



WEATHERIZATION

TOPIC OF STUDY

Building Sciences



90 MINUTES

KEY TERMS

equilibrium
feedback loop
system
systems thinking

LESSON

Building Science

OBJECTIVES

Students will:

- Apply concepts of House as a System to a variety of scenarios
- Construct an accurate model of a house system using concept mapping
- Explain the interrelatedness of the components of the house as a system

BIG IDEA(S)

Building science using principles of other science disciplines to understand the house as a system.

TASK LIST SUBCATEGORY

- 801 Identify the principles of building science
- 802 Describe the interconnection of systems
- 106 Describe the impact of energy systems (social, economic, health, and environmental)

OVERVIEW

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems. A house is a single system of connected parts. Building science is based on the use of scientific principles to understand how the house as a system impacts energy efficiency, air flow, and the overall health, safety, and comfort of the occupants. Building science is an approach to weatherization that uses modern technology to study building construction, maintenance, safety and durability in an effort to increase energy efficiency. (*Energy Conservation Handbook*, p. 89)

STANDARDS

PA/SDP

- 3.1.12.A8.** Change and Constancy: Describe and interpret dynamic changes in stable systems
- 3.2.12.A5.** Change and Constancy: Predict the shift in equilibrium when a system is subjected to a stress
- 3.4.10.A2.** Interpret how **systems** thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.12.B1.** Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of **technologies**.
- 3.4.12.C3.** Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E3.** Compare and contrast energy and power **systems** as they relate to pollution, renewable and non-renewable resources, and conservation.



INSTRUCTIONAL

TEXT/REFERENCES

Energy Conservation Handbook. pp. 89 – 92

MATERIALS NEEDED

Teacher Presentation: U.S. DOE Weatherization/Technician Fundamentals, *House as a System* Powerpoint Presentation: <https://www.energy.gov/eere/wap/downloads/weatherization-installer-technician-fundamentals-20-house-system>

Content: Videos linked below, worksheets in Appendix

Technology: Access to YouTube



WEATHERIZATION

TOPIC OF STUDY

Building Sciences



90 MINUTES

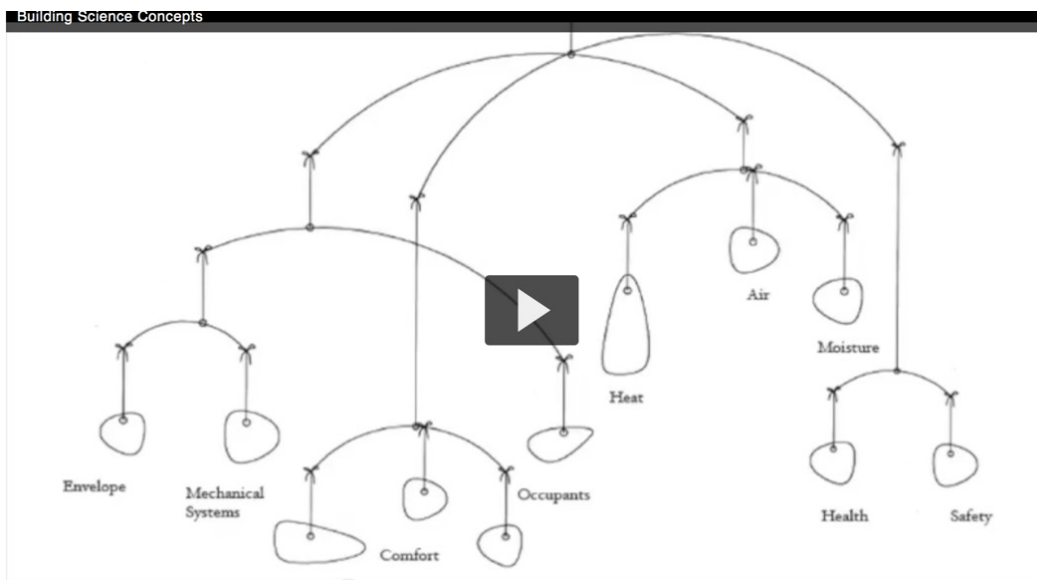
IMPLEMENTATION (LESSON PLAN)

ENGAGE

- Watch the video segment from 3:33 – 9:11 on the interconnectedness of the components of the home: https://mediaspace.nau.edu/media/Building+Science+Concepts/0_9gnqhk0n/69035282

EXPLORE

- Have students create their own concept maps/graphic organizers similar to the mobile shown in the video above and image below. Include the concepts listed below in the circles and on the linking lines describe how each of the components are related to each other.



EXPLAIN/EXTEND

- Ask students to discuss their concept maps. Ask students to draw a cutaway diagram of their own home and label with the above components.

EVALUATE

- Students can take quiz found on pages 169-170 in the *Energy Conservation Training Handbook*.





RESOURCES/LINKS

Basic Building Science webinar by The Energy Center of Wisconsin

<https://www.youtube.com/watch?v=vCSAjgVUplA>

Building Science Basics materials

<https://www.energy.gov/eere/wap/downloads/weatherization-installertechnician-fundamentals-20-building-science-basics>

Building Science Concepts

<https://www.wbdg.org/resources/building-science-concepts>

Building Science Concepts: Northern Arizona University

https://mediaspace.nau.edu/media/Building+Science+Concepts/0_9gnqhk0n/69035282

Energy Star Qualified Homes Building Science Introduction

https://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/ENERGY_STAR_V3_Building_Science.pdf

Introduction to Building Science powerpoint slides

https://www.tboake.com/2013/172-building_science_13.pdf

National Energy Education Development (NEED) Project: Building Science booklet

<https://www.need.org/Files/curriculum/guides/BuildingScience.pdf>

PBS Teaching About Systems

<https://why.pbslearningmedia.org/resource/syslit14-sci-sys-ilpdsystems/teaching-about-systems/#.X2VKLi-ZPVo>

U.S. DOE Weatherization/Technician Fundamentals, House as a System, ppt.

<https://www.energy.gov/eere/wap/downloads/weatherization-installertechnician-fundamentals-20-house-system>

Whole Building Design Guide

<https://www.wbdg.org/continuing-education/wbdg-courses/wbdg15>



WEATHERIZATION

TOPIC OF STUDY

Building Sciences



90 MINUTES

