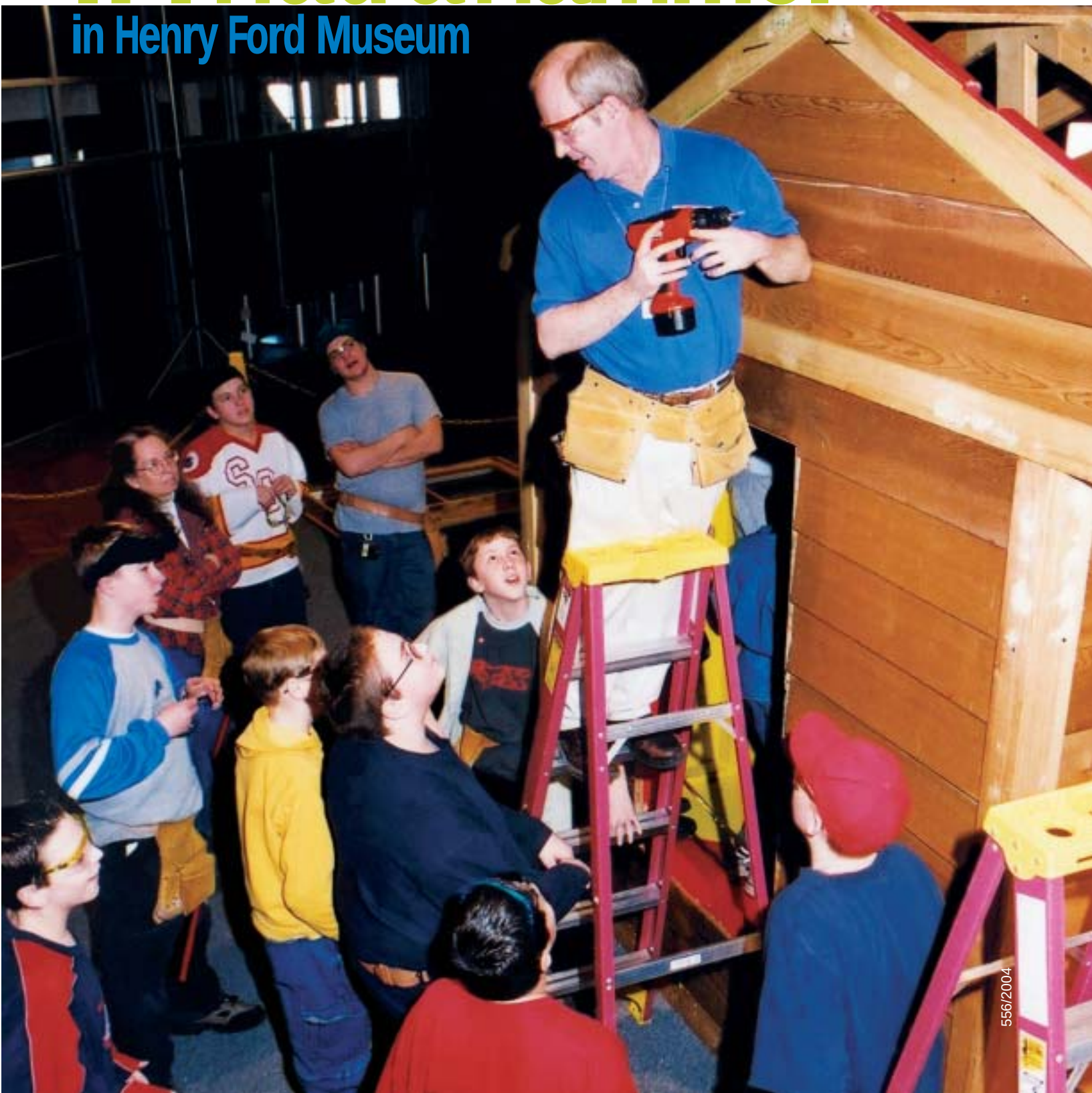
If I Had a Hammer

in Henry Ford Museum



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If I Had a Hammer in Henry Ford Museum

Dear Educator:

Thank you for choosing the *If I Had a Hammer* experience for your students. *If I Had a Hammer* is a "teaching for understanding" program designed for 4th-to 7th-graders. Students have an opportunity to apply outside the classroom what they have learned in the classroom. This program engages the whole child and provides a broad context for viewing the historic structures and collections in Henry Ford Museum or Greenfield Village.

