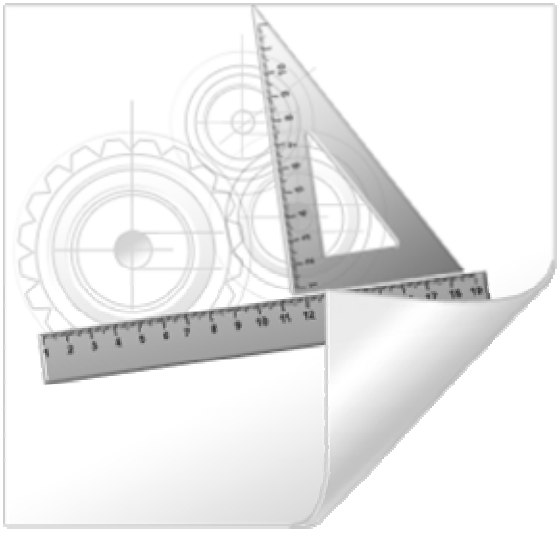
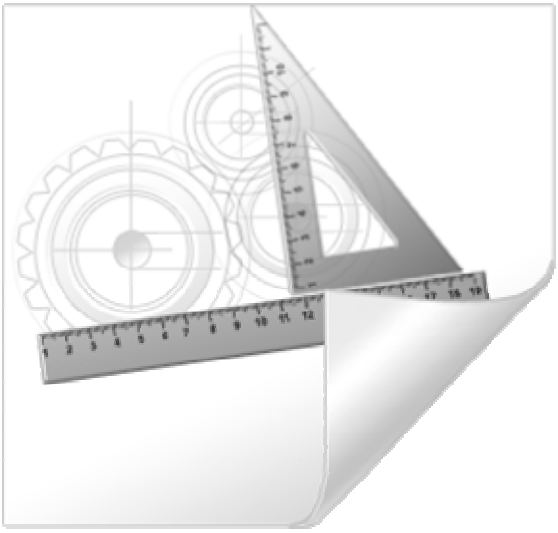

Project title	*Designing for the Future in the Classroom Today*
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For information concerning IMPACT II opportunities including Adapter and Disseminator grants, please contact:

The Education Fund
305-892-5099, Ext. 18
e-mail: Lvalle@educationfund.org
web site: www.educationfund.org

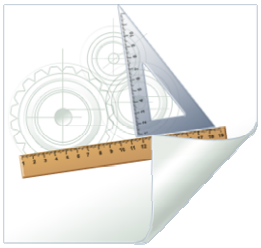
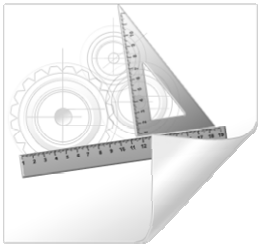


Table of Contents



Goals and Objectives

The project *Designing for the Future in the Classroom Today* helps students understand what it takes to make buildings and communities work for the people who live in them. Societies express themselves through their buildings as much as through their food, their clothing, their customs, and their family organizations. After participating in the project, students are amazed by the new perspective that architecture gives them on mathematics, science and the world around them.

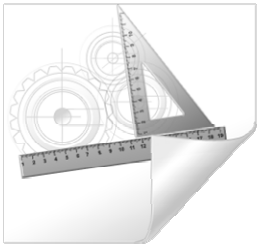
During the project, students learn the many ways buildings and other structures can be constructed as well as how location, local building materials, and the purpose of the structure affect its design. As students view, study and construct buildings, bridges, and other structures, they ask a series of questions: Who created this building? What is the original function of the building/structure? What materials were used to make it? What cultural needs are expressed through the structure? What available technology was used (tools, fuel, construction methods)? What is the cost?

After students are introduced to the basics of building, they use mathematics and science skills to measure, plan and construct models of various buildings and structures. In one specific activity, teams of students use materials to construct various bridges, including suspension, truss and simple girder. As students plan, measure, construct and share models, they increase vocabulary by physically using beams, walls, arches, columns, cantilevers, and trusses from their bridge building kits. They also use mathematics and online research to determine the cost of their bridge in the real world. Scientific thinking skills are developed as students collect, analyze, and organize building information, then use the results of their conclusions to build their projects.

