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Career Cluster:

This cluster includes careers in designing, planning, managing, building and maintaining the built environment.

North Dakota Architecture

Introduction

There are thousands of challenging educational and training opportunities within the high-skilled world of Architecture and Construction. This activity will give the student an opportunity to experience the resources and opportunities that exist in the State of North Dakota in Architecture and Construction.

Warm-Up Activity

Ask the students to brainstorm and list some of the most famous pieces of architecture in the world (i.e. bridges, buildings, highways). Direct the students to imagine that they and two of their friends are civil engineers working for a local architectural firm. The city recently decided to add a piece of architecture to the community. The firm for which they work, along with several others, has been asked to submit a design that would both serve the needs of the city and act as an icon for the community and region.

Procedure

The three students in each group are to research the type of architecture and then construct a model or design a drawing to present to the class.

Throughout the process, students will keep track of the jobs and occupations involved in the planning and building of their design as well as identify related North Dakota employers. For North Dakota occupation and employment information, students will visit www.imaginend.com and click on Employment. At that website, under Resources, go to Agencies and visit the North Dakota Career Resource Network at www.ndcrn.org and click on ND Occupations and then Career Clusters to find specific information about North Dakota occupations in Architecture and Construction.

In the assigned groups, students will decide upon the type of architecture for their project. Within the group, students will discuss the aspects of the project. The following questions will help provide direction in the procedure.

- What makes this architecture unique?
- What effect does this architecture have on the city?
- What makes this architecture necessary?

Bridge engineering will need the following materials:

- Popsicle sticks
- Drinking straws
- Glue
- Masking tape
- Two blocks of wood

Challenge the group to build a bridge that will span 40 centimeters. The only materials students may use for the bridge itself are popsicle sticks, drinking straws, glue, and masking tape.

- Popsicle sticks and drinking straws may be shortened, bent, or cut.
- No part of the bridge may touch anything between the two ends of the span.

Allow each group one class period to research bridge engineering. They should first find out the basic principles of the three main kinds of bridges: suspension, beam, and arch.

Allow each group another class period to brainstorm ideas, make sketches, and choose a final design for their bridges.

Allow each group another class period to build the bridges.

After all bridges have been completed, have students test the bridge by how much weight it will support. Rolls of pennies or scientific weights could be used. Students may modify the bridge at this point and then see if it will hold more weight.

Have the group present the bridge and testing results to the class. The group will discuss their architecture research and related occupation and employment information.

Discuss why some bridges were more or less successful than others.

- What factors went into the strength or weakness of each bridge?
- What flaws were inherent in the building materials?
- How were these flaws overcome?
- Discuss how each of the three basic types of bridges – suspension, beam, and arch – transfers loads from the bridge to the ground.
- Describe where tension and compression occur on each type of bridge.

Identify the occupations represented in the designing and building process and answer the following questions:

- What occupations were represented in the bridge you designed?
- What North Dakota businesses employ workers in these occupations?
- How many people are employed in this occupation in North Dakota?
- What is the annual average salary paid for the occupation in North Dakota?

Assessment

Projects may be assessed on a three-point rubric. The three-points include the following:

- worked cooperatively
- carefully prepared plans and sketches, and
- thoroughly researched principles of engineering and applied principles learned.

Standards

This activity addresses the following North Dakota Social Studies Standard:

Standard 4: Social Studies Resources.

- 8.4.1 Use various map forms, tools, and technologies to acquire, process, and report information related to social studies.
- 8.4.2 Use primary and secondary sources to gather, interpret, analyze, and evaluate information related to social studies.
- 8.4.3 Use technology to gather, organize, record, interpret, and evaluate information related to social studies.

Time Frame

This lesson will take approximately five class periods.

Resources

The following websites are extremely useful to both teachers, in planning the lesson, and students, in researching the activity.

<http://school.discovery.com/lessonplans/programs/bridges/>

The sample was taken from “DiscoverySchool.com” and modified to meet the needs of ImagineND. It is recommended to visit this website and use the links provided to complete this lesson.

<http://www.ce.ufl.edu/index.html>

From the menu at this University of Florida engineering website, click on “Education Activities.”

<http://bridgecontest.usma.edu/>

West Point, home of the oldest engineering college in the Country, offers a free download of great Bridge Design software that will provide hours of fun and intuitive learning for the students.




www.imaginend.com

This website will lead you to a number of links helpful in researching North Dakota occupations and North Dakota employment opportunities.

