**Discover, Design, Build - Science, Technology, Engineering, Art, and Math**

Instructor: J.P. Henkel

Email: jp.henkel@bartcharter.org

**Bridge Building**

Description:

In this unit, students will design and build a prototype for a bridge that is conceived to cross the Hoosic River that borders the back of the BART campus and spans to the Ashuwillticook Rail Trail, that is used by BART students to travel to a town park used for school fitness classes.

You will work in teams of 2-3 over 6 class periods.

* think creatively and apply the design process to solve problems.
* collaborate with peers and mentors.
* design, construct, test, and revise prototypes.
* critique the work of others productively.
* respond to feedback and challenges to make improvements.
* communicate ideas visually and verbally.

**Parameters**:

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| Teacher-supplied balsa wood strips will be made available. |
| The model is site specific, and based on the actual area to be spanned. |
| Only glue (no other fasteners) may be used. Glue is teacher supplied. |
| Bridges will be tested by placing a 2”x 2”x 1” block on the **bed** of the bridge. A hook will extend from this block and must pass THROUGH the roadway. |
| Aesthetics are not a grading factor, but workmanship is. |
| Structures will be impounded and weighed the day before testing day. |
| Sand will be gradually added to a bucket hanging from the hook until the structure fails. At that time the bucket will be weighed. |
| Scores will be calculated by the weight of the sand divided by the weight of the bridge. The highest result represents the strongest bridge. |

**Procedures:**

Day 1: Watch video on bridge design. Experiment with relative strength of different shapes. Calculate efficiency ratios.

Day 2: Define project. Brainstorm solutions. Sketch. Build prototypes.

Day 3. Build prototypes.

Day 4: Test prototypes. Analyze results. Make revisions.

Day 5: Build final.

Day 6: Reflect.

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| topic | 0 - not attempted | 2 - poor | 3 - needs some work | 4 - good | 5 - outstanding |
| design process | minimal or no effort made | Students made little attempt to follow the design process. | Student documented some parts of the design process. May have skipped parts. | Students followed and documented all parts of the design process | Student used the repetitive nature of the design process to improve their project to achieve excellence |
| prototyping | minimal or no effort made | prototypes were attempted but were unrealistic or not intended to improve the design process. | prototypes were attempted, but little attention was paid to lessons learned | at least 2 prototypes were built and tested | Many rounds of prototyping took place which incorporated solutions to specific problems. |
| collaboration | minimal or no effort made | students did not function as a team | one student may have dominated the team or students worked independently of each other | students appeared to operate as a team - all members contributing | students encourage each other to achieve in ways that they would not have alone |
| present & critique | minimal or no effort made | both the critique and the presentation were unclear or lacking coherence | either the critique or the presentation was unclear or lacking coherence | all students presented to the group clearly and offered productive critiques of others | presentation was excellent **and** critiques were inciteful |
| respond to feedback | minimal or no effort made | students did not use feedback and did not improve their project | students may have improved their project but did not use feedback | students used feedback to improve their project | students used feedback to identify their own strengths and weaknesses and used this reflection to improve |
| communication | minimal or no effort made | drawings were not to scale or were unclear | scale drawings had some errors | scale drawings were accurate and clear | scale drawings were accurate, clear, and well-annotated |

TOTAL POINTS \_\_\_\_