After visiting educational websites to learn about architecture and how it is affected by the needs of society, students will follow plans to construct other structures from building kits, such as a tower, bank, and fire station. For the final presentation, teams of students will design and build a room, structure, or building of their choice using a girder and panel building set. The teams also research and create a written explanation of their structure to include its function and value to the community.

Competency-Based Curriculum/ Sunshine State Standards

- MA.5.G.5.3: Solve problems requiring attention to approximation, selection of appropriate measuring tools, and precision of measurement.
- MA.5.G.5.2: Compare, contrast, and convert units of measure within the same dimension (length, mass, or time) to solve problems.
- MA.5.A.6.3: Describe real-world situations using positive and negative numbers.
- MA.5.G.5.3: Solve problems requiring attention to approximation, selection of appropriate measuring tools, and precision of measurement.
- SC.5.N.1.1: Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
- SC.H.1.2: The student uses the scientific processes and habits of mind to solve problems.
- LA.5.6.4.1: The student will select and use appropriate available technologies to enhance communication and achieve a purpose (e.g., video, presentations).
- LA.5.6.4.2: The student will determine and use the appropriate digital tools (e.g., word processing, multimedia authoring, web tools, and graphic organizers) for publishing and presenting a topic.
- LA.B.2.2:The student writes to communicate ideas and information effectively.



Course Outline and Overview

What better way for students to improve math, science, reading and writing skills than to plan, design and construct their own buildings? *Designing for the Future in the Classroom Today* ties the Sunshine State Standards with engaging, hands-on activities that introduce students to the fascinating field of architecture. This innovative project combines building using kits, technology, and creativity as students develop problem-solving and organizational skills. The project is readily adaptable for other grade levels and content areas and would be an exciting and motivating addition to any curriculum

The project has greatly benefited students' academic achievement. Mathematics computation and measurement skills increased as students designed and planned their building of structures. Scientific thinking skills improved as students researched information, then collected and organized it. They then used their results to construct their bridges, towers, and buildings. Finally, students' communication skills increased as their shared their final products with their peers.

- At the start of the project, students will brainstorm what they know about building, construction and architecture.
- Buildings known to students are listed (examples in Miami: Freedom Tower, Football Stadium, Basketball Arena, Adrienne Arsht Center for the Performing Arts, Parrot Jungle Island, Delano Hotel, Biltmore; other locations, such as Eifel Tower, St. Peter's Cathedral, White House…) Focus questions are listed and answered during the course of the project: Who created this building, What is its original function? What was it built of? What was the cost? How did technology fit into the design and construction? How did culture play a role in its design?
- Student teams then begin their investigations into various types of building and construction: bridges (suspension, simple girder and truss); use and functions of beams, walls, arches, columns, cantilevers
- Student teams construct models from the kits provided by the grant: bridge, tower, bank, fire station… or student teams construct buildings of their own design
- Student teams present their model to classmates and give explanation of its, function, design, construction and value to community

Lesson Plan

My House

Materials
9” x 12” white paper or similar size
Drawing pencils
Crayons or markers

Objectives
Students will…
Review details of their homes (house, apartment, townhouse, mobile home, condominium…)
Draw a picture of their home

Activity

1. In preparation for activity, students can sketch pictures of where they live, take photos of house/apartment and bring to class or email to teacher or look up address and view house/apartment on http://earth.google.com/
2. Look at examples of different kinds of houses, apartments, townhouses, mobile homes, condominiums… http://architecture.about.com/od/periodsstyles/ig/House-Styles/, http://www.fotosearch.com/photos-images/apartment.html, http://www.buildingsystemsnetwork.com/
3. Notice the details, similarities and differences; how do they compare to where you live? Is the roof pitched or flat? Does it have tiles or shingles? Is the outside painted or does it have siding? What kind of door do you have? Are there hurricane shutters on the windows? What are the functions of the different parts of the house?
4. Review geometric shapes and their characteristics: rectangles, squares, circles, ovals, triangles, crescents, polygons, quadrilaterals … Ask students to think about where they live…Think about all the shapes they see. Does one shape repeat more than others?
5. Have students draw their house (apartment, condominium, townhouse, or mobile home) from the way it looks in the front. Share with class and describe parts of the house and their function.

