

Bridges are all around us and we use them without even acknowledging all of the engineering and math that goes into their construction. It was our goal to bring some of the beauty of design and geometry to the forefront of students' minds, introduce them to engineering, and help them to begin to appreciate the applications of geometry into bridge building.

To attempt to find out if the project accomplished this job, we gave a pre-test and a post-test to gauge where the students were beginning and how they grew during the project. Even though our survey was not the best tool (looking backward we would have designed the survey differently – but that's another paper), we gained valuable information. A copy of the survey is attached. We also had students write their reflections about the project.

The unit included

- Showing a movie to introduce bridges,
- Listening to a presentation by a civil engineer,
- Completing a packet of information, and internet website, and worksheets;
- Using software to design and virtually test student bridges,
- Construction of basswood bridges,
- Testing of the bridges,
- Evaluations of team members, and
- Reflections on the project.

Our pre-/post-test revealed the following information:

- Students know more about what engineering is after participating in the project.
- Three people who thought they might be interested in engineering decided that it was not for them
- Seventeen people are interested in investigating engineering as a possible career
- Students think that they can identify different types (81%) of bridges and different parts (83%) of bridges.
- Students realize that there is a lot to study about bridges and they are beginning to appreciate it.
- Students understand that there is a connection between geometry and bridge building (95%)
- 100% of the students believe that bridges are an important part of our lives.
- 100% of the students believe that there are a lot of mathematical applications in bridge building.

After reading students' reflections, it became apparent that there are two groups of students – one group enjoys working on the computer and designing from that standpoint and the other group enjoys the actual hands-on construction of the bridge with basswood and glue. After watching students over a period of years, this seems to make sense. This might not have been the case before video games. The students who enjoyed the computer more tend to like see the computer do all the work. They tended to have less patience for the finer skills of the actual building. The other group had less patience to learn a new computer program and didn't trust it anyway.

All of the students enjoyed the testing of the bridges and watching what happened when the weight was applied. All of the groups commented that more triangles would make their bridge stronger! Comments also included that if they had been more careful with the construction and the glue that it would have made a difference and if they reinforced parts of the bridge it would have held more weight.

Below are quotes that were a part of students' reflections after the project.

- "I learned that there is more to bridges than meets the eye, and that certain bridges are made for certain things."
- "I would try to be more precise when cutting the angles on the wood, use a little less glue, and probably add a few extra members for support in places that the bridge seemed a little weak."
- "My favorite part was building the bridge. My least favorite was the bridge packet, but it did help."
- "My favorite part of the project was actually building the bridge. It let me actually do something with all of our plans and bring the whole thing to life."
- "The design and testing was my favorite part. The designing was fun. To work on the computer program allowed us to test it before we built it and to see how it held up when weight was applied. The red boards on the computer showed us the weak members of our bridge."

We believe that this unit was a success in the fact that it helped students appreciate bridges and the connections that geometry had to bridges. They have a better idea of what an engineer does and whether or not they'd like to learn more about becoming one.

Survey on Bridges

Dear student,

Please answer the following questions below. Your responses will be treated confidentially. There are no right or wrong answers. Your answers will not count toward your grade on any homework on this unit or for this subject. Put an (x) on or circle the answers that apply to you.

	Question	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Sure
1	I understand the connection between Geometry and bridge building.	5	4	3	2	1
2	I enjoy learning about engineering constructions like bridges.	5	4	3	2	1
3	I know the differences between different types of bridges.	5	4	3	2	1
4	I have never appreciated why we should learn about bridges.	5	4	3	2	1
5	I can identify the different parts of bridges.	5	4	3	2	1
6	I would like to study engineering in the future.	5	4	3	2	1
7	Bridges are an important part of our lives	5	4	3	2	1
8	I think there are a lot of mathematical applications in bridge building.	5	4	3	2	1

Please feel free to write additional comments regarding your experience with bridges or knowledge about bridges on the back of this page.

Thank you for your time.