

MOREnet, MODOT and RoundTrips Present:
Bringing Down the Glasgow Bridge

Date: October 9, 2009

Times: (9:00 to 10:00 a.m. and 10:30 to 11:30 a.m. CST)

Grade Levels: 4-12

Cost: No Fee

Abstract:

“5..4..3..2..1...” That’ll be the sequence as Missouri Department of Transportation officials bring down the Glasgow Bridge spanning the Missouri River to begin construction of a new bridge. Talk to the experts. Explore the math, science and planning involved in creating a safe and effective implosion.

Program Description:

Join us live on Friday, October 9 from Rolla, and Macon Missouri. Be part of the action as explosives expert Dr. Paul Worsey (Professor of Mining Engineering, Missouri S&T) and engineers Dennis Brucks and Brian Haeffner from Missouri Department of Transportation walk us through the process of bringing down the Glasgow Bridge.

As part of its continual work to maintain and upgrade Missouri’s roads and bridges the Missouri Department of Transportation determined the need to replace the bridge crossing the Missouri River at Glasgow, Missouri. That new bridge is now set to open on October 16, but before that new bridge could be built, the old bridge needed to be removed to make way for construction of a new span connecting route 240 across the Missouri River. In this program your students will interact with the engineers Dennis Brucks and Brian Haeffner who will give us technical aspects of the destruction and rebuilding of the bridge. Ask your questions about what it takes to safely destroy one bridge so you can begin to build another. See video excerpts of the bridge coming down, and explosives demonstrations by Dr. Paul Worsey.

This program is the ninth of an ongoing series of ten programs that began during the 2008-2009 school year. During this series of programs entitled *Project MO-Bridge: Connecting Students to Their Future*, your students will be able to learn what it takes to build a new bridge—from dream to design to construction to operation. Students will interact with experts in a wide variety of fields and learn how specific aspects of their science, social studies, and mathematics curriculum come to life in the construction of a new bridge. Archived versions of previous programs can be found at <http://mobridge.more.net>.

Program Objectives:

1. The participant will explore the essential elements needed to safely and successfully implode a bridge.
2. The participant will interact with experts involved in planning and executing the bridge implosion and learn about their occupations and work process.
3. The participant will gain knowledge about the engineering of bridges.

Program Format:

The program will focus on the process and materials used to create a safe and successful bridge implosion that will then enable engineers and other transportation officials to build a new bridge at the same location.

Program Order—The videoconference program will consist of the following segments.

1. **Welcome and Introduction**—Student groups and experts will be introduced and welcomed to the program. Information will be given on the series of interactive programs that will continue throughout the school year as the new bridge is constructed.
2. **Background**—This segment of the program will focus on “why” the bridge is being brought down and why a new bridge is being put in its place. Students will interact with Dennis Brucks and Brian Haeffner from the Missouri Department of Transportation who have determined a new bridge is necessary and who will be part of that new bridge construction. Students will see images and video of the current bridge and also design plans for the new bridge.
3. **Questions and Answers**—This segment will let students ask questions of the experts who have planned the implosion of the bridge and will execute that implosion. Students will see images and video of the preparations made for the implosion as well as materials and equipment that are involved. Experts will talk about why they chose the course of action they did, how they have planned for safety and success, and what they “expect” will happen during the implosion itself. We will watch video of the bridge implosion with commentary by the experts.
4. **What it looks like, up close**— From the M S&T explosives test lab, Dr. Worsey will step us through the process of using explosives. The demonstration will show how using controlled and directed explosions can quickly remove structural components.
5. **Summary and Closing**—We’ll summarize the major concepts learned today, seek final questions from students, and invite participation in the school year series of programs that will follow the construction of the new bridge.

Featured National Standards: (Science)

From the Center for Science, Mathematics and Engineering Education

6.5 Science and Technology Standards**Grades 5- 12**

Abilities of technological design

Understanding about science and technology

Featured State Standards (Missouri):

Schools from across the country are invited to join in the program. Missouri state standards are provided for Missouri schools since funding for this program comes from various Missouri organizations.

