to reduce the negative impact of that use

**Grade 3 Science:*** 1. assess the importance of form, function, strength, and stability in structures through time;
* 2. investigate strong and stable structures to determine how their design and materials enable them to perform their load-bearing function;
* 3. demonstrate an understanding of the concepts of structure, strength, and stability and the factors that affect them.

**SPECIFIC:** **Grade 1 Social Studies:*** B1.1 Describe some of the ways in which people make use of natural and built features of, and human services in, the local community to meet their needs, and what might happen if these features/services did not exist.
* B3.1 Identify some of the natural and built features of their community
* B3.2 identify some distinct areas in the local community
* B3.5 demonstrate an understanding of some common non-standard units of measurement (e.g., footsteps, tiles, blocks, houses)

**Grade 1 Science:*** 2.1 follow established safety procedures during science and technology investigations
* 2.2 investigate characteristics of various objects and structures, using their senses
* 2.3 investigate, through experimentation, the properties of various materials
* 2.4 use technological problem-solving skills (see page 16), and knowledge acquired from previous investigations, to design, build, and test a structure for a specific purpose
* 2.5 use appropriate science and technology vocabulary, including experiment, explore, purpose, rigid, flexible, solid, and smooth, in oral and written communication
* 2.6 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g., orally explain their choices of materials and design decisions when presenting their structures)
* 3.1 describe objects as things that are made of one or more materials 3.2 describe structures as supporting frameworks 3.3 describe materials as the substances from which something is made 3.4 describe the function/purpose of the observable characteristics (e.g., texture, height, shape, colour) of various objects and structures, using information gathered through their senses (e.g., sandpaper is rough to help take the rough edges off wood; a traffic light is tall so it can be easily seen; a stop sign is the same shape and colour in many countries around the world to make it easily recognizable)
* 3.7 describe the properties of materials that enable the objects and structures made from them to perform their intended function 3.8 list different kinds of fasteners (e.g., tape, glue, button, zipper), and describe the uses of each

**GRADE 3 Social Studies:** * A1.1 describe some of the similarities and differences in various aspects of everyday life
* A1.2 compare some of the roles of and challenges facing people in Canada around the beginning of the nineteenth century with those in the present day
* A2.1 formulate questions to guide investigations into some of the major challenges facing different groups and communities in Canada from around 1780 to 1850

**Grade 3 Science:*** 1.1 assess effects of strong and stable structures on society and the environment
* 1.2 assess the environmental impact of structures built by various animals and those built by humans
* 2.2 investigate, through experimentation, how various materials (e.g., paper and wood) and construction techniques (e.g., folding, adding layers, twisting/braiding, changing shapes) can be used to add strength to structures
* 2.3 investigate, through experimentation, the effects of pushing, pulling, and other forces on the shape and stability of simple structures (e.g., the effect of adding one or more struts on the strength of a tower; the effect of adding ties on the strength of a bridge; the effect of adding weight to the base of a tower on the stability of the tower)
* 2.4 use technological problem-solving skills (see page 16), and knowledge acquired from previous investigations, to design and build a strong and stable structure that serves a purpose (e.g., a place to store lunch bags, a place to put wet boots)
* 2.5 use appropriate science and technology vocabulary, including compression, tension, strut, ties, strength, and stability, in oral and written communication
* 2.6 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g., an oral report to the class on the results of experiments to strengthen materials)

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| **Learning Goals:**“We are learning to…” Evaluate different climate patterns across a variety of Canadian landforms; evaluating landscapes and their effect on habitat and culture.  | **Success Criteria:** “We will be successful when…”We are able to document, describe and present our findings on climate & wind patterns, Ontario landforms and their effect on habitat and culture to our class using a variety of documentation tools such as Book Creator, Pic Collage, iMovie or Chatterpix |
| **Lesson Overview:****The Windmill STEAM Challenge: How can you design and build a model of a windmill that will turn when blown by the wind?*** **Divide students into groups of four**
* **Research Ontario landforms, their designated climates and renewable and non-renewable resources.**
* **Discuss the use of fossil fuels and their effect on our environment and climate change**
* **Review how landforms and climate affect how people live; and the importance of the utilization of natural resources**
* **Review using a Bill Nye YouTube video "What causes wind?" and discuss why April is considered a windy month. Discuss how our landform affects our wind patterns.**
* **Ask students to turn to their elbow partners and discuss what windmills are and ask students to generate some ideas around their possible uses**
* **Using a YouTube video review the History of Windpower to allow students the opportunity to see how technological advancements impact the use of some structures today**
* **Make a real-world connection to Wolfe Island (we live in Kingston, Ontario) where there are 86 Wind turbines that power approximately 75,000 homes each year in our surrounding area.**
* **Review constraints of the windmill challenge with students: You may only use the supplies provided to each group which include: 3 cardboard tubes, 5 popsicle sticks, 1 dowel stick, a roll of tape, 5 rubber bands, 1 pipe cleaner, 3 sheets of cardstock paper, 1 round object that has a centre hole and scissors**
* **Safety rules must be followed as you are building. Students must bring devices to the safety table as needed (to poke holes)**
* **The windmill tower must be free-standing and movable**
* **The turning mechanism must be securely attached to the tower and turn freely**
* **You may test your windmill as needed at one of the testing stations (small fan located at each) in-order-to determine the adjustments to be made**
* **Your final windmill may be decorated**
* **Each team will present its windmill and demonstrate how it works.**
* **Teams must follow the engineering design process (Ask, Imagine, Plan, Create, Improve, Present & Reflect)**
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| **Materials and Technology:** * **3 cardboard tubes, 5 popsicle sticks, 1 dowel stick, a roll of tape, 5 rubber bands, 1 pipe cleaner, 3 sheets of cardstock paper, 1 round object that has a centre hole and scissors**