If I Had a Hammer Program Goals

This 2 1/2–hour experience is designed to:

- Blend language arts, mathematics, science, social studies, career and employability and technology knowledge and skills into an integrated, interdisciplinary approach.
- Offer real-life challenges where students work together to achieve a goal—the building of an 8' x 11' house where they learn how to use, apply and understand skills and concepts.

Connections to the Michigan Curriculum Framework

SS.II.2	Students will describe, compare and explain the locations and characteristics of ecosystems, resources, human adaptation, environmental impact and their interrelationships.
SS.IV.2	Students will use economic reasoning when comparing price, quality and features of goods and services.
ELA.3	Students will focus on meaning and communication as they listen, speak, view, read and write in personal, social, occupational and civic contexts.
MA.II.3.6	Students will apply measurement to describe the world and to solve problems.
MA.V.2.5	Students will explore problems that reflect the contemporary uses of mathematics in significant contexts and use the power of technology and algebraic and analytic reasoning to experience the ways mathematics is used in society.
SC.I.7	Students will write and follow procedures in the form of step-by-step instructions, recipes, formulas, flow diagrams and sketches.
SC.II.1.3	Students will show how common themes of science, mathematics and technology apply in real-world contexts.
CES.5	Students will display personal qualities such as responsibility, self-management, ethical behavior and respect for self and others.
CES.6	Students will identify, organize, plan and allocate resources efficiently and effectively.
CES.7	Students will work cooperatively with people of diverse backgrounds and abilities and contribute to a group process with ideas, suggestions and efforts.

Classroom Activities

1. "Building" Vocabulary

Objectives

By participating in this activity, students will be able to:

- Expand their use and understanding of vocabulary associated with building.
- Identify several occupations and the specialized vocabulary associated with them.

Materials Needed

- Photocopies of **Handout #1** "Building" Vocabulary (Page 7 of this guide)

Procedure

There is an extensive vocabulary that can be learned and used when building a house. Copy and distribute the "Building" Vocabulary Handout and have students work in small groups to define each word using dictionaries, encyclopedias or any other reference materials.

When all groups have completed the sheet, call the class together for discussion. Some possible questions for discussion are:

- Why is it important to know these words when building houses?
- What are all the occupations associated with building houses?
- How does knowledge of specialized vocabulary help you to complete tasks such as building a house? Planting a garden? Playing a sport? Baking a cake? Learning a computer program?
- Ask students to identify other occupations that require a specialized vocabulary.

Extend learning by asking students to contact people in the building professions to find out more about these words and other specialized vocabulary. Invite these professionals to the classroom to find out how their occupation has changed over time. Questions could focus on:

- Changes in tools, materials used and customer's needs
- Safety considerations
- Rules or regulations
- Technical and interpersonal skills required
- Tools of the Trades—such as architect, carpenter, electrician, etc.

Assessment

Create a collage of words and images associated with buildings, architecture, building occupations, etc.

2. Classroom Construction Projects

Objectives

By participating in this activity, students will be able to:

- Explore issues of teamwork, leadership and communication in a fun and hands-on way.
- Follow directions and ask for help as needed.
- Accept and offer suggestions in a positive way and evaluate solutions.
- Demonstrate positive personal qualities as a member of a work group.

A. The Tallest Tower

Materials Needed

- Assemble for each group identical sets of building materials: 3 pieces of paper, 10 paper clips and 1 pair of scissors.
- Apply about a 5-foot strip of masking tape to a wall or doorjamb that will be used as a measuring site to compare the heights of towers.

