

## Best Practices of Technology Integration

**Title:** *Anything I can do you can do better*

**Subject(s):** Jr. High Math (with Sr. High Physics Mentors)

**Intended Grade Level(s):** 7th, 8th (and 11th, 12th)

**Description:**

During a two-week unit within the 7th-8th Grade Transition Mathematics classes the students will design build and test Popsicle bridges. During the learning process they will incorporate: communication skills, the elements of the design to construction process, 2-D and 3-D geometric shape classification/identification, mathematical modeling,

**Curriculum Benchmarks:**

[MI.MAT.I.1.E.2](#)

Represent and record patterns and relationships in a variety of ways including tables, charts, and pictures.

[MI.MAT.III.1.E.2](#)

Organize data using concrete objects, pictures, tallies, tables, charts, diagrams and graphs.

[MI.MAT.I.1.HS.5](#)

Use patterns and reasoning to solve problems and explore new content.

[MI.MAT.I.1.MS.1](#)

Describe, analyze and generalize patterns arising in a variety of contexts and express them in general terms.

[MI.MAT.I.1.MS.3](#)

Use patterns and their generalizations to make and justify inferences and predictions.

[MI.MAT.II.1.MS.1](#)

Distinguish among shapes and differentiate between examples and non-examples of shapes based on their properties; generalize about shapes of graphs and data distributions.

[MI.MAT.II.1.MS.2](#)

Generalize the characteristics of shapes and apply their generalizations to classes of shapes.

[MI.MAT.II.1.MS.3](#)

Derive generalizations about shapes and apply those generalizations to develop classifications of familiar shapes.

#### MI.MAT.II.1.MS.4

Construct familiar shapes using coordinates, appropriate tools (including technology), sketching and two- and three- dimensional shapes.

#### MI.MAT.II.1.MS.7

Use shape, shape properties and shape relationships to describe the physical world and to solve problems.

#### MI.MAT.II.2.MS.1

Locate and describe objects in terms of their position, including compass directions, Cartesian coordinates, latitude and longitude, and midpoints.

#### MI.MAT.II.3.MS.1

Select and use appropriate tools; measure objects using standard units in both the metric and common systems, and measure angles in degrees.

#### MI.MAT.II.3.MS.2

Identify the attribute to be measured and select the appropriate unit of measurement for length, mass (weight), time, temperature, perimeter, area, volume, and angle.

#### MI.MAT.II.3.MS.5

Use proportional reasoning and indirect measurements to draw inferences.

#### MI.MAT.II.3.MS.6

Apply measurement to describe the real world and to solve problems.

#### MI.MAT.III.1.MS.1

Collect and explore data through observation, measurement, surveys, sampling techniques and simulations.

#### **Materials/Hardware/Software:**

Pre-engineering Bridge Builder CD-ROM and/or West Point Bridge Designer software loaded onto 22 IBM Compatible PC's, 3000 popsicle sticks (in 120 stick bundles), white school glue, two concrete blocks, graphing paper, rulers/protractors/pencils, TI-35SX calculators, two "snake" hooks, empty 5-gallon bucket, double-angled 6" PVC pipe, three sets safety goggles, garden trowel, 125# dry and screened sand in 4 dry-wall buckets with lids, PowerPoint® Presentation Software, hand-outs on \*Bridge Design and \*Integrated Civil Engineering, Nova film on VCR/TV titled: "Superbridge" and film clipping on the "Collapse of the Tacoma Narrows Bridge" in 1940 and its subsequent re-design and re-construction, Field Trip to RR Trestles and Houghton-Hancock Lift Bridge

## **Activities/Procedures:**

**Day One:** PowerPoint® Presentation of geometric shapes definitions and diagrams. Students will draw and classify/identify the fourteen shapes incorporated in bridge construction

**Day Two:** Handouts on Architectural components of bridge constructions and classification of types of bridges

**Day Three:** Film Presentation of “Super Bridge” to be stopped each time a geometric shape is recognized by class.

**Day Four:** Wearing my hard hat and construction tools I’ll introduce the film clip of “the Collapse of the Tacoma Narrows Bridge” in 1940 by saying that “I” built a bridge and I want them to see what happened. At end of film the question will be posed for large group discussion “what happened and why”. Assignment: Internet exploration to find the causes and methods of re-design.

**Day Five:** Small group discourse on results of the research and listing of remedies in the bus en route to various Upper Peninsula Bridges and RR Trestles. Students will videotape and take digital photos for subsequent Multimedia Presentations. Both estimation by comparison and actual Customary/Metric Measurements made to verify accuracy of predicted values will be made. Assignments: sketches and dimensioned drawings of the visited structures and labeling of as many identifiable geometric shapes as possible.

**Day Six:** Project introduction and parameters: construction of 24” span with roadway to be made of 120 popsicle sticks and standard white glue (note: emphasize trust of the structure of the construction and not the fasteners). Integrity test Pass out bundles of materials and cutting tools/clippers/shears/glue

**Days Seven through Nine:** physical work on the models, structures in CLG’s

**Day Ten:** testing of Bridges by total sand load capabilities at center of span from suspended bucket. Competition winners determined by formula:

$$\text{LOAD} / \text{STRUCTURE WGT.}$$

## **Assessment/Evaluation:**

Evaluation of drawings/sketches and above assignments, ability of group’s structure to withstand loading within constraints/limitations

## **Follow-up Activities:**

Posters of various bridge structures, research on Civil Engineering and related careers, bring in other films “cued” to points showing bridges and components (both geometric and structural)

**Submitted By:**

**Name:** Simi, Dennis M.

**School District:** Ontonagon Area School District

**School:** Ontonagon Junior/Senior High School

**Address:** 701 Parker Avenue, Ontonagon, Michigan 49953  
(906)884-4433

**Email:** [simid@oasd.k12.mi.us](mailto:simid@oasd.k12.mi.us)