

Galt

MUSEUM
& ARCHIVES

stories unfolding...



Building Bridges



Museum Educator

403-320-4248

tours@galtmuseum.com

TEACHER'S MANUAL

BUILDING BRIDGES TEACHER’S GUIDE

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This teacher's guide offers background information and ideas for classroom activities designed to complement a visit to the Galt. It contains information to assist you in planning your visit, information and activities for both before and after your visit, and outlines what you can expect from your education program.

The Galt's Mission

The Galt Museum & Archives engages and educates our communities in the human history of Southwestern Alberta by preserving and sharing collections, stories and memories that define our identity and guide our future.

Program Overview

Through inventiveness and curiosity, **Building Bridges** encourages students to explore a variety of building materials and structures. Students are introduced to the High Level Bridge and then use that example as motivation as they build their own bridges. **Building Bridges** also focuses on group work and the ability to work together to achieve a common goal.

Program Length

Building Bridges runs throughout the school year and is designed to be 90 minutes in length. Groups wishing to remain for longer time period, should make arrangements with the Museum Educator.



Curriculum Connections

Written to complement the Grade 3 Science Curriculum, this program is flexible enough to be used for programming from ECS to Grade 7. Building Bridges addresses the following curriculum objectives:

Science Topic 1C: “Building Things”

Science Topic 3B: “Building With a Variety of Materials”

Science Topic 3C: “Testing Materials and Designs”

Science Topic 7.2: “Structure and Design”

Science Topic 7.3: “Force and Motion”

Social Studies 1.2: Moving Forward With the Past: My Family, My History and My Community

Social Studies 2.2: A Community in the Past

Confirmation, Cancellations, and Contact Information

Your program has been scheduled as per the information on your confirmation sheet. If you have any questions about your booking or the program, please contact the Museum Educator at tours@galtmuseum.com or (403) 320-4248. If you must cancel or reschedule a program, please let us know as soon as possible. We will try to fit your class in at another time as time permits.

Payment

Payments can be made in advance of the program or on the day of the program. The Galt accepts VISA, MasterCard, debit, cash, and cheques. Cheques should be made out to the Galt Museum & Archives or City of Lethbridge. If payment is made in advance, receipts will be available on the day of the program. Otherwise, receipts will be mailed out to the school. The payment amount is \$45 per class per program.



Expectations for Visitors

- There should be one or two adult supervisors per class (this may include yourself). More adults are always welcome and there is no cost for adult supervisors. Younger siblings accompanying the class with their parents are also most welcome to attend the program.
- Running is not permitted in the Galt. There is green space to the south of the Galt if the class requires a space to stretch their legs.
- In order to protect and preserve the artifacts, drinks, food, and chewing gum are not permitted in the galleries or Archives. Drinking and eating are permitted in the Viewing Gallery.
- Because they are fragile and irreplaceable, artifacts on display should not be touched or handled.
- It is requested that there be no flash photography in the galleries. Light can, over time, damage the artifacts. Flash photography can be taken in the viewing gallery and programming areas (i.e. classroom).
- Visitors are not required to whisper in the Galt. Indoor voices are preferred.
- Washrooms are located on the main floor in the old portion of the building.

The Role of Adult Supervisors

Adult supervisors are an integral part of the Galt's programs. The following suggestions are provided to help make their role clearer and easier to manage. Some teachers find it useful to photocopy these suggestions for their adult supervisors.

- ✓ Float around and assist during the activities.
- ✓ Maintain the focus of the activities as you assist students through the activities. Remind students of what they are trying to discover and help them troubleshoot problems they may encounter.
- ✓ Depending on the activity, supply the students with answers to questions and additional information. Your Museum Education Volunteer (Docent) or Museum Educator will answer any questions you may have. If a question can not be answered during the program, it will be recorded and more information will be forwarded to the school.
- ✓ Assist in keeping students together.
- ✓ Ensure that students do not: run in the galleries, touch the artifacts on display, or drink or chew gum in the exhibits.
- ✓ Ask any available staff for assistance if there is an emergency.
- ✓ Encourage the students to ask questions and get involved.
- ✓ Enjoy your visit.

Your Arrival at the Galt

- The Galt has a parking lot north of the building with bus and vehicle parking.
- Buses and vehicles may drop off and pick up students at the north east corner of the building (using the east entrance). This is a fire access road so please do not leave vehicles here once they are emptied.
- Please enter through the east entrance. There is a coat room down the hallway to your left as you enter. Please leave all coats and backpacks here. Students do not need to remove boots. This coat room is solely for the use of programs and is not for general visitors.
- Galt staff will meet you at the east entrance.



Background Information for Building Bridges

For more information, please check the glossary at the end of the manual, the Galt's brochures on the High Level Bridge and Before the High Level Bridge, or see the book The CPR High Level Bridge at Lethbridge by Alex Johnston.

