Art Exhibit

This challenge can be done in any grade level. You can use the general challenge (listed first) or use the grade level differentiated challenges (listed in grade level order after general challenge).

Design Challenge Summary

Challenge: What will the students be required to do?

Crystal Bridges is preparing for a new exhibit of miniature animal statues. Since the statues are smaller, they want them to be displayed on pedestals that will allow visitors to see them better. Before they begin construction on the exhibit, they'll need to design a model of the exhibit. Your task is to help them design the model of these pedestals for the exhibit.

Your pedestal needs to be:

- free standing (not attached to anything or hanging from anything)
- at least 2 ft tall
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

- 100 index cards
- 1 ft of scotch tape
- A ruler *(to be used only for measuring the height of your pedestal)*
- Scissors

Class materials: 1 stuffed animal (representing the miniature statue) to be used to test each design

AR K-12 Science Standards: What standards are addressed?

Engineering, Technology, and Applications of Science:

K-ETS1-2; 1-ETS1-2; 2-ETS1-2

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

3-ETS1-2; 4-ETS1-2; 5-ETS1-2

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-ETS1-3; 4-ETS1-3; 5-ETS1-3

Plan and carry out fair tests in which variables are controlled and failure points are considered to indentify aspects of a model or prototype that can be improved.

Result: What will students know, value, and be able to do as a result of the lesson? What's the big idea?

Know and apply the engineering design loop process to a problem.
Demonstrate ability to modify designs based on observations and predictions.
Work collaboratively on solving a problem.

Assessment: What evidence will be used to determine student learning?

Did they meet the challenge?
Did they follow the design loop process?
Did they work collaboratively?

Prior Knowledge/Experiences: What prior content knowledge and skills will the students need?

Experiences with the Engineering Design Loop process and/or problem solving
Connections to the Mathematical Practices
Investigations/inquiry in Science

Materials/Equipment/Preparation: What materials and equipment will students need to successfully complete this design challenge?

Group materials include:

- 100 index cards
- 1 ft of scotch tape
- A ruler (to be used only for measuring the height of the pedestal)
- Scissors

Class materials: 1 stuffed animal (representing the miniature statue) to be used to test each design

Summary/Connections: How will this design challenge connect with new/future learning, other content areas, real world experiences, etc.?

This lesson will help students develop problem solving skills and collaboration skills that are essential in succeeding in the 21st century. It will allow students the opportunity to transfer and apply skills from various content areas within one task.

Discuss the designs:

- Which designs worked the best? Why?
- Were there any specific shapes or structure designs that worked better than others? Why?
- Did you do anything to the index cards to make them stronger? Why is this important?
- Was the number of index cards used important? Why/Why not?

Discuss the concepts involved:

- What Science concepts did you have to understand and apply in building this pedestal?
- What Mathematics did you use in building this pedestal?
- Why would it be important for someone who is designing/building to test their designs before producing them?

Extension:

- Students could write about the process, their design, etc.
- Ask students what other materials they could test with this challenge. Bring those in and test.
- Use different constraints – increase the height; change animal used; decrease # of cards allowed; etc.
- Upper Grades: complete the challenge without ruler… Could they measure the height without a ruler?
  Hint index cards are 3x5*

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Your task is to help them design the model of these pedestals for the exhibit.

Your pedestal needs to be:

- free standing *(not attached to anything or hanging from anything)*
- at least 2 ft tall
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

100 index cards

1 ft of scotch tape

A ruler *(to be used only for measuring purposes)*

Scissors

Class materials:

1 stuffed animal (representing the miniature statue) to be used to test each design

Challenge Differentiated by Grade Level

Kindergarten:

Crystal Bridges is preparing for a new exhibit of miniature animal statues. Since the statues are smaller, they want them to be displayed on pedestals (towers) that will allow visitors to see them better. Before they begin construction on the exhibit, they'll need to design a model of the exhibit. Your task is to help them design the model of these pedestals (towers) for the exhibit.

Your pedestal (tower) needs to be:

- free standing (not attached to anything or hanging from anything)
- taller than a tower of 23 unifix cubes
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

- 100 index cards
- 12 inches of scotch tape *(teacher will distribute)*
- Tower of 23 unifix cubes *(to be used only for measuring the height of your pedestal)*
- Scissors

Class materials: 1 stuffed animal (representing the miniature statue) to be used to test each design

Standards: What standards can be addressed?

AR K-12 Science Standards: Engineering, Technology, and Applications of Science

K-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Math:

Mathematical Practice Standards

K.MD.2: Directly compare two objects with a measurable attribute in common, to see which object has "more of"/ "less of" the attribute, and describe the difference. (taller than/shorter than)

ELA:

W.K.3 Use a combination of drawing, dictating, and writing to narrate a single event or several loosely linked events, tell about the events in the order in which they occurred, and provide a reaction to what happened.

W.K.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

SL.K.1 Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood

SL.K.6 Speak audibly and express thoughts, feelings, and ideas clearly.

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Your pedestal needs to be:

- free standing *(not attached to anything or hanging from anything)*
- taller than a tower of 23 unifix cubes
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

100 index cards

12 inches of scotch tape

Tower of 23 unifix cubes *(to be used only for measuring purposes)*

Scissors

Class materials:

1 stuffed animal (representing the miniature statue) to be used to test each design

Challenge Differentiated by Grade Level

1st Grade:

Crystal Bridges is preparing for a new exhibit of miniature animal statues. Since the statues are smaller, they want them to be displayed on pedestals (towers) that will allow visitors to see them better. Before they begin construction on the exhibit, they'll need to design a model of the exhibit. Your task is to help them design the model of these pedestals (towers) for the exhibit.

Your pedestal (tower) needs to be:

- free standing (not attached to anything or hanging from anything)
- at least 24 unifix cubes tall
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

- 100 index cards
- 12 inches of scotch tape *(teacher will distribute)*
- Unifix cubes *(to be used only for measuring the height of your pedestal)*
- Scissors

Class materials: 1 stuffed animal (representing the miniature statue) to be used to test each design

Standards: What standards can be addressed?

AR K-12 Science Standards: Engineering, Technology, and Applications of Science

1-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Math:

Mathematical Practice Standards

1.MD.1: Order three objects by length; compare the lengths of two objects indirectly by using a third object

ELA:

W.1.3 Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.

SL.1.1 Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups

SL.1.3 Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.

SL.1.5 Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts or feelings

SL.1.6 Produce complete sentences when appropriate to task and situation.

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Your task is to help them design the model of these pedestals for the exhibit.

Your pedestal needs to be:

- free standing *(not attached to anything or hanging from anything)*
- at least 24 unifix cubes tall
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

100 index cards

12 inches of scotch tape

Unifix cubes *(to be used only for measuring purposes)*

Scissors

Class materials:

1 stuffed animal (representing the miniature statue) to be used to test each design

Challenge Differentiated by Grade Level

2nd Grade:

Crystal Bridges is preparing for a new exhibit of miniature animal statues. Since the statues are smaller, they want them to be displayed on pedestals (towers) that will allow visitors to see them better. Before they begin construction on the exhibit, they'll need to design a model of the exhibit. Your task is to help them design the model of these pedestals (towers) for the exhibit.

Your pedestal (tower) needs to be:

- free standing (not attached to anything or hanging from anything)
- at least 24 inches tall
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

- 100 index cards
- 12 inches of scotch tape
- A ruler *(to be used only for measuring the height of your pedestal)*

Standards: What standards can be addressed?

AR K-12 Science Standards: Engineering, Technology, and Applications of Science

2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Math:

Mathematical Practice Standards

2.MD.1: Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

(if you haven't transitioned into standard units at the time you complete this challenge, use 24 unifix cubes for your tool)

ELA:

W.2.3 Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts and feelings, use temporal words to signal event order, and provide a sense of closure

SL.2.1 Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups

SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information or deepen understanding of a topic or issue

SL.2.4 Tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences

SL.2.6 Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification

*****NOTE*****

If you need to use non-standard units of measurement for this task, you can use the 1st grade task card.
The 2nd grade task card is written for the standard unit of measurement.

2nd Grade

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Your task is to help them design the model of these pedestals for the exhibit.

Your pedestal needs to be:

- free standing *(not attached to anything or hanging from anything)*
- at least 24 inches tall
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

100 index cards

12 inches of scotch tape

A ruler *(to be used only for measuring purposes)*

Scissors

Class materials:

1 stuffed animal (representing the miniature statue) to be used to test each design

Challenge Differentiated by Grade Level

3rd Grade:

Crystal Bridges is preparing for a new exhibit of miniature animal statues. Since the statues are smaller, they want them to be displayed on pedestals (towers) that will allow visitors to see them better. Before they begin construction on the exhibit, they'll need to design a model of the exhibit. Your task is to help them design the model of these pedestals (towers) for the exhibit.

Your pedestal (tower) needs to be:

- free standing (not attached to anything or hanging from anything)
- at least 24 inches tall with a base perimeter of at least 20 inches
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

- 100 index cards
- 1 ft of scotch tape
- A ruler *(to be used only for measurement purposes)*

Class materials: 1 stuffed animal (representing the miniature statue) to be used to test each design

Standards: What standards can be addressed?

AR K-12 Science Standards: Engineering, Technology, and Applications of Science

3-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to indentify aspects of a model or prototype that can be improved.

Math:

Mathematical Practice Standards

3.MD.8: Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

ELA:

W.3.10 Write routinely over extended time frames and short time frames for a range of discipline-specific tasks, purposes, and audiences.

SL.3.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

SL.3.6 Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

3rd Grade

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Your task is to help them design the model of these pedestals for the exhibit.

Your pedestal needs to be:

- free standing *(not attached to anything or hanging from anything)*
- at least 24 inches tall with a base perimeter of at least 20 inches
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

100 index cards

1 foot of scotch tape

A ruler *(to be used only for measuring purposes)*

Scissors

Class materials:

1 stuffed animal (representing the miniature statue) to be used to test each design

Challenge Differentiated by Grade Level

4th Grade:

Crystal Bridges is preparing for a new exhibit of miniature animal statues. Since the statues are smaller, they want them to be displayed on pedestals (towers) that will allow visitors to see them better. Before they begin construction on the exhibit, they'll need to design a model of the exhibit. Your task is to help them design the model of these pedestals (towers) for the exhibit.

Your pedestal (tower) needs to be:

- free standing (not attached to anything or hanging from anything)
- at least 2 feet tall with a base area of at least 20 sq. inches
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

- 100 index cards
- 1 ft of scotch tape
- A ruler *(to be used only for measurement purposes)*

Class materials: 1 stuffed animal (representing the miniature statue) to be used to test each design

Standards: What standards can be addressed?

AR K-12 Science Standards: Engineering, Technology, and Applications of Science

4-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

4-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to indentify aspects of a model or prototype that can be improved.

Math:

Mathematical Practice Standards

4.MD.1: Know relative sizes of measurement units within one system of units…Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table

4.MD.3: Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

ELA:

W.4.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.4.10 Write routinely over extended time frames and shorter time frames for a range of discipline-specific tasks, purposes, and audiences.

SL.4.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 4 topics and texts, building on other's ideas and expressing their own clearly.

SL.4.3 Identify the reasons and evidence a speaker provides to support particular points.

SL.4.4 Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

Art Exhibit

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Your task is to help them design the model of these pedestals for the exhibit.

Your pedestal needs to be:

- free standing *(not attached to anything or hanging from anything)*
- at least 2 feet tall with a base area of at least 20 sq inches
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

100 index cards

1 foot of scotch tape

A ruler *(to be used only for measuring purposes)*

Scissors

Class materials:

1 stuffed animal (representing the miniature statue) to be used to test each design

Challenge Differentiated by Grade Level

5th Grade:

Crystal Bridges is preparing for a new exhibit of miniature animal statues. Since the statues are smaller, they want them to be displayed on pedestals (towers) that will allow visitors to see them better. Before they begin construction on the exhibit, they'll need to design a model of the exhibit. Your task is to help them design the model of these pedestals (towers) for the exhibit.

Your pedestal (tower) needs to be:

- free standing (not attached to anything or hanging from anything)
- at least 0.6 meters tall with a base area of at least 144 sq cm
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

- 100 index cards
- 30 cm of scotch tape
- A ruler or meter stick *(to be used only for measurement purposes)*

Class materials: 1 stuffed animal (representing the miniature statue) to be used to test each design

Standards: What standards can be addressed?

AR K-12 Science Standards: Engineering, Technology, and Applications of Science

5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to indentify aspects of a model or prototype that can be improved.

Math:

Mathematical Practice Standards

5.MD.1: Convert among different-sized standard measurement units within a given measurement system and use these conversions in solving multi-step, real world problems

ELA:

W.5.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

W.5.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.5.10 Write routinely over extended time frames and shorter time frames for a range of discipline-specific tasks, purposes, and audiences.

SL.5.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 5 topics and texts, building on other's ideas and expressing their own clearly.

SL.5.3 Summarize the points a speaker makes and explain how each claim is supported by reasons and evidence.

SL.5.4 Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace

5th Grade

Art Exhibit

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Your task is to help them design the model of these pedestals for the exhibit.

Your pedestal needs to be:

- free standing *(not attached to anything or hanging from anything)*
- at least 0.6 meters tall with a base area of at least 144 sq cm
- able to stand and hold the stuffed animal (representing the miniature statue) for at least 10 seconds

Your materials include:

100 index cards

30 cm of scotch tape

A ruler or meter stick *(to be used only for measuring purposes)*

Scissors

Class materials:

1 stuffed animal (representing the miniature statue) to be used to test each design