

Wilson Area School District Planned Course Guide

Title of planned course: 7th Grade Tech Ed

Subject Area: Tech Ed

Grade Level: 7

Course Description: This curriculum will guide students through the process of designing, engineering, and constructing balsa wood bridges using hand tools and wood glue. Students will research various types of bridges, explore different truss designs, and use the West Point Bridge Designer software for modeling. The curriculum aligns with the PA STEELS standards.

Time/Credit for this Course: 35 days

Curriculum Writing Committee: Brian Meckley

Curriculum Map

Week 1: Introduction to Bridges

- **Lesson 1:** Overview of Bridges
 - Types of bridges: Beam, Arch, Suspension, and Truss
 - Discuss the purpose and importance of bridges in society
- **Lesson 2:** Research Assignment
 - Students research different types of bridges and present findings
 - Focus on materials, design, and real-world examples

Week 2: Understanding Truss Bridges

- **Lesson 3:** Introduction to Truss Bridges
 - Discuss the structural integrity of trusses
 - Explore common truss designs: Pratt, Warren, Howe, and K-Truss
- **Lesson 4:** Design Challenge
 - Students sketch their own truss bridge designs
 - Discuss factors affecting bridge strength and stability

Week 3: Modeling with West Point Bridge Designer

- **Lesson 7:** Introduction to West Point Bridge Designer
 - Overview of the software and its features
 - Demonstration of how to create a bridge model
- **Lesson 8:** Virtual Bridge Design
 - Students create their own bridge designs using the software
 - Analyze and adjust designs based on feedback from peers and teachers

Week 4: Materials and Tools

- **Lesson 5:** Introduction to Balsa Wood and Tools
 - Discuss properties of balsa wood and its suitability for model bridges
 - Introduce hand tools: saws, glue, clamps, and measuring tools
- **Lesson 6:** Safety Procedures
 - Review safety guidelines for using tools and materials
 - Hands-on practice with tools

Week 5 & 6: Building the Balsa Wood Bridge

- **Lesson 9:** Construction Planning
 - Finalize designs and create a materials list
 - Plan the construction process
- **Lesson 10:** Building the Bridge
 - Begin constructing balsa wood bridges using hand tools and wood glue
 - Collaboration and teamwork during the building process

Week 7: Testing and Evaluation

- **Lesson 11:** Bridge Testing
 - Conduct load tests to evaluate bridge strength and stability
 - Record and analyze results
- **Lesson 12:** Reflection and Evaluation
 - Students present their bridges and discuss the design process
 - Reflect on what worked well and what could be improved

Curriculum Scope & Sequence

Planned Course: 7th grade Tech Ed

Unit: Introduction to Engineering Concepts

Time frame: 1-1.5 weeks

State Standards: 3.2.6-8.g, 3.2.6-8.h, 3.5.6-8.c, 3.5.6-8.g, 3.5.6-8.h, 3.5.6-8.m, 3.5.6-8.n, 3.5.6-8.o, 3.5.6-8.p, 3.5.6-8.q, 3.5.6-8.u, 3.5.6-8.y, 3.5.6-8.bb, 3.5.6-8.cc, 3.5.6-8.dd, 3.5.6-8.ll

Essential content/objectives: At the end of the unit, students will be able to:

- Describe the physics of bridge building
- Explain how tension and compression forces act on a bridge support when a load is applied

Core Activities: Students will complete/participate in the following:

- Discussion on what makes a good bridge design, as well as how geometry is used to make strong structures
- Identify the types of bridges: Beam, Arch, Suspension, and Truss and the purpose and importance of each bridge in society
- Construct different geometric shapes to test the strength of each

Extensions: Computer bridge simulator

Instructional Methods:

- Lecture
- Demonstration
- Guided practice

Materials & Resources:

- Computer
- Research powerpoint
- Research packet
- Triangle and square shapes
- Tacoma narrows bridge video
- West Point bridge designer

Assessments:

- Completed research packet
- Completed bridge prototype

Curriculum Scope & Sequence

Planned Course: 7th grade Tech Ed

Unit: Research and Design Truss and Bridge Styles

Time frame: 1 - 1.5 weeks

State Standards: 3.5.6-8.a, 3.5.6-8.b, 3.5.6-8.g, 3.5.6-8.h, 3.5.6-8.m, 3.5.6-8.n, 3.5.6-8.o, 3.5.6-8.p, 3.5.6-8.q, 3.5.6-8.t, 3.5.6-8.u, 3.5.6-8.v, 3.5.6-8.w, 3.5.6-8.x, 3.5.6-8.dd, 3.5.6-8.ii, 3.5.6-8.jj, 3.5.6-8.