This is from road master Roger Honest, who checks 850 miles of rail in addition to the bridge:

- The bridge is checked on a regular basis; major work is done in the summer.
- The rivets and steel are examined twice each year; sometimes the head of the rivets pops off due to the vibrations of the trains.
- 1200 rivets were replaced in 1982 by scaling down the towers using a safety belt.
- Spot painting is done when required including on the decking which is washed down once a year to remove up to one inch of dirt build-up. Rust deterioration takes place under the paint.
- A three inch water line from the city is on the bridge in case of fire.
- The bridge decking is made of wood so is flammable. Sparks from the brakes could cause a fire but none has happened recently.
- There are water barrels every 150 feet on the bridge. The water is turned off in winter.
- The speed limit on the bridge is now 35 M.P.H. but when crews are working on the bridge, it is limited to 10 m.p.h.
- The concrete piers tend to deteriorate; this is caused by rain or moisture getting in the hairline cracks.
- Due to temperature changes, the steel expansion joints on the girders have to be greased regularly.

The following is some brief information on the CPR High Level Bridge.

- The bridge cost \$1,334,525 to build. It is 5,327.625 feet in length (1 mile 47 feet or 1.62 km), with a maximum height of 314 feet (100 metres) from the bed of the river.
- Construction started on August 15, 1908, on the steel portions of the bridge. Concrete- 17,090 cubic yard used. 12, 436 tons of steel used. 7, 600 gallons of paint used (2 coats).
- Work on the substructure began in 1907. Owing to delays caused by extreme floods in June 1908 and other difficulties met in connection with the river foundations, the substructure was not completed until February 1909.
- The steel bridge was designed by engineer John Schweitzer, who also designed the spiral tunnels at Field, BC. The bridge was to be built of steel and was to extend from one prairie level to the other, thus eliminating the need to go down to the river level to make a crossing.
- The erection traveller was built on site. A very ponderous machine, the erection traveller was built almost entirely of steel, stood sixty feet high, weighed 712 000 lbs, took one month to build, and cost \$100 000.
- The design is officially called a viaduct.
- Three men died during the construction of the bridge.
- The bridge was completed June 22, 1909, and the first train crossed the bridge on 23 October 1909 (though a passenger car crossed the bridge the day it was finished). When it was completed the trip to Fort Macleod took only 1 hour, compared with two hours on the old line. The new bridge replaced 20 old wooden bridges.
- On account of the great height of the structure and the severe winds so frequently experienced, it was decided to use spans of the through, instead of the deck-plate, girder type. In other words, the railway track was nestled between two eight-foot high girder spans instead of running on top of them. This made it practically impossible for derailed cars to leave the deck. A derailed car in falling from the structure would have knocked out tower legs and bracing, owing to the great spread of the bents.

Pre- and Post-Activities

These activities can be done prior to your visit to the Galt or after you have returned to your classroom.

TUG OF WAR

The way a bridge works is a lot like playing tug of war when there is no winner. If both sides are weighted equally, the rope and all the players balance and stay put. That's what a good bridge does. But if one side is stronger, down comes the other. The goal in these games is to stay put and not tug the other side off balance. Choose sides so each team is about equal in strength.

1. Be a Suspension Cable Bridge
 - Line up side by side, with everybody holding hands. Start pulling apart at the centre, but don't pull so hard that players fall down. Remember, you want to stay up, so if one team is stronger, the players on that team have to pull less. As you pull, feel the tension (stretch) in your arms and shoulders. Now you know what it's like to be a cable on a suspension bridge.
2. Be a Stone in an Arch Bridge
 - The players on each team line up, one behind the other, facing the other team. The middle two players place their hands on each other's shoulders. The outside players put their hands on the waist of their teammate in front of them. Once you're set, start pushing. Again, push equally so everyone stays up. As you're pushed, feel the compression (pushing) force that squeezes your body. That's what it's like to be a stone in an arch or a support under any bridge.
3. Balance Like a Bridge
 - Now try pulling and pushing. Line up side by side with some space in between. The two in the middle lean toward each other so their shoulders touch. They also hold hands with the players on the outside. All other outside players also hold hands. While the middle two push against each other, the outside players pull. Can you push and pull so everyone stays put? Who feels both compression and tension?

NEIGHBOURHOOD WALK

Take a walk and identify common building shapes such as beams, arches or triangles. These shapes provide strength and support.

PURPOSE AND USE

In the program we concentrated on the High Level Bridge, but there are many different types of bridges and each bridge is designed to best meet the needs for its type. There are four bridges that cross the Oldman River in Lethbridge and each bridge is different (Highway 3, Whoop Up Drive, Walking Bridge, High Level Bridge). Look at these four bridges and other buildings around town and see how their function is related to their design.

