the CEED

THE CENTER FOR ENERGY EFFICIENT DESIGN

Title			
Grade Level	8th grade	**Subject**	Physical Science
Objective(s): - Design a model home that is energy efficient - Use the CEED dashboard to figure out energy saved/used from green roof - Design a green roof top of choice - Measure the temperature and in model homes using thermal energy gun.		**SOL Addressed:** PS. 7a The student will investigate and understand temperature scales, heat, and heat transfer. Key concepts include Celsius and Kelvin temperature scales and absolute zero. PS.6c The student will investigate and understand states and forms of energy and how energy is transferred and transformed. Key concepts include heat, light, and sound	
		Common Core Standards: **MS PS. 3B** **MS PS. 3A**	
Materials Needed Per Class of 30 **and** **Prior Knowledge**	**Foam Board kit: Foamwerks Product Model house kit (AC Moore)** **Grass seedlings (offer students a variety of types)** **Soil** **Trays for growing grass and transplanting seedlings** **Thermal Energy Radar gun (Sloan ordering)** **Lab chart for data**		
Ways to differentiate this lesson plan	• **EXTENSION** for Higher Level Learner Students can not only design a model home with a green roof, but they would be able to design another model home with a solar roof top to compare the energy savings and temperature changes. They could research solar design models and construct using extra solar cells from other kits used. • **MODIFICATIONS** Students would be given a model design already planned and be given a selected type of grass.		

CEED

Instructional Activities

<table>
<tr>
<td>Introduction/ Anticipatory Set</td>
<td>Anticipatory Set: How will the teacher introduce the lesson to the students?
We would go out to the CEED building and look at the design of the building and the concept of the green roof. Look up other homes and compare their designs and types of greenery used.

Questions to ask students:
• What did they notice about the design?

• What type of greenery/grass used?
• How would they plan on integrating a irrigation system?</td>
<td>Introduction:
Students would look at the dashboard and collect information regarding the green roof.

Students would have already discussed energy transformation and conservations.</td>
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<tr>
<td>Guided Practice</td>
<td colspan="2">Research Shows that students learn best when they are
• actively engaged and thinking in the classroom
• drawing conclusions by analyzing data, models or examples and by discussing ideas
• working together in self-managed teams to understand concepts and to solve problems
• reflecting on what they have learned and on improving their performance
• interacting with an instructor as a facilitator of learning

Sample Facilitator Questions for the Activity:
What question(s) will students be investigating? Energy conservation, Temperature Scales, Home design.
What process will students follow to collect information that can be used to answer the question(s)? Use the dashboard for collecting information prior to design. Trial and error and data collection.</td>
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<tr>
<td>Independent Practice</td>
<td colspan="2">Instructions for independent or student group activity. Ideally, students should work together in learning teams to acquire knowledge and develop understanding through guided inquiry. The students should apply the new knowledge gained in the guided practice to new exercises and problems, present their results to the class, reflect on what they have learned, and assess how well they have done including methods of improvement.

Students will build their model homes in cooperative groups of 2. The students will then transplant a green roof to the model home. The home needs to not only sustain the green roof but also provide heat to the model. They will show the class their design and report the data collected using the Thermal gun.</td>
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Closure (Summary of Lesson)	What will the teacher do to bring the lesson to a close? How will the students make sense of the investigation? How could the students improve / modify for the future? Students should have an indication that the design and the green roof need to go hand and hand. Students would have had an opportunity to see energy saving ideas and designs come into play when looking at energy transformation and conservation. They themselves would have seen the data first hand and the experience of working out oriental problems.
CEED Building Application/ Sensor Data	This area of the lesson should incorporate dash board information or any sensor data required for the investigation. Students would use the dashboard for data collection from the green roof as well as building design. We will use the dashboard and go over to the building for data collection and sketching ideas.
Assessment	Model home Data collected Rubric for grade

INQUIRY LEARNING RESEARCH PROCESS GUIDELINES

The following table is just one guideline to use for developing your own inquiry materials. The seven steps in the Learning Research Process include not only how people learn but also how research is conducted. The heart of the design, the three-stage learning cycle of exploration, concept invention or formation, and application is embedded in the middle. In addition to these three stages, this design takes into account that learners need to be motivated to spend the time required for understanding complex subjects and that learners need to build this new knowledge onto prior knowledge. These are similar to the 5E and 7E learning models.

The Learning-Research Process

Steps in the Learning-Research Process	7E Equivalent	Component of the Activity
1. Identify a need to learn.	Engage	An issue that excites and interests is presented. An answer to the question *Why?* is given. Learning objectives and success criteria are defined.
2. Connect to prior understandings.	Elicit	A question or issue is raised, and student explanations or predictions are sought. Prerequisite material and understanding is identified.

3. Explore	Explore	A model or task is provided, and resource material is identified. Students explore the model or task in response to critical-thinking questions.
4. Concept invention, introduction, and formation	Explain	Critical-thinking questions lead to the identification of concepts, and understanding is developed.
5. Practice applying knowledge.		Skill exercises involved straightforward application of the knowledge.
6. Apply knowledge in new contexts.	Elaborate and Extend	Problems and extended problems require synthesis and transference of concepts.
7. Reflect on the process	Evaluate	Problem solutions and answers to questions are validated and integrated with concepts. Learning and performance are assess

Hanson, D. (2006). POGIL Instructor's Guide to Process-Oriented Guided-Inquiry Learning. Lisle, IL: Pacific Crest