Vocabulary
Roof, wall, door, window, chimney, garage, yard, weather vane, stairs, porch, carport, deck, shutter, shingle, tile, gable, vent, stoop, gutter

Tips: Make sure house/apartment… online pictures are not on blocked websites; place links in “Favorites.” Download Google Earth in advance.

Lesson Plan

Geometric Shapes

Materials
Patterns for 3-dimensional shapes
http://www.primaryresources.co.uk/maths/mathsE3.htm#3
http://mathforum.org/alejandre/workshops/net.html
Construction paper or colored copy paper
Tag board
Scissors
Glue

Objectives
Students will…
Identify shapes used in architecture
Create and construct a model
Create a cone, cube, triangular prism and cylinder
Use at least three, 3-dimensional shapes in house

Activity
1. In preparation for activity, print out patterns for 3-dimensional shapes and review characteristics of 3-dimensional cones, cubes, triangular prisms and cylinders.
2. Have students view 3-D Shapes PowerPoint http://www.primaryresources.co.uk/maths/powerpoint/cm_3dShapes.ppt
3. Introduction to lesson: questions to ask students: “What do you think architects do?”, “What shapes do architects use to build things?”, ” What is the difference between 2-dimensional and 3-dimensional?”, “Think about what a house would look like if you designed it; today you will work in teams to design and construct your house using 3-dimensional shapes.”
4. Demonstrate how to make cones, triangular prisms, cylinders and cubes from patterns. Have students make their own geometric shapes.
5. Divide students into teams and have them discuss and plan model of their house model. They must use at least three, 3-dimensional shapes.
6. When models are complete, mount on tag board and display.

Vocabulary
2-dimensional, 3-dimensional, cone, cube, triangular prism, cylinder, pyramid, cuboids, architect

Lesson Plan

Elements of Architecture

Materials
White drawing paper
Black markers
Crayons or colored markers
Shape templates http://www.enchantedlearning.com/crafts/books/shapes
Photos of buildings http://www.fotosearch.com/photos-images/buildings.html
http://architecture.about.com/od/greatbuildings/Great_Buildings_and_Structures.htm , http://fiveprime.org/hivemind/Tags/dome,pattern

Objectives
Students will…
Identify basic shapes used to make buildings
Learn that special shapes are used just for architecture
Learn terms: arch, dome, and column
Observe shapes in photos of buildings
Create buildings using shape templates

Activity
1. Review shapes used from previous lesson: square, rectangle, and triangle. Introduce the words: column (post used to hold roof up that are usually rectangular or cylindrical), arch (shape of half circle used to create opening for windows, doors or halls), and dome (like an upside down bowl shape used as a roof).
2. Look at photos/pictures of buildings. For pyramid, ask, “What is the basic shape you see? Triangle.” For Stonehenge, “What shapes do you see? The rectangles act as columns.” Use other examples from the Eiffel Tower, Taj Majal, Capital Building in Washington, D.C., Angkor Wat in Cambodia, and St. Paul’s Cathedral in London.
3. Demonstrate to students: Using a marker, draw the ground line. Then trace shapes to create a building. Use them like building blocks. Stack one shape on top of the other. Overlap them. Use just part of a shape. Add decorations and designs. Add a background, trees, hills, and sky.
4. Students then create their own buildings using shapes introduced.
5. Label shapes used in building picture.

Vocabulary
Column, arch, dome, design, rectangle, square, triangle

Tip: Practice drawing building in advance or have several already drawn to show students.

Lesson Plan

Free Standing Model

Materials (per group)
20 plastic drinking straws
20 straight pins (be careful)
10 small paper clips,
1 roll masking tape
1 yard stick
Free Standing Model Worksheet

Objectives
Students will…
Build free standing model using materials provided
Compute cost of structure
Identify problems, successes and revisions of construction

Activity

1. Discuss factors of building: cost, time, planning, modeling, designs, and teamwork needed for a real world construction project.
2. Divide students into teams; provide with materials and place to work. Team members can have specific jobs: spokesperson, timekeeper, cost tracker, recorder…
3. Explain objective: to plan and build a free standing model using materials, but the materials cost money. Their task is to build the tallest structure spending the least amount of money on materials.
4. Allow time to brainstorm and plan.
5. During building time, have students keep track of building costs.
6. When time is up, team tallies cost and measures structure.
7. Teams complete Free Standing Model Worksheet.
8. Teams display structures and share successes and failures.