TEAMWORK

Building a strong bridge is not only about knowing how to build, it is also about working well with a group. Teamwork, compromise, cooperation, and communication are important for bridge building. If you were in charge of building a bridge and making the project work, what would you do to keep the team working well together?

PAINTING THE BRIDGE

Why Did They Paint the Bridge? It took 7,600 gallons of paint to paint the High Level Bridge. Why did they bother? Try the following experiment and see if you can figure out why they painted the bridge and why they repaint it. Gather three small plastic containers and three small pieces of steel wool. Put one piece of steel wool in each container. Bring some water to a boil for a minute or two. Cool. Pour the water into one of the containers, completely covering the steel wool. In the second container, cover the steel wool with water from the kitchen faucet. Don't add any water to the third container. Check the containers in a few hours or the next day. Meanwhile, keep in mind that for steel to rust, it must be exposed to water and oxygen. Oxygen is found in air and water. Boiling removes oxygen from the water. Now that you know these facts, what will you expect to see?

POETRY AND PHOTOGRAPHS

The High Level Bridge is just a bridge. Its purpose is to allow trains to get from one side of the river valley to the other. And, yet, it is the most photographed and painted site in Lethbridge. Why do you think people want to photograph, paint and draw the bridge? What does the bridge mean to you? Draw a picture of the bridge or write a poem about a bridge.

DREAM BRIDGE

If you could build a bridge anywhere in the world, where would it be? Perhaps you want to connect two continents or islands? Use a map or globe if you have trouble finding the perfect place. Once you find where you want to build your bridge, design, draw, and/or build your bridge using whatever material you think is necessary.

THE MIGHTY BRIDGE

Borrow the video “The Mighty Bridge” or watch it at the museum. Did you know there was a song written about the bridge? Discuss the symbolism of the bridge. What does the bridge mean to the Lethbridge community? Why do you think so many people take pictures of the bridge? What does the bridge mean to you?

Your Galt Program

ACTIVITY 1 : WELCOME AND INTRODUCTION

Students will be welcomed to the museum and will review what a museum is and the expectations of visitors to the museum. The group will also learn about the development of the CPR High Level Bridge and will be shown the model coulee system over which they need to build the bridge.

ACTIVITY 2: PLAN THE BRIDGE

Students will be divided into groups and will as a group plan what type of bridge they are going to build. The bridge must be highest enough, long enough, and strong enough. Students may be divided into groups before coming to the program or may be divided at this time (teacher discretion). Group sizes are usually 4 to 6 in a group.

ACTIVITY 3: CHOOSE THE MATERIALS

Students will choose the material for the bridge. Students will have a variety of materials from which to build the bridges. The materials may include, but are not limited to, straws, paper, Styrofoam cups, paper clips, pipe cleaners, and Popsicle sticks.

ACTIVITY 4: BUILD THE BRIDGE

Students will work in their groups to build the bridge based on the plans agreed upon in Activity 2.

ACTIVITY 5: PRESENT THE BRIDGE

Each group will present their bridge to the rest of the class and explain what worked well about their bridge and what was frustrating. Bridges will be tested at this time.

ACTIVITY 6: CONCLUSION

Students will review the activities of the program and will be invited to visit the museum and Archives again.

Glossary

Anchor Bolts: These are 2 ½” in diameter and 8’ 11” long and are used to fix one corner of a tower; the other three are therefore free to move with the expansion and contraction of the steel.

Bent: A structural member or framework used for strengthening a bridge or trestle transversely.

Compression: One of the two major forces that act on the parts of a bridge, compression, pushes on, or squeezes, bridge parts (see tension).

Concrete Piers: Also known as pedestals, these were constructed in pits to form the substructure or base for the steel towers. A 1:3:6 mixtures of cement, sand, and gravel were used.

Excavations: The excavations (or pits) for the concrete piers were taken out by teams and scrapers with the balance down by pick and shovel.

Rivets: A rivet is a metal bolt or pin, having a head on one end, used to fasten metal plates together.

Sliding Plates: These were permanently lubricated with graphite and slowed for the expansion and contraction movement of the steel.

Tension: The other of the two major forces that act on the parts of a bridge, tension, pulls on, or stretches, bridge parts (see compression).

Tower Spans: Consist of the two bents which were made 67 feet long in order to give longitudinal stiffness to the towers and reduce the traction stress in the lower legs.

Viaduct: Via means by way of. A viaduct is a series of spans or arches used to carry a road or railroad over a wide valley.

Evaluation

An evaluation form was sent out with your confirmation. Evaluation results allow us to offer the most effective and highest standard program that we can. Your feedback and suggestions are greatly appreciated. Please fax the form back to us at (403) 329-4958 or mail to Museum Educator at 910 4 Ave S, Lethbridge, AB T1J 0P6.



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