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**CODE/MOE/UOIT Makerspaces Project**

**Lesson Plan: Grade 5 Science & Mathematics:**

**Structures and Mechanisms & Measurement**

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| **BIG IDEAS:**  **Science and Technology Grade 5: Structures and Mechanisms**  Structures and mechanisms throughout our environment have forces that act on and within them.  ***(Overall expectations 1 and 3)***  We can measure forces in order to determine how they affect structures and mechanisms. This information can be used to guide the design of new structures and mechanisms. ***(Overall expectations 1 and 2)***  Forces that result from natural phenomena have an effect on society and the environment. ***(Overall expectations 1 and 3)***  **Mathematics Grade 5: Measurement**  Estimate, measure, and record perimeter, area, temperature change, and elapsed time, using a  variety of strategies;  Determine the relationships among units and measurable attributes, including the area of a  rectangle and the volume of a rectangular prism.  **Curriculum Expectations:**  **S&T Grade 5 Structures and Mechanisms**  **2.3** use scientific inquiry/research skills (see page 15) to investigate how structures are built to withstand forces.  **S&T Grade 5 Structures and Mechanisms**  **2.4** use technological problem-solving skills (see page 16) to design, build, and test a frame  structure ***(e.g., a bridge, a tower)*** that will withstand the application of an external force ***(e.g., a strong wind or simulated vibrations from a train)*** or a mechanical system that performs a specific function ***(e.g., a building crane).***  **Mathematics Grade 5**  -estimate and measure the perimeter and area of regular and irregular polygons, using a variety of tools (e.g., grid paper, geoboard, dynamic geometry software) and strategies.  - determine, through investigation using a variety of tools (e.g., concrete materials, dynamic geometry software, grid paper) and strategies (e.g., building arrays), the relationships between the length and  width of a rectangle and its area and perimeter, and generalize to develop the formulas [i.e., *Area* = *length* x *width*; *Perimeter* = (2 x *length*) + (2 x *width*)]; | |
| **Learning Goals:**  Design functional houses  Determine efficient methods for calculating area  Create 3D objects from 2D designs | **Success Criteria:**  Students have planned, calculated, and constructed a model of our dream house using MinecraftEDU |
| **Lesson Overview:**  Blueprints and floorplans briefly introduced (straight lines, top down view, measurements and labels, interior vs exterior, various vocab terms).  Using grid paper, students will draw a 2d floor plan of the house they currently live in, and estimate the area of various rooms.  They will then design a floor plan of their dream home, labelling rooms and calculating the area of each room, and of the total house.  When they have a completed floor plan, they will be asked to construct a model of their ideal home using creative MinecraftEDU on a collaborative server.  Students can use a variety of materials to create model homes to test their structural strength and stability to see if they can withstand natural forces. | |
| **Materials and Technology:**  Example images of blueprints vs completed buildings  Grid Paper (1cmx1cm)  Rulers  Pencil Crayons  Laptop with functional MinecraftEDU installation  Junk material for design prototypes | |
| **Student Accommodations/Modifications:**  Extra time  + Complexity by labelling the rooms that a house must include  - Complexity by having them lay out and construct an ideal backyard | **Lesson will be differentiated by:**   * **Content, specifically:** * **Process, specifically:** * **Product, specifically: 2D Floor plan of a dream house, 3D Model of a dream house** * **Environment, specifically:** |
| **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. |
| - Introduce the task by talking about the various structures that students in the class live in (apartments, houses, trailers).  - Have them briefly sketch out a floorplan of their home, and estimate the area of each room  - Discuss vocab, and non-standard units of measurement, as well as necessary parts of a home, and the difference between interior and exterior parts.  -Diagnostic/Formative data collected as product (sketch) | |
| **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. |
| Students will draw out a 2d floor plan on 1cm grid paper, labelling rooms, and calculating the area of each room, and of the overall house. When complete, students will create a model of their home using creative MinecraftEDU on a collaborative server.  Create prototypes of their models using a variety of materials to test forces acting on them.  Misconceptions: How large / small rooms really are, rooms that are required to have in households (kitchen, bedroom, bathroom, etc.), differences in orientation between plans and models, measurements needed, plans needed for upper floors.  Demonstration of understanding: Students should be able to take a top-down screenshot of their 3d model before they construct the roof, and show the similarities and any differences between their model and their plan on paper.  Assessment Data: Collected based on rubric applied to success criteria for 3d Model.  Extension: Design a second type of home, or expand plans to allow room for landscaping an ideal yard to go with your ideal home.  Build a functional model home based on the designs. | |
| **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. |
| Students will be selected to share based on the different features they include in their model, and the solutions they used to solve. The entire class will go for a “digital tour” of the homes created on the MinecraftEDU server.  Questions to ask: Why did you include that? How do those look in buildings you’ve visited? How is this house better than your current one? How is it worse? What did you find difficult to build using MinecraftEDU ? If you could create another house, what would you do differently? Which types of materials did you use? How long did it take to create? Whose house do you really like, and why? | |