Essential content/objectives: At the end of the unit, students will be able to:

- Apply and explain the use of the engineering design process to design a bridge with given size limitations
- Calculate the strength-to-weight ratio of their final designs

Core Activities: Students will complete/participate in the following:

- Research different truss and bridge designs focusing on materials, design, and real world examples
- Create a sketch of a truss bridge design
- Evaluate the forces which act on bridges under load
- Use this research to design a truss bridge
- Use West Point Bridge Designer software

Extensions: Computer bridge simulator

Instructional Methods:

- Demonstration
- Guided practice
- Independent work
- Peer tutoring

Materials & Resources:

- Computer
- Research powerpoint
- Research packet
- Bridge building instructions
- Balsa wood and balsa wood cutters
- Rulers
- Tape
- Cardboard
- Wood glue
- T-pins
- Wax paper
- Tri square
- Blueprints
- Testing materials

Assessments:

- Research project presentation on types of bridges
- Truss bridge design sketches
- Virtual bridge design using West Point Bridge Designer
- Constructed balsa wood bridge performance in load testing
- Reflection on the engineering design process

Curriculum Scope & Sequence

Planned Course: 7th Grade Tech Ed

Unit: Test Truss and Bridge Styles

Time frame: 1 - 1.5 weeks

State Standards 3.5.6-8.j, 3.5.6-8.q, 3.5.6-8.t, 3.5.6-8.x, 3.5.6-8.jj

Essential content/objectives: At the end of the unit, students will be able to:

- Apply scientific principles to bridge building
- Build a bridge that will support at least 20 pounds of weight when tested

Core Activities: Students will complete/participate in the following:

- Use West Point Bridge Designer to construct test trusses they have designed which meet specific criteria and test the characteristics of each
- Test designs on the bridge simulator discussing strength and stability

Extensions: Computer bridge simulator

Instructional Methods:

- Demonstration
- Guided practice
- Independent work
- Peer tutoring

Materials & Resources:

- Computer
- Research powerpoint
- Research packet
- Bridge building instructions
- Balsa wood and balsa wood cutters
- Rulers
- Tape
- Cardboard
- Wood glue
- T-pins
- Wax paper
- Tri square
- Blueprints
- Testing materials

Assessments:

- Completed research packet
- Weight test for completed trusses

Curriculum Scope & Sequence

Planned Course: 7th grade Tech Ed

Unit: Construct and Test a Final Bridge Project

Time frame: 2.5 - 3 weeks

State Standards: 3.5.6-8.j, 3.5.6-8.q, 3.5.6-8.t, 3.5.6-8.x, 3.5.6-8.jj

Essential content/objectives: At the end of the unit, students will be able to:

- Apply scientific principles to bridge building
- Build a bridge that will support at least 20 pounds of weight when tested

Core Activities: Students will complete/participate in the following:

- Identify and use hand tools: saws, glue, clamps, and measuring tools
- review safety guidelines for using tools and materials
- Plan construction process which includes creation of a materials list and finalizing designs
- Construct a balsa wood bridge they have designed which meets specific criteria using hand tools and wood glue
- Conduct load tests to evaluate bridge strength and stability
- Record and analyze results from tests and reflect on the results

Extensions: Computer bridge simulator

Instructional Methods:

- Demonstration
- Guided practice
- Independent work
- Peer tutoring

Materials & Resources:

- Computer
- Research powerpoint
- Research packet
- Bridge building instructions
- Balsa wood and balsa wood cutters
- Rulers
- Tape
- Cardboard
- Wood glue
- T-pins
- Wax paper
- Tri square
- Blueprints
- Testing materials

Assessments:

- Completed research packet
- Weight test for completed bridge
- Rubric for overall bridge project grade