The Cluster/Pathway Model for Architecture & Construction outlines the pathways and occupations as well as the related cluster knowledge and skills. This model can be located by clicking on Career Clusters at www.imaginend.com.

Career Cluster: Architecture & Construction

Careers in designing, planning, managing, building and maintaining the built environment.

Sample Career Specialties / Occupations	<p>Architect • Architectural and Civil Drafter • Drafter • Regional and Urban Planner/Designer • Industrial Engineer • Materials Engineer • Mechanical Drafter • Environmental Designer • Civil Engineer (structural, geotechnical, transportation, etc.) • Programmer • Mechanical Engineer (HVAC, plumbing, fire protection, etc.) • Electrical Engineer (electronics, security, telecommunications) • Preservationist • Environmental Engineer (hydro engineering, acoustical, etc.) • Landscape Architect • Surveyor • Fire Prevention and Protection Engineer • Cost Estimator • Electrical and Electronic Engineering Technician • Civil Engineering Technician • Environmental Engineering Technician • Surveying and Mapping Technician • Interior Designer • Landscape Designer • Specifications Writer • Building Code Official • Computer Aided Drafter (CAD) • Renderer (traditional and computer) • Modeler (traditional and computer)</p>	<p>General Contractor/Builder • Specialty Contractor • Construction Engineer • Construction Manager • Superintendent • Project Manager • Construction Foreman • Estimator • Project Inspector • Manufacturer’s Representative • Sales and Marketing Manager • Equipment and Material Manager • Scheduler • Education and Training Director/Coordinator • Safety Director • Construction Inspector • Subcontractor • Preservationist • Service Contractor • Field Supervisor • Specialty Trades Subcontractor • Mason • Construction Craft Laborer • Iron/Metalworker (structural and reinforcing) • Carpenter • System Installer • Electrician • Boilermaker • Electronic Systems Technician • Sheetmetal Worker • Security and Fire Alarm Systems Installer • Concrete Finisher • Glazier • Tile and Marble Setter • Landscaper/Groundskeeper • Elevator Installer • Roofer • Painter • Explosives Worker • Plasterer/Drywall • Paperhanger • Insulation Worker • Drywall Installer • Plumber • Pipe Fitter • Millwright • Heating, Ventilation, Air Conditioning and Refrigeration Mechanic • Carpet Installer • Electrician • Steamfitter • Terrazzo Worker and Finisher</p>	<p>General Maintenance Contractor • Specialty Contractor • Construction Engineer • Construction Manager • Superintendent • Project Manager • Construction Foreman • Estimator • Facilities Engineer • Reliability Engineer • Environmental Engineer • Demolition Engineer • Project Inspector • Operating Engineer • Manufacturer’s Representative • Sales and Marketing Manager • Equipment and Material Manager • Scheduler • Maintenance Planner/Scheduler • Maintenance Estimator • Security Controls Manager • Preservationist • Remodeler • Safety Director • Construction Inspector • Subcontractor • Service Contractor • Field Supervisor • Specialty Trades Subcontractor • Mason • Iron/Metalworker (structural and reinforcing) • Carpenter • System Installer • Electrician • Boilermaker • Cost Estimator • Sheetmetal Worker • Security and Fire Alarm System Installer • Concrete Finisher • Glazier • Tile and Marble Setter • Hazardous Materials Remover • Landscaper/Groundskeeper • Elevator Installer • Paperhanger • Insulation Worker • Drywall Installer • Insulation Worker • Plumber • Pipe Fitter • Millwright • Heating, Ventilation, Air Conditioning and Refrigeration Mechanic • Carpet Installer • Electrician • Steamfitter • Terrazzo Worker and Finisher • Refractory Technician • Hydro Testing Technician • Thermal Control Technician • Restoration Technician • Wastewater Maintenance Technician • Highway Maintenance Worker</p>
Pathways	<p>Design/Pre-Construction</p> 	<p>Construction</p> 	<p>Maintenance/Operations</p> 
Cluster K&S	<p>Cluster Knowledge and Skills</p> <p>◆ Academics ◆ Communications ◆ Problem Solving and Critical Thinking ◆ Information Technology Applications ◆ Systems</p> <p>◆ Safety, Health and Environmental ◆ Leadership and Teamwork ◆ Ethics and Legal Responsibilities</p> <p>◆ Employability and Career Development ◆ Technical Skills</p>		