Procedure

Organize students into small groups to work and problem solve together to build the tallest tower.

Tell students that each tower must meet the following criteria:

- Only the materials provided can be used in building the tower.
- The towers must be freestanding. They may not lean against the wall or be held up.
- Towers must be brought to the tape on the wall for measuring. This means they will have to be transportable or easy to rebuild at the measuring site.

As towers are completed, have students take them to the measuring site. After all towers have been constructed and measured, review with entire class successful and non-successful strategies for building the tallest tower.

B. Square and Round Structures

"We made these little gray houses of log that you see, and they are square. It is a bad way to live, for there can be no power in a square. You have noticed that everything an Indian does is in a circle, and that is because the power of the World always works in circles and everything tries to be round."
(Neihardt, J.G. *Black Elk Speaks*. Lincoln, NE: University of Nebraska Press, 1961)

Materials Needed

- Toothpicks and marshmallows. Assemble for each group one set of building materials—each set should contain at least 60 toothpicks and 30 miniature marshmallows.

Procedure

Organize students into pairs to construct a small square or rectangle house and a round or dome house out of toothpicks and marshmallows.

Ask students to compare and contrast their two structures:

- Which is stronger?
- Which uses more resources?
- What are the advantages of each type of structure?
- What are the disadvantages?
- What kinds of building materials do they think are best suited for each structure?
- Can you identify examples of each type of structure in your community? Other parts of the world?
- If they could choose either structure to live in, which would they choose? Why?

Extend student learning:

- Arrange to visit the Dymaxion House in Henry Ford Museum, Greenfield Village or historic structures in your own community to compare and contrast the design, materials used, interior and exterior decoration and household technologies with those of structures built today.
- Invite an architect or engineer to your classroom during or after these classroom construction activities to talk about their job.

Assessment

Ask the following questions at the conclusion of these activities to encourage discussion and reflection:

- What role does communication play in these activities?
- What role does cooperation play in these activities?
- How could communication be improved?
- How does the group work together to solve problems?
- Identify at least one way you contributed to the successful (or unsuccessful) completion of these activities.

3. Workers' Stories

"I've been a tradeswoman for about fourteen years. In 1982 I got together with some other women to start our own business. Just women, with no men to teach us or help us. At first we did repair and small jobs, and in seven years we worked up to building houses and doing general contracting. I'm proud of what we accomplished, but all along the way we had to fight with internalized messages that said "you can't do this—you're just a girl!" But each new project was bigger than the one before and each success reinforced our belief in ourselves."

"After a while I realized that these were skills I could pass on to other women and started teaching workshops. I discovered that the first step is the most profound. Getting over initial fears of tools and machines spans a giant chasm in our emotional lives. When you do something you've been told all your life that only men can do—it's very powerful. It can transform."

"Once women discover they can handle tools, they are ready to believe the rest. They can see that going on to bigger projects is only a matter of degree, of increments of time and experience. The mystique is shattered forever. And when they realize they can do this thing, what else in their lives might work the same way?"

(Janice Goldfrank in Martz, Sandra, ed. *If I Had a Hammer: Women's Work in Poetry, Fiction and Photographs.* Watsonville, CA: Papier-Mache Press, 1990.)

Objectives

By participating in this activity, students will:

- Explore, explain and discuss ideas in a group.
- Respond to written text and compare their responses with others.

Procedure

Copy or read the above to your students.

Initiate discussion and reflection by asking the following questions:

- How would you describe Janice Goldfrank?
- What obstacles did she face in establishing herself in the building profession? Who or what created those obstacles?
- What lessons did she learn as a result of her experiences?
- What is your response to people who don't believe you can achieve something? Why?
- Do you think her story is a unique one? Why or why not?
- Do you know of similar stories?

Assessment

Extend your learning by interviewing men or women you know in non-traditional occupations.

What are their stories?

Have students write them down and share them with the rest of the class.