Show-Me Knowledge Standards (Science)

In Science, students in Missouri public schools will acquire a solid foundation which includes knowledge of

1. properties and principles of matter and energy
2. properties and principles of force and motion

Missouri Grade Level Expectations

Strand 1 Matter and Energy

Energy Transformations

Physical and Chemical Properties and Changes of Matter

Energy Forms and Transfer

Strand 2 Force and Motion

Laws of Motion

Work and Simple Machines

Force, Motion, and Work

Interactions between Energy, Force, and Motion

Participant Preparation:

1. Participants should come to the program with an interest in bridges, engineering, math or science. (or maybe in just “blowing things up”)
2. Participants should utilize preparatory materials provided for the program and other resources of their own to better understand the context of the program’s subject and to think in advance of questions they wish to ask the experts. Any questions determined in advance, can be e-mailed to us prior to the program at roundtrips@clayton.k12.mo.us.
3. Participants should have pencil and paper ready to use during the program to jot down ideas and additional questions as they come to mind.

Pre-Program Activity Suggestions:

1. Students should explore the Missouri Department of Transportation website dealing with building the new Glasgow Bridge. That website can be found at <http://www.modot.mo.gov/northcentral/glasgowbridgeproject.htm>. The site includes information about the original bridge, plans for the new bridge, and a web cam showing current work on the bridge. Students should develop questions about what they read to ask during the program or to send to us in advance of the program at roundtrips@clayton.k12.mo.us. Teachers might want to divide the class into groups and have each group investigate a specific part of the website to explore in depth. Students can then share their learning with the rest of the class and present the questions they have developed to ask of the program’s experts.

2. The current Glasgow Bridge is an example of a multi span truss bridge. Have students find out more about these type of bridges, how they are engineered and built, why this design is selected for certain locations, etc. Have students share what they have learned with others in the class. As a class, have students determine questions for the show's experts that answer areas they don't understand as a result of their research or seem contradictory as a result of their research. Ask these questions during the program or send them to us in advance at roundtrips@clayton.k12.mo.us. Questions that we are unable to answer during the program will receive e-mail responses from experts involved in the program.

3. Talk to students about potential energy and kinetic energy. Describe stored chemical energy (like explosives), stored mechanical energy (compressed strings and stretched rubber bands), gravitational potential energy (an I-beam of a bridge above the river), thermal (heat) energy (the heat of an explosion melting metal), sound energy (the boom), and motion energy (as described by Newton's Laws of Motion).

Post-Program Activity Suggestions:

1. As a follow up to this program and as a lead in to the other programs in the upcoming series, have students create a list of questions they have about "what happens next" in the construction of the new bridge. Send those questions to us at roundtrips@clayton.k12.mo.us for MODOT experts to answer and reply to your students.

2. Have each student journal on what they have learned about bridges and engineering that they did not know before the program. What did they find most interesting, frustrating, unique, etc. about the occupations of those involved in the bridge implosion? What did they find most interesting, frustrating, unique, etc. about the planning involved in the implosion? What was their reaction to seeing the implosion? Was it as large as they expected, etc.? Have them share their journal entries with a partner or with the teacher.

3. Have students create a list of changes between potential and kinetic energy they saw happen in the conference.

4. Have students tell about energy changes. For example, tell about where they saw changes of chemical energy to mechanical energy, or chemical energy to thermal (heat) energy.

5. Have students share what they found most interesting and potentially frustrating about the careers they saw today. What would they like or dislike about being an engineer or explosives expert?

Supplemental Resources:

For more activities and website resources related to the program, please visit <http://www.roundtrips.org>.

Program Series:

This program is the first of an ongoing series of programs that will occur throughout the 2008-2009 school year. During this series of programs entitled Project MO Bridge: Connecting

Students to Their Future, your students will be able to learn what it takes to build a new bridge—from dream to design to construction to operation. Students will interact with experts in a wide variety of fields and learn how specific aspects of their science, social studies, and mathematics curriculum come to life in the construction of a new bridge. You can choose to enroll for any number of programs within the series.