Vocabulary
Free standing structure, budget, cost, construction, model

Tips: Allow plenty of time for students to plan, construct, and share results of activity. Photograph models and place on school web site.

Free Standing Model Worksheet

Name of Team Members _____

_____

Students work in teams to build a free standing model. The winning team builds the tallest structure while spending the least on materials. Students can only use materials provided.

Cost of materials	
Straws	$1.00 each
Paper clips	$.20 each
Straight pins	$.10 each
Masking tape	$.20 an inch
_____ Straws x $1.00 =	
_____ Paper clips x $.20 =	
_____ Pins x $.10 =	
_____ inch Tape x $.20 =	
Height of structure _____inches	
Total cost of structure _____	

When activity is completed, students discuss questions with team members. Teams share results with classmates.

Questions

What was the most difficult part of building the free standing model?

How did you solve any problems?

Did you need to make changes after beginning construction? If so, what were the changes?

Lesson Plan

Columns

Ionic

Corinthian

Doric

Materials (per group)
Tag board
3 sheets each 18 x 24 papers
Scissors
Glue
Pencils/pens/water soluble markers
Brush and cup of water
Pictures of columns
http://www.freekidscoloring.com/around_the_world/ancient_greece/
http://en.wikipedia.org/wiki/Pediment

Objectives
Students will…
Identify columns as an architectural element
Identify Doric, Corinthian and Ionic columns
Create 3-D columns

Activity

1. Introduction: The ancient Greeks used columns to hold up the roofs of their buildings and temples to allow people to move freely in and out. Columns have three basic parts: the capital or top, the shaft or middle post, and the base, or bottom. There are three kinds of columns; the Doric is the most simple with a capital shaped like a bowl; the Ionic has two curls for its capital; the Corinthian has a capital that looks like a basket with flowers.
2. Pass out materials and have students choose order they want to recreate (Doric, Ionic, and Corinthian) on larger sheet of paper using pencil. Create the order or column in pencil and trace over with marker. Paint over marker with water to make lines look antique. Recreate the same order (same size) using second sheet; paint over with marker and brush with water. See: http://en.wikipedia.org/wiki/Classical_order
3. Cut both orders/columns out of page. Fold the second drawing in half and open it up again. Glue the folded column to the first column drawing.
4. Glue to tag board. Display.

Vocabulary
Pediment, Doric, Corinthian, Ionic, column, capital, post, base, shaft

Lesson

Bridge Building I

Materials (per group)
Scissors
Cardboard strip 1” x 11”
Books
Eraser or small sponge
Five-foot long rope and six-feet long rope
String
Pictures of bridges http://en.wikipedia.org/wiki/Bridge

Objectives
Students will…
Identify four basic bridges: arch, beam, suspension and cable-stayed
Understand benefits and drawbacks of each type of bridge

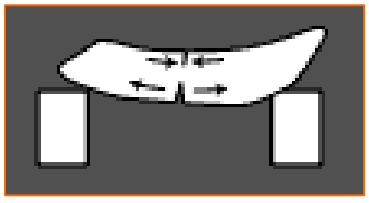
Activity #1 Arch Bridge

1. In preparation, print out pictures of bridges; divide students into teams. Identify arch bridge and ask,” How do abutments support an arch bridge?”
2. Provide 1” x 11” cardboard strips to teams. Have students gently bend the strip so it has a curve. Then, place cardboard on table so it resembles an arch. Press down the center of the arch. What happens to the ends of the cardboard?

3. Next, place a stack of books at each end of the arch. Press again. What happens?
4. Notice that the stack of books act as abutments, keeping the ends of the arch from spreading apart.

