Building Science
Table of Contents

COURSE DESCRIPTION
Students are introduced to the core principles of building science. Building science is a systems-based approach to construction that examines the building as a system of parts and materials that interact with one another, its occupants, and the environment in profound ways. Students learn about the building as shelters, designed to protect occupants through the design and construction of performance-based building envelopes. Students are also introduced to key energy measurements, and perform a home energy audit to synthesize and apply key understandings from the unit.

Lesson 1: The Human Need for Shelter
In this lesson, students identify the makeup and role of human shelters by pinpointing various climates and global locations in time, thereby creating a broad overview of how shelters initially reflected their environment and the people who created them.

Lesson 2: At Home in the Zone
In this lesson, students view the United States by geographic region, with an eye to various climate zones. They first identify why climate matters to good building practices, then solidify their understanding by creating a rap or rhythm piece about their assigned “zone.”

Lesson 3: Why Thermodynamics Matters in Construction
In this lesson, students tackle the two most important laws of thermodynamics – the first and the second – by tracing the journey of two energy sources: coal and sunlight. First, they identify the source of both, and then trace them – and the resulting loss of usable power (net energy) – to their final destination in a building.

Lesson 4: Heat on the Move
In this lesson, students take a close look at the role of heat (conduction, convection, and radiation) as it relates to good building science. They will research one specific building material for its ability to resist or conduct heat, creating the initial chapter of a Global Building Materials Catalog.

Lesson 5: The Way Water Moves
In this lesson, students continue their study of the natural conditions which may impact a building by examining the role of moisture. They expand their research on one specific building material; this time as it demonstrates an ability to absorb or repel water. Research is added to the Global Building Materials Catalog.
Lesson 6: Air Carrier

In this lesson, students finish their study of the three prime natural conditions of climate by looking at the way air can move through a building. Using the same potential building material they used in previous lessons, they research its ability to resist or allow air flow. All research is added to the Global Building Materials Catalog.

Lesson 7: Building Envelopes: First Line of Defense

In this lesson, students look into the most fundamental part of a building – its envelope. Students experiment with potential envelope materials by testing them with water, and then with air, to determine their suitability as air and moisture barriers.

Lesson 8: Putting Building Metrics to Use

In this lesson, students delve into the complex world of building metrics, looking at U-value, R-value, kWh, BTUs, air exchanges, pascals, and ppsi. They pay particular attention to the two most widely used, kWh and BTUs, learning to track them on a utility bill and at home.

Lesson 9: Good Buildings Going Bad

In this lesson, students demonstrate a thorough understanding of good building strategies learned to date by designing a building using bad building strategies. When finished, students defend their design choices by identifying their correct opposite.

Lesson 10: Green Building Science

In this lesson, students are introduced to one of this country’s foremost green builders. Using knowledge from his website, they put building science to the test by conducting a blower door test on their classroom.

Lesson 11: Home Energy Audit

In this lesson, students conduct an energy audit on their homes. They are given a template to guide them through the audit process. They then share their results in class, creating ratings and a sheet of upgrades for each home based on audit results and their knowledge of building science.

Lesson 12: The House that Science Built

In this lesson, students create a to-scale design home. Using the knowledge base they now have, students identify climate, materials, size, sources of energy, and primary building materials. This design can be revised and revisited at the end of a course or additional units.