

Topic: Energy Transfer, Surface Area, and Volume

Teacher: Witte
Genre: Math
Grade Level: 6,7

Unit: Geometry
Duration: 4 periods

Essential Question

(Domain 1: Planning and Preparation-Component 1c: Designing Coherent Instruction)

- How do you find the surface area and volume of a rectangular prism and how does the volume/surface area relate to heat loss in a house.

Background Knowledge

Background Summary:

- Area of basic shapes, Knowledge of a rectangular prism

Lesson Objective:

- Students will be able to calculate the surface area and volume of a rectangular prism

Standards

(Domain 1: Planning and Preparation- Component 1a: Demonstrating Knowledge of Content and Pedagogy)

MP.3 Construct viable arguments and critique the reasoning of others. Students develop different arguments as to why area formulas work for different polygons. Through this development, students may discuss and question their peers' thinking processes. When students draw nets to represent right rectangular prisms, their representations may be different from their peers'. Although more than one answer may be correct, students have an opportunity to defend their answers as well as question their peers. Students may also solve real-world problems using different methods; therefore, they may have to explain their thinking and critique their peers.

MP.4 Model with mathematics. Models are used to demonstrate why the area formulas for different quadrilaterals are accurate. Students use unit cubes to build right rectangular prisms and use these to calculate volume. The unit cubes are used to model that $V = lwh$ and $V = bh$, where b represents the area of the base, and that both are accurate formulas to calculate the volume of a right rectangular prism. Students will use nets to model the process of calculating the surface area of a right rectangular prism.

MP.6 Attend to precision. Students understand and use labels correctly throughout the module. For example, when calculating the area of a triangle, the answer will be labeled units² because the area is the product of two dimensions. When two different units are given within a problem, students know to use previous knowledge of conversions to make the units match before solving the problem. In multi-step problems, students solve each part of the problem separately and know when to round in order to calculate the most precise answer. Students attend to precision of language when describing exactly how a region may be composed or decomposed to determine its area

6.G.A.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems

Vocabulary (Domain I: Planning and Preparation - Component 1e: Demonstrating Knowledge of Students.)	Prep Work/Materials (Domain 1 Planning and Instruction-Component 1e: Designing Coherent Instruction, Domain 3 Instruction-Component 3c: Instruction Engaging Students in Learning)	Cross Curricular Connection (Domain I: Planning and Preparation - Component 1a: Demonstrating Knowledge of Content and Pedagogy, Component 1b: Demonstrating Knowledge of Students.)
Area, Prism, Surface area, Volume, 2 Dimensional, 3-Dimensional, Heat Transfer, Insulators	EV3 robot, Temperature sensors, Oak Tag sheets, Hot Glue Gun, Wooden Dowels,	Science Heat Transfer in relation to the houses.
Differentiation (Domain I Planning and Preparation-Component 1e: Designing Coherent Instruction, Domain 3: Instruction - Component 3b: Using Question and Discussion techniques Domain 3: Instruction - Component 3c: Engaging Students in Learning)		
<ul style="list-style-type: none"> Some students will be able to create a room, Calculators will be provided, follow up problems will be tiered. Students will have the option of making a house or an apartment. 		
Procedure (Domain I Planning and Preparation-Component 1e: Designing Coherent Instruction, Domain 3: Instruction - Component 3b: Using Question and Discussion techniques Domain 3: Instruction - Component 3c: Engaging Students in Learning)		Student Engagement (Teacher Assessment)

<p>Have students build a living structure (House or apartment) Out of oak tag , masking tape, scotch tape, glue guns and dowels. Remind students to add windows, doors, rooms and floors. Have students find the area of each wall and roof structure.</p> <p>Have students take initial , internal temperature of the house and external temperature.</p> <p>Have students place house of light source, record internal and external temperature each 30 seconds for 5 Minutes.</p> <p>Have students observe the exterior of house with thermal imagery for 5 minutes and record observations. Notice where heat is escaping</p> <p>Students will use the robot to test the temperature of both the inside of the house and the outside of the house.</p>	
<p>Assessment (Formative or Summative) (Domain 1 Planning and Instruction- Component 1e: Designing Coherent Instruction, Domain 3 Instruction- Component 3c: Engaging Students in Learning, Domain 3 Instruction- Component 3d: Using Assessment in Instruction)</p>	<p>Student Engagement (Teacher Assessment)</p>
<p>The house calculations will be checked for accuracy, The write up of the project and the construction will be graded on a rubric. The pairs/groups will have an evaluation form for each other.</p>	
<p>Additional Resources</p>	
<p>Materials for insulation such as cotton balls, plastic for windows, foil, https://www.teachingchannel.org/videos/stem-lesson-ideas-heat-loss-project</p>	