4. It Costs What!?

Objectives

By participating in this activity, students will:

- Use drawings to explain and justify conclusions based on data.
- Measure and calculate materials required and associated costs.

Materials Needed

- Photocopies of **Handout #2 –** Drawing of the foundation of the house in the *If I Had A Hammer* program. (page 8 of this guide)

Procedure

Copy and distribute **Handout #2** or draw it on the board.

Ask students to solve the following problems:

- If the joists are nailed every 16" apart and the band for the foundation is 8' long, how many joists are needed?
- How many 2" x 6" boards are needed in all?
- If each 2" x 6" costs $4.50, how much would the foundation cost?
- What other materials and tools would you need to build the foundation?
- Brainstorm all the tools and materials needed.

Assessment

Using this brainstormed list of tools and materials as the shopping list, have students work in small groups to research the cost of all they would need to build the foundation. They should research prices at a minimum of two lumber stores. Have students chart or graph their findings so that they can compare the prices that each store charges.

When students have completed their charts or graphs, bring the class together for a discussion and ask these questions:

- Was there a wide or narrow range in price differences for the same item? Can you explain why?
- Were there any surprises in the research? If so, what were they?
- Where would they purchase the needed tools and materials? Why?
- Would they buy everything from one store? Why or why not?
- What factors other than cost influence purchasing decisions?

Extended Student Learning

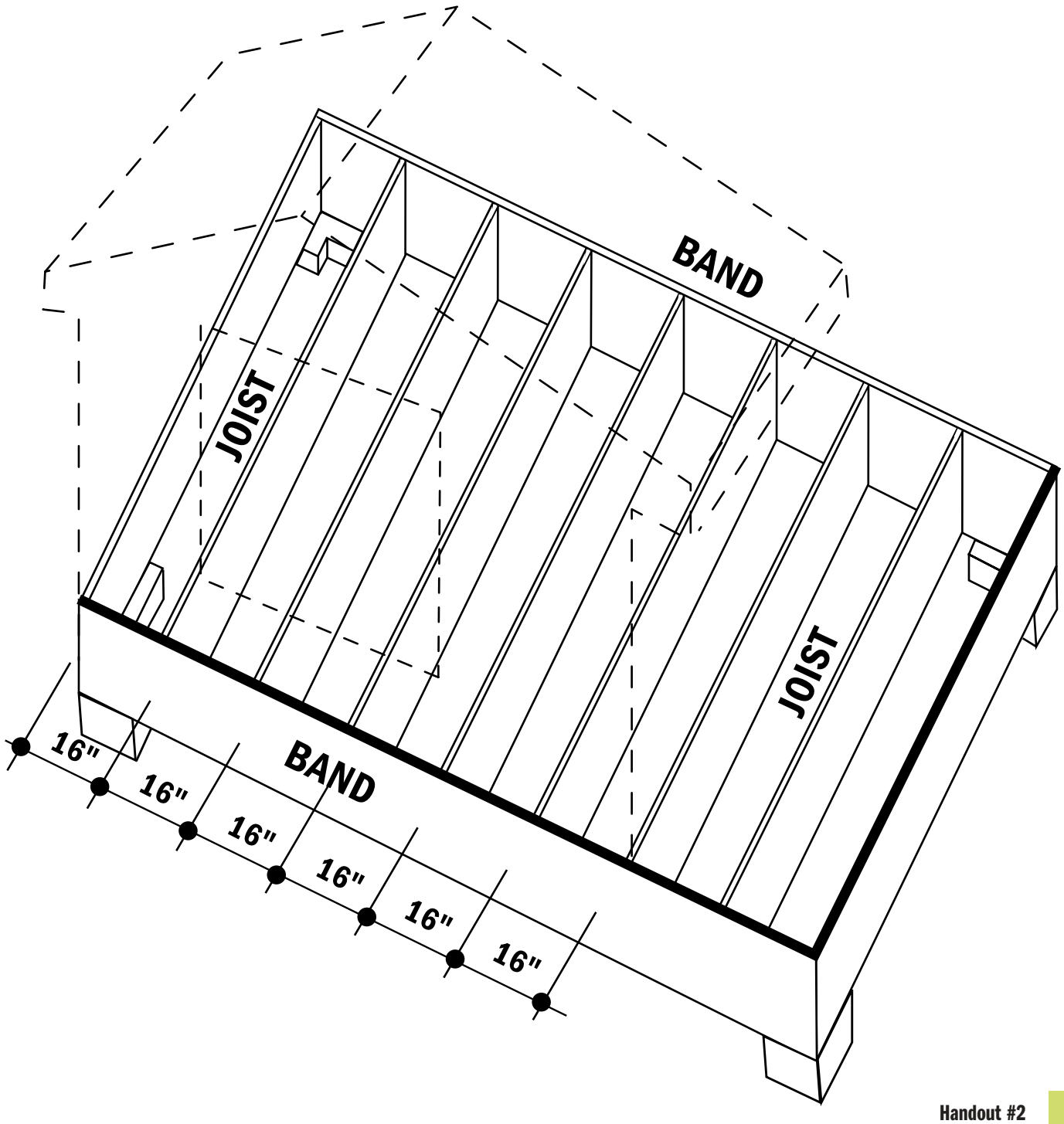
- Have students create a "shopping list" for a project of their choosing such as building a CD rack, building a doghouse, making a picture frame. Identify all the materials needed to complete the project. Research the cost of doing the project at two stores. If they were to build it, how much would they charge for their labor?
  What would be the cost of their project including labor?
  Would others pay that price?
  Why or why not?
  How much do you think it would cost to have someone else build it?
- Find books or periodicals in the library that can help students "de-construct" the cost of various products or services. What are the various components that figure into the total cost of a product or service?
- Check with the school cafeteria to learn how they figure the cost per meal served.
  Is there a minimum or maximum cost associated with school meals?
  How is this number determined?
  What factors influence the school menu besides cost?