**ENGINEERING DESIGN PROCESS:****Ask: How can you design and build a model of a windmill that will turn when blown by the wind?****Imagine: Background/Research: What have windmills been used for in the past? How and why are windmills used today?****Plan: Sketch and label your idea for the windmill model.****Create: Explain how you made the turning mechanism for the windmill.****Improve: Describe some ways you improved your windmill as you worked.****Reflect: Describe your presentation. What app. did you choose to showcase your learning? How did your windmill work when it was demonstrated?****Describe the building experience. What was the hardest part? What surprised you? What did you learn about the benefits of living in the St. Lawrence Great Lakes Lowlands landform in Ontario?** |
| **Student Accommodations/Modifications:** **Students are placed in homogenous groupings and provided with a choice board of iPad apps to present their findings and final product at the end of the challenge.** | **Lesson will be differentiated by:*** **Content, specifically: Content has been created in a way so that all can access material**
* **Process, specifically: Homogenous groupings to help with fine motor issues, voice to text is imbedded in all provided documentation apps**
* **Product, specifically: Differentiated based on individual skills**
* **Environment, specifically: Quiet work space if required**
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| **MINDS ON: Getting Started** |
| During this phase, the teacher may: • activate students’ prior knowledge; • engage students by posing thought-provoking questions; • gather diagnostic and/or formative assessment data through observation and questioning; • discuss and clarify the task(s).  | During this phase, students may: • participate in discussions; • propose strategies; • question the teacher and their classmates; • make connections to and reflect on prior learning.  |
| **Describe how you will introduce the learning activity to your students.** * **Divide students into groups of four**
* **Research Ontario landforms, their designated climates and renewable and non-renewable resources.**
* **Discuss the use of fossil fuels and their effect on our environment and climate change**
* **Review how landforms and climate affect how people live; and the importance of the utilization of natural resources**
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* **Your final windmill may be decorated**
* **Each team will present its windmill and demonstrate how it works.**
* **Teams must follow the engineering design process (Ask, Imagine, Plan, Create, Improve, Present & Reflect)**

**What key questions will you ask?** **The Windmill STEAM Challenge: How can you design and build a model of a windmill that will turn when blown by the wind?****How will you gather diagnostic or formative data about the students’ current levels of understanding?*** **Observations, Student-Teacher Conferencing, Checklist**
* **All data gathered will be saved in a digital portfolio for each individual students using OneNote**
* **Students orally present their process and findings using the documentation feature of choice to the whole class in a sharing circle**
* **Student presentations are blogged on our STEAM room Google Sites Account to be shared out to our broader community members**

 **How will students be grouped? How will materials be distributed?** * **Students will be grouped homogenously**
* **Materials will be distributed to in small, organized containers**
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| **ACTION: Working on it** |
| During this phase, the teacher may: • ask probing questions; • clarify misconceptions, as needed, by redirecting students through questioning; • answer students’ questions (but avoid providing a solution to the problem); • observe and assess; • encourage students to represent their thinking concretely and/or pictorially; • encourage students to clarify ideas and to pose questions to other students. | During this phase, students may: • represent their thinking (using numbers, pictures, words, manipulatives, actions, etc.); • participate actively in whole group, small group, or independent settings; • explain their thinking to the teacher and their classmates; • explore and develop strategies and concepts.  |
| **Describe the task(s) in which your students will be engaged.** * **Researching**
* **Oral/Visual Presentation at the end of the challenge**
* **Building and Constructing using a variety of provided materials**
* **Problem-solving, collaboration, ingenuity, documentation**

**What misconceptions or difficulties do you think they might experience?** * **That climate change and the use of renewable and non-renewable resources as well as landforms in Ontario affect wind patterns**
* **How does a windmill generate power?**
* **Building the turning mechanism so it spins and ensuring that their structure is free-standing**

**How will they demonstrate their understanding of the concept?*** **Students will represent their thinking (using pictures, words, technology, actions, etc.)**
* **participate actively in whole group, small group, or independent settings**
* **explain their thinking to the teacher and their classmates**
* **Completion of a peer and self-reflection activity at the end of this challenge**

**How will you gather your assessment data (e.g., checklist, anecdotal records)?*** **All data gathered will be saved in a digital portfolio for each individual students using OneNote**
* **Students orally present their process and findings using the documentation feature of choice to the whole class in a sharing circle**
* **Student presentations are blogged on our STEAM room Google Sites Account to be shared out to our broader community members**

**What extension activities will you provide?** * **Immediately following this STEAM challenge students will participate in a sharing circle and discuss what they have learned with the group how it might be relevant to our world as a whole**
* **Review examples of renewable and non-renewable resources and challenge students to think of another renewable resource that we might be missing. How could it be used to generate power of some sort?**
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| **CONSOLIDATION: Reflecting and Connecting** |
| During this phase, the teacher may: • bring students back together to share and analyse strategies; • encourage students to explain a variety of learning strategies; • ask students to defend their procedures and justify their answers; • clarify misunderstandings; • relate strategies and solutions to similar types of problems in order to help students generalize concepts; • summarize the discussion and emphasize key points or concepts.  | During this phase, students may: • share their findings; • use a variety of concrete, pictorial, and numerical representations to demonstrate their understandings; • justify and explain their thinking; • reflect on their learning. |
| **How will you select the individual students or groups of students who are to share their work with the class (i.e., to demonstrate a variety of strategies, to show different types of representations, to illustrate a key concept)?** * **All students will present using their documentation method of choice**

**What key questions will you ask during the debriefing?** * **What specifically have you learned about structures, landforms in Ontario and renewable and non-renewable resources?**
* **What kind of challenges would landform and climate have presented to our early settlers?**
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