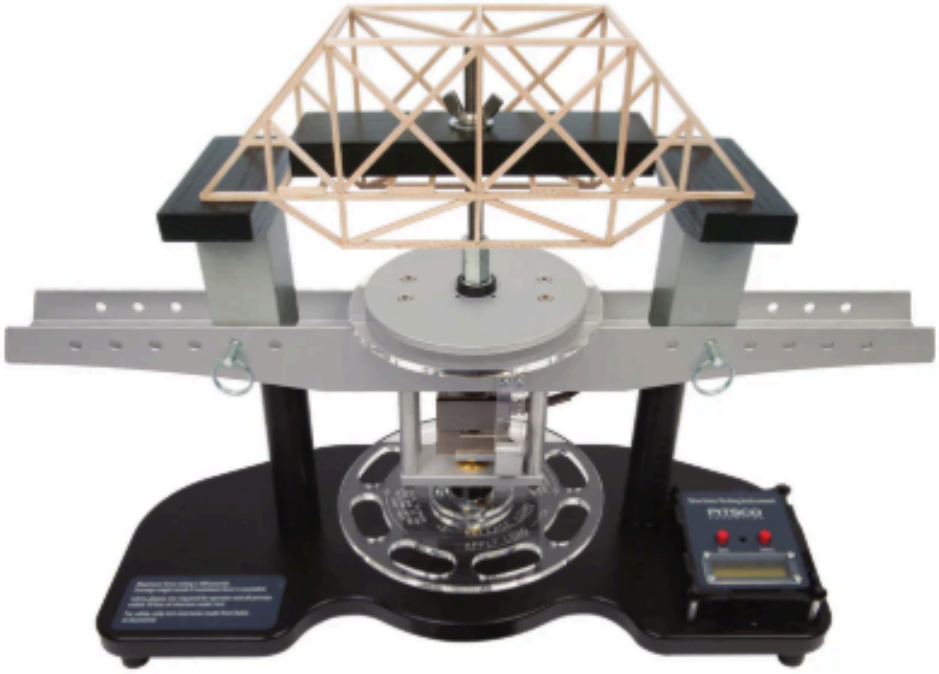
Structure Testing Instrument

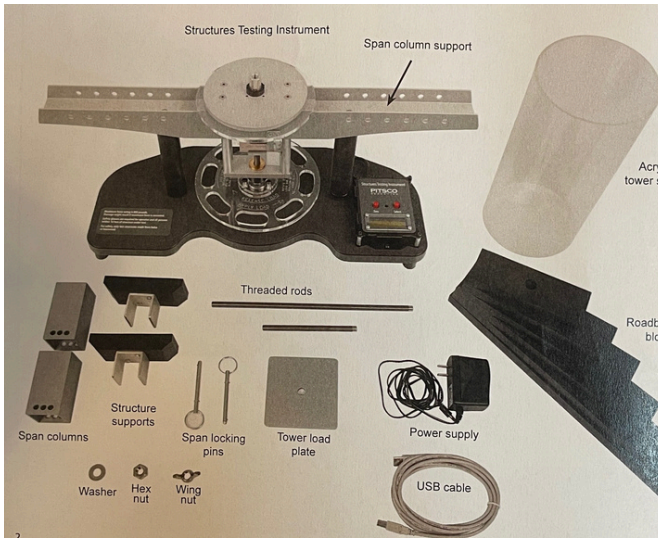


Mid-Valley
STEM-CTE HUB

www.midvalleystem.org
midvalleystemctehub@linnbenton.edu
Linn-Benton Community College
Albany Campus - CC-212

Mid-Valley
STEM-CTE HUB

Structure Testing Instrument



The Pitsco Structures Testing Instrument 2.0 STEAM Kit provides students with a hands-on opportunity to explore engineering principles by testing the structural integrity of models such as balsa wood or basswood towers and bridges. Utilizing load-cell technology, students can apply up to 800 pounds of force in small increments, capturing both peak and current loads. This allows for precise analysis without the need to destroy the structure, fostering an understanding of forces, equilibrium, and material strength in a controlled environment.

Grade Level

6th - 12th

Group Size

2 - 4

Time Duration

60 minutes to multi-session

Content of Kits

Components

- Wood cutter
- Structure testing device
- Structure supports
- Acrylic tower shield
- Roadbed load blocks
- Power and USB cables
- Tower load plate
- Locking pins

Components Cont.

