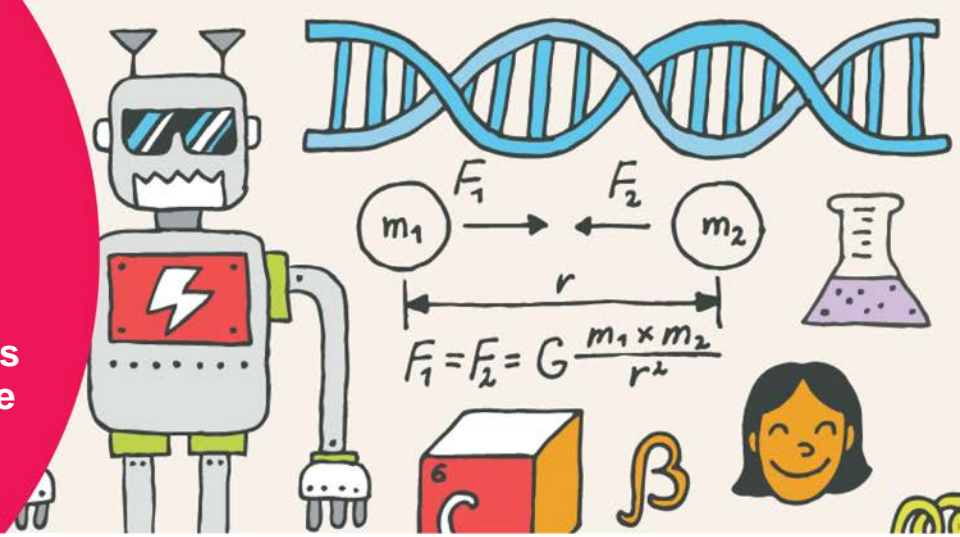


Bâtisseurs de ponts

Activités pour stimuler les jeunes esprits avant et après votre visite au Musée



AVANT VOTRE VISITE

Activité: Forces agissant sur différents types de ponts

Introduction

Start by discussing a few basic concepts about different types of bridges:

1. What are bridges used for? (*cars, trucks, trains, pedestrians, etc.*)
2. Where are they used? (*over small bodies of water, over large bodies of water, over canyons, over roads*).
3. What things have to be considered when building a bridge? (*weather in area, what will go over it, where it is, cost, material, etc.*)
4. For these reasons there are many different types of bridges that exist. Some examples are:



Pont à poutre High Level- construit 1913.
Edmonton, Alberta. Rivière North Saskatchewan



Pont suspendu Lion's Gate - construit 1938.
Burrard Inlet, Vancouver, Colombie Britannique



Pont en arc Old Mill- construit 1916.
Rivière Humber River Valley, Toronto, Ontario.

5. Have a quick discussion on what forces are and how they act on various structures. (*There are many types of forces but primarily they can be identified as pushing or pulling or using other words tension or compression.*) Forces can be applied externally (such as gravity) or internally (from one part of a structure acting on another part).

Objectif d'apprentissage: To discover forces acting on various types of bridges.

Pont à poutre

Matériel

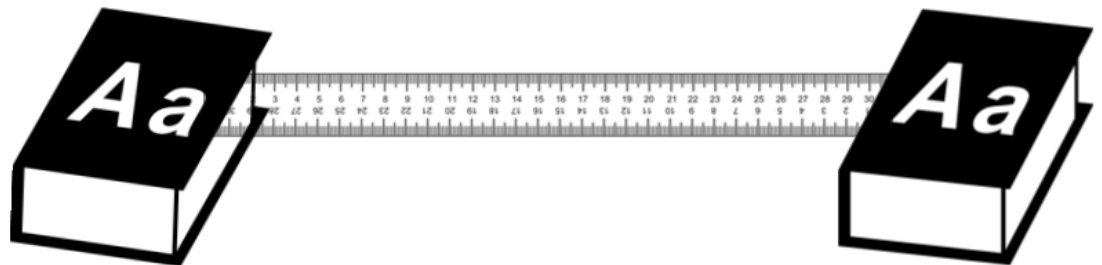
- Two books
- Ruler (30 cm long)
- Ten pennies

Instructions

1. Place the books at a distance from each other so that the ruler can be placed between them.
2. Place the ruler on the books.
3. Stack pennies in the center of the ruler or simply press down in the center of the ruler.
4. Observe.

- What happens to the ruler as more pennies are stacked? (*starts to bend and collapse towards the 'water'*)

- What type of forces would be in the ruler? (*Pushing force along the top of the ruler (compression) and pulling forces along the bottom of the ruler (tension)*).



Pour une meilleure représentation visuelle, vous pouvez utiliser un morceau de nouille de piscine, un long ballon mince ou une éponge humide avec des lignes transversales dessinées sur sa longueur pour montrer les forces sur le pont lorsque la charge est appliquée plutôt que d'une règle.

Pont suspendu

Matériel

- Eight books
- String (approximately 90 cm long)

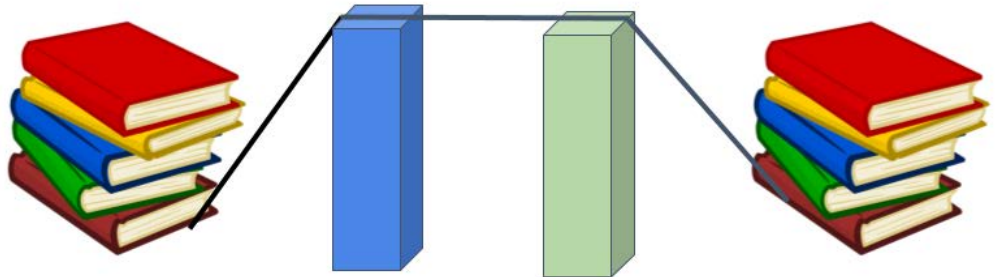