"Building" Vocabulary

Define the terms below using words or pictures.

1. Floor joist
2. Band
3. Decking
4. Framing
5. Stud
6. Clapboard Siding
7. Corner Boards
8. Safety Goggle
9. Truss
10. Roof Covering
11. On Center
12. Fascia Board
13. Gable
14. Area
15. Vertical
16. Horizontal
17. Budget
18. Flathead screwdriver
19. Phillips head screwdriver

Foundation Drawing



Resources

There is an extensive array of print and online resources that can be used to increase student knowledge and understanding.

Below is a selection of resources highly recommended and successfully used by teachers to spark interest and enthusiasm in building and structures.

Print

Courtenay-Thompson, Fiona; Tritton, Roger and Liddiard, Nicole, editors. *The Visual Dictionary of Buildings*. London: DK Press, 1993.

A details source book for children and adults. K-12.

Hooker, Saralinda; Ragus, Christopher and Salvadori, Mario G. *The Art of Construction*. Chicago: Chicago Review Press, 1990.

Award-winning text introduces building principles. Students test principles with common materials. Grades 4-8

Isaacson, Philip. *Round Buildings, Square Buildings, and Buildings that Wiggle Like Fish*. New York: Knopf, 2001.

Award winning children's book using photos and text to convey the power and beauty of architecture. All ages.

Kluger-Bell, Barry. *Exploratorium Guide to Scale and Structures*. New York: Heinemann, 1995.

Hands-on projects of the physics and math of structures. Grades 3-8

Macaulay, David. *Unbuilding*. New York: Houghton Mifflin, 1987.

This fictional account of the dismantling and removal of the Empire State Building describes the structure of a skyscraper.

Online

www.cubekc.org
Center for the Understanding of the Built Environment Web site. Includes a variety of teacher resources.

www.tiesmagazine.org
The Magazine of Design and Technology Education Web site. Ideas for integrating math, science and technology into the curriculum by focusing on design and problem solving.

www.temple.edu/architecture/special/aie
Resources for using architecture in education.

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