- Threaded rods
- Span columns

Components

- Balsa wood
- Graph paper

Mid-Valley
STEM-CTE HUB

Usage

Getting Started

1. **Unbox and Inspect Components -** Ensure all parts are present and undamaged. The kit includes the Structures Testing Instrument, acrylic tower shield, roadbed load blocks, span columns, structure supports, span locking pins, USB cable, threaded rods, tower load plate, washer, hex nut, wing nut, and power supply.

2. **Set Up the Testing Instrument -**Place the instrument on a stable, flat surface. Attach the span columns and structure supports as per the user guide.

3. **Prepare the Structure -** Position the structure (e.g., a balsa wood tower) on the load plate. Ensure it is centered and securely placed.

4. **Connect to Power -** Plug in the power supply and turn on the instrument. The digital display should activate.

Storage

- Store the Structures Testing Instrument in a dry, dust-free environment to maintain its functionality.
- Keep all components organized in the provided storage case to prevent loss and ensure easy access.
- Regularly check for any wear or damage, especially to the load cells and digital display.

Troubleshooting

- **Instrument not powering on -** Verify that the power supply is securely connected and functional. Check the power switch and ensure the outlet is providing power.
- **Inaccurate load readings -** Ensure the structure is properly centered on the load plate. Recalibrate the instrument if necessary, following the instructions in the user guide.
- **Digital display issues -** Check the USB connection and ensure the software is correctly installed and up to date. Restart the instrument and computer if needed.

Mid-Valley
STEM-CTE HUB

Activity Guide

Beginner

Load and Observe
Students will incrementally apply force to a simple structure, observing at which point the structure begins to show signs of stress. Discuss the observed behaviors and relate them to real-world engineering applications.

Intermediate

Material Comparison
Test structures made from various materials (e.g., balsa wood, basswood, cardboard) to compare their strength and load-bearing capacities. Analyze the results and discuss the implications for material selection in engineering.

Advanced

Design Optimization
Challenge students to design and build structures that maximize strength while minimizing material usage. Use the testing instrument to evaluate their designs and iterate based on the results.

Extension Activities:

Real-World Applications
Research and present on real-world structures (e.g., bridges, skyscrapers) and the materials and design considerations that contribute to their strength and stability.

Mid-Valley
STEM-CTE HUB

Learning Extensions

STEAM Connections: Engineering - Math - Science

Learning Objectives:

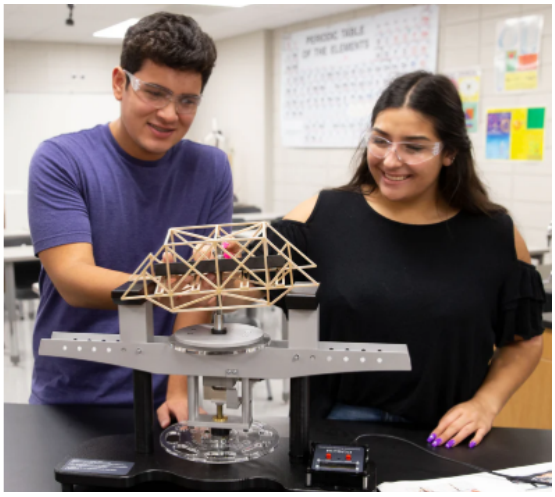
- Understand the principles of force, equilibrium, and material strength.
- Develop skills in structural analysis and testing.
- Apply engineering design processes to real-world challenges.
- Analyze and interpret data to inform design decisions.

Career Connections:

- **Civil Engineer -** Designs and tests structures such as bridges and buildings.
- **Materials Scientist -** Studies the properties and behaviors of materials under stress.
- **Structural Analyst -** Evaluates the strength and stability of structures.
- **Construction Manager -** Oversees the construction of structures, ensuring safety and compliance with design specifications.

Essential Employability Skills:

- Critical Thinking
- Problem-Solving
- Collaboration
- Communication
- Attention to Detail



Mid-Valley
STEM-CTE HUB

Resources and Accessibility

Safety Guidelines

- Always wear safety goggles when conducting tests to protect your eyes from potential debris.
- Ensure the testing area is clear of unnecessary items to prevent accidents.
- Do not exceed the recommended load limits to avoid damage to the instrument and ensure safety.
- Supervise students at all times during testing procedures.

Accessibility

- Provide tactile markers on the instrument for students with visual impairments.
- Allow extra time for students with motor challenges to set up and operate the instrument.
- Offer verbal instructions and demonstrations to support diverse learning needs.
- Ensure the testing area is accessible to all students, including those with mobility impairments.

Library Catalog

Library Resources

Feedback

QR to feedback survey