Activity #2 Beam Bridge

1. In preparation, slice a shallow notch across the top and bottom of flat erasers or small sponges. Create a beam bridge by supporting each end of the eraser or sponge with a stack of books.
2. Press down on the center of the bridge. What happens to the top and bottom notches? Notice the top notch squeezes together in compression, while the

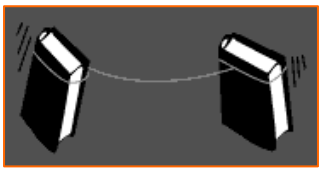


bottom notice spreads apart under tension.

3. Ask, “What happens when a load pushes down on a beam bridge?”

Activity #3 Anchorages

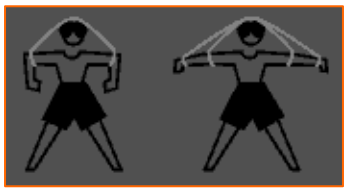
1. Tie two loops of string around the tops of two hard cover books of similar size. Tie a third piece of string to each loop so that it hands loosely between the books. Press down on the center string. “What happens?”



2. Next, stand two books about 10 inches apart and put a stack of heavy books on one end of the string to secure it to the table. Then pass the string over each book letting some string hang a loop between the books. Place a second stack of books on the other end of the string. Press again on the center of the string. What happens? Notice how the stacks of books or anchorages help to stabilize the bridge. What are anchorages for?

Activity #4 Cable-Stayeds

1. Make cable-stayeds to support your arms. Take the piece of five feet long rope and have a partner tie each end of the rope to each of your elbows. Then lay the middle of the rope on top of your head. The rope acts as a cable-stayed and holds up your elbows.
2. Have your partner tie a second piece of rope, the six-foot long rope, to each wrist. Lay the second rope over your head; now you have two cable-stayeds. “Where do you feel a pushing force or compression? “ Notice how the cable-stayeds transfer the load of the bridge (arms) to the tower (head).



Vocabulary
Arch, beam, suspension, cable-stayed, abutment, anchorage, girder, stress, stay, viaduct, tension, span, compression, cantilever

Tips: To extend the lesson, have students research the various bridges, Famous Bridges of the World http://www.civl.port.ac.uk/comp_prog/bridges1/ , Famous Bridge Index http://www.famousbridge.com/ , About.com Bridges http://architecture.about.com/od/famousbridges/Famous_Bridges.htm

Students then create a PowerPoint presentation of their findings to include text and photos. Students present PowerPoint to classmates.

Lesson

 **Bridge Building 2** *Bridge Building Kit can also be used

Materials (per group)
12 drinking straws
Masking tape
Centimeter ruler
Scissors
4 large paper clips
Paper cups
Books or chairs
Pennies
Four feet string (cable)

Objective
Students will…
Demonstrate that by adding cables to a straw bridge and anchoring the cables on both sides, the load that a bridge can support increases

Activity
1. Provide materials to groups and direct students to construct a bridge.
2. Have students investigate Bridge Basics http://www.pbs.org/wgbh/buildingbig/bridge/basics.html
3. Directions: Cut two short of straw three cm long. For each tower, tape two straws on either side of a short piece of straw. Tape the long straws together at the top, also.
4. Tape one tower to the edge of a desk. Tape the second tower to a second desk of the same height. Position the towers 17 cm apart.
5. Place another straw between the towers so its ends rest on the short pieces. This straw is the bridge deck; this is a simple beam bridge.
6. Make a load tester by un-bending a large paper clip into a V-shape. Poke the ends of the paper clip into opposite side of a paper cup near the rim. Use a second paper clip to hand the load tester over the bridge deck. Record how many pennies the paper cup can hold before the bridge fails.
7. After testing the strength of the beam bridge, predict how many pennies a suspension bridge will support.
8. Change the beam bridge into a suspension bridge. Tie the center of a 100-cm cable around the middle of a new straw. Place the straw between the towers. Pass each end of the cable over a tower and down the other side.
9. To anchor the bridge, wrap each end of the cable around a paper clip. Slide the paper clips away from the tower until the cable pulls tight. Then

tape the paper clips firmly to the desks. Test it again.

10. Record data and observations in a chart. Draw and write a conclusion from the tests. Make sure to identify the forces acting on the loaded suspension bridge. Which parts of the bridge are in compression? Which parts are in tension?
11. Lesson can be extended by having students experiment with attaching the cables from the bridge deck only to the tops of the towers. “How strong is the bridge this way? Why?” (This model is less strong than the model in which the cables extend back down to the ground on the other sides of the towers. A load on this bridge deck pulls the tips of the towers inward; there is no balancing tension pulling the towers back out toward the ground).

Vocabulary
Tower, suspension, cable, compression, tension, simple beam, bridge deck

Tips: Make a model of the simple beam and suspension bridge in advance to display to students. Also, scale drawings can be done with graph paper or using computer application.

Bridge Vocabulary

- Abutment- an architectural component that supports an arch, vault, or the like, as of a bridge
- Anchorage- a source or means of stability
- Arch- a structural element, usu. of masonry, that is curved and used to span an open space such as a door
- Beam- a long, heavy timber or piece of metal or stone used as a major support in a building
- Cantilever- a bridge using structures that extent horizontally, supported on only one end
- Compression- the act or process of pressing together or condensing
- Girder- a heavy beam, ed. made of steel or wood, that serves as a horizontal support in a bridge or building
- Span- the section of a bridge, trestle, or the like between two supports
- Stay- an object used to support or steady something; brace
- Stress- physical pressure or force that causes strain on something
- Suspension- the act of suspending or the condition of being suspended
- Tension- the act of stretching or state of being stretched; strain
- Truss- any structural framework that is composed of rigid straight members in triangular conformations and that functions as a beam or cantilever bearing tension or compression vertically
- Viaduct -a road or passageway built on a series of short spans or arches over a valley or lower routes

Lesson

Bridge Building 3

Materials
Bridge Data Table
List of bridge links: http://en.wikipedia.org/wiki/Category:Bridges_in_Florida
http://fcit.usf.edu/florida/photos/transprt/bridges/bridges.htm
http://www.dot.state.fl.us/statemaintenanceoffice/CBR/BridgeInformation.shtm

Objective
Students will…
Research a bridge and complete Bridge Data Table

Activity
1. Preparation: make copies of Bridge Data Table, research bridge websites
2. Review bridge types and divide students into teams
3. Assign bridge to each team: Seven Mile Bridge in Key West, Granada Bridge in Ormand Beach, Edison Bridge in Ft. Myers, Matanzas Pass Bridge in Ft. Myers, Clearwater Memorial Highway in Clearwater, Bridge of Lions in St. Augustine, Sanibel Causeway in Sanibel…
4. Teams research assigned bridge and complete Bridge Data Table; compare findings.
5. Teams will provide answers for following questions:

   Bridge Name: _____

- Why was your bridge built? Give at least two reasons why it was needed at the time.
- How many years did it take to complete?
- What communities/counties/states were joined by the bridge?
- What problems arose before or during construction?
- How do you think life changed for the people living on either side of the bridge, after it was completed?
- Describe what problems, if any, have arisen since the bridge was constructed. How have the problems been solved?

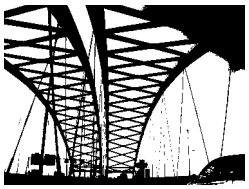
Vocabulary
arch bridge, beam bridge, suspension bridge, cable-stayed bridge, causeway, skyway, span

Bridge Data Table

Teams members _____

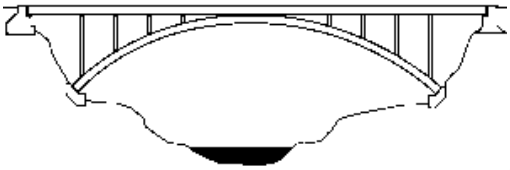
_____

Name of Bridge	
Bridge Type	
Year Completed	
Area Spanned (river, canal, bay…)	
Bridge Height	
Length of Span	
Material Used	
Cost	
Bridge Weight	
Challenges During Construction	
Interesting Facts	



Types of Bridges

A beam or truss bridge is a pair of girders supporting a deck spanning the gap between two piers. This beam has to withstand both compression in its upper parts and tension in its lower parts. Where it passes over supports, other forces come into play. The beam can be a hollow box girder or an open frame or truss.



An arch bridge is designed so that no part of it has to withstand tension. Concrete is used in arched bridge design. When reinforced concrete is used, a more elegant and less expensive arch can be designed and most concrete arch bridges are reinforced.

Suspension bridges consist of a deck suspended from cables slung between high towers. The cables of high tensile steel sire can support immense weight. The towers are in compression and the deck, sometimes a long slender truss (used as a hollow beam), is supported at frequent intervals along its length.

A cantilever bridge is generally carried by two beams, each supported at one end. Unlike a simple beam supported at both ends, a cantilever must resist tension in its upper half and compression in its lower.

Lesson

Skyscrapers *Skyscraper Building Kit can also be used

Materials (per group)
One large piece poster board or butcher paper
Sticky notes of different sizes
Index cards with tape
Ruler
Colored markers/crayons

Objectives
Students will…
Investigate skyscrapers and the building concepts used by architects
Identify unique features of skyscrapers

Activity

1. Brainstorm names of famous skyscrapers and discuss why these giant buildings are needed. Skyscrapers are efficient in crowded cities because they provide maximum living and work space while taking up a small amount of ground space. They are now cultural and industrial icons and a source of pride for their city.
2. Tell students that they will create a skyline mural in the classroom and divide class into seven teams. One for each skyscraper: Petronas Towers, Sears Tower, Guangzhou Tower West in China, Empire State Building, Nakheel Tower in Dubai, International Commerce Center in Hong Kong, Abraj al Bait Towers in Saudi Arabia (or others of your choice)
3. Use sites for research: http://skyscraperpage.com/ , http://en.wikipedia.org/wiki/Skyscraper , http://www.pbs.org/wgbh/buildingbig/skyscraper/index.html
4. After students complete research, have each team to create an illustration, drawn to scale, of its skyscraper on poster board or butcher paper. Each team should use the same scale, 1 foot of illustration = 100 feet of actual skyscraper. The true scale depends on the wall space available. Include stick figure of five-foot person for comparison.
5. Next have students fill out index cards with basic facts about the buildings (name, year built, location, height, materials used, name of architect, goals of architect, and challenges in building). Then write a minimum of five fun facts about the building on sticky notes to post on illustration.

6. Have teams answer following questions and share:

   How do architects and engineers make skyscrapers strong enough to withstand strong winds, earthquakes, hurricanes, tornadoes and severe changes in weather and temperatures?

   Which skyscraper would you like to visit and why?

   How do skyscrapers enhance a city? Why are people proud of their skyscrapers? Give examples.

   If you designed a skyscraper, what would it look like? What materials would you use? What design elements would you use to reflect Miami's history, culture and icons? Visit for examples:
   http://www.jetsetmodern.com/bacardi.htm ,
   http://www.skyscrapercity.com/showthread.php?t=618307 ,
   http://en.wikipedia.org/wiki/Template:Future_Miami_skyscrapers
   http://www.worldofstock.com/closeups/TAU5407.php

   What are the dangers involved in constructing skyscrapers? What are some safety features?

   Are skyscrapers a good way to build in urban areas? Do the advantages outweigh the disadvantages? Provide evidence.

7. Students can participate in PBS Skyscraper Challenge
   http://www.pbs.org/wgbh/buildingbig/skyscraper/challenge/

Vocabulary
Skyscraper, bedrock, tower, reinforced concrete, compression, foundation, superstructure, wind load, steel frame, tube, temperature, vibration

Tips: To extend lesson, have students create 3-dimensional models of their skyscrapers. Carved Styrofoam, Legos, cut and bent cardboard, cut and glued balsa wood or other items can be used.

Students can investigate various careers in engineering and architecture:
Architect
Construction Manager
Structural Engineer
Geotechnical Engineer
Electrical Engineer
Landscaper
Draft person
Carpenter
Surveyor

Skyscraper Vocabulary

- Compression- a pressing force that squeezes a material so that it becomes more compact. The lower columns of a skyscraper are squeezed by compression.
- Concrete- a mixture of water, sand, small stones, and cement.
- Foundation- the part of a building that is below the ground. Before construction on a skyscraper, the engineers determine what kind of material to use for the foundation.
- Steel- an alloy of iron and carbon that is hard, strong, and malleable.
- Superstructure- the part of the skyscraper that is above the ground.
- Wind load- the force of wind blowing against the side of a building. In skyscrapers more than 40 stories tall, the wind load has a great impact on the building.

Lesson

My Dream House/Building

Materials
12” x 18” colored construction paper
9” x 12” colored construction paper
6” x 9” colored construction paper
Scissors
Glue
Black markers
Paper scraps

Objectives
Students will…
Cut out geometric shapes: rectangles, triangles, circles…
Design a building with shapes
Add details with paper scraps and markers

Activity
1. Explain to students that they will plan, design and construct their dream home or building using materials provided. Discuss what elements make a dream house or building.
2. Pass out three sizes of paper and materials to each student. The largest sheet is for the background, the medium sheet is for the building, and the smallest sheet is for the roof and other details.
3. Demonstrate how to cut the medium sheet into smaller rectangles, buy folding sheet in half and cutting along crease; folding this in half and cutting along crease and so on; until the paper is used up.
4. Fold, crease and create a roof out of the smallest sheet of paper.
5. From the scraps of paper, create windows, building trims, fences, clouds, bushes, trees, chimneys, window boxes, stairs… Use shapes such as domes, arches, columns and other architectural elements learned about.
6. On largest paper, lay out design and arrange until building and design details are complete.
7. Glue shapes to largest paper and use black marker to add more details.
8. When dried, share dream home/building designs with classmates and describe the parts and details of the home/building.

Vocabulary
Window, column, arch, dome, door, roof, landscape, attic, basement, garage, chimney, fence

Resources

Bennett, D. Skyscrapers: Form and Function. The book explains how form and function are integrated to make beautiful buildings that work. Simon & Schuster. 1995.

Frederick, M. 101 Things I Learned in Architecture School. Great reference book for beginning architectural students. http://www.amazon.com

Haslam, A. Building. Hands-on experiments introduce structures such as skyscrapers, dams, keystone bridges, igloos and shows materials used and methods of construction. Two-Can Pub Inc. 2000.

Keister, E. Four Extraordinary Skyscrapers. Teaches readers about most classic skyscrapers: Empire State Building in New York; The Transamerica Pyramid in San Francisco; Petronas Towers in Kuala Lampur; and Bank of China Tower in Hong Kong. Running PR Book Pub. 2005.

Radevsky. A.The Modern Architecture Pop-Up Book. Three dimensional replicas of some of the world's most innovative modern and contemporary architecture. Universe Pub. 2008.

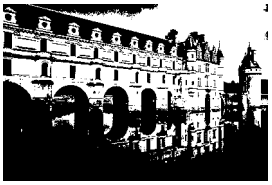
Architect Magazine Online http://www.architectmagazine.com

Architecture Week http://www.architectureweek.com/

Architectural Digest http://www.architecturaldigest.com/

Tek Mom Search Tools for Students http://www.tekmom.com/search/index.html Search Engines and Reference Tools

Wikipedia website- search words: architecture, architectural style, glossary of architecture, history of architecture



Bibliography

The Architecture Week Great Buildings Collection http://www.greatbuildings.com

About.Com: Architecture http://architecture.about.com/

The Educator's Reference Desk http://www.edureg.org

Yahoo Directory for Mathematics and Science
http://dir.yahoo.com/Science/mathematics/

Loggia Exploring the Arts and Humanities
http://www.loggia.com/designarts/architecture/kids.html

The Basics of Bridge Building http://thesolutionsite.com/lesson/5506/lesson1.htm

Fun With Architecture: Build Anything You Can Imagine. Learn Technologies Interactive. (Macintosh and Windows).

Architectures, Vol. 1. DVD. http://www.amazon.com

Ching, F. A Visual Dictionary of Architecture. 1996. http://www.amazon.com

Gonzales, Leslie. *Free Standing Structure*, An Educator's Reference Desk Lesson Plan

Kids Discover Magazine: *Shelter* http://www.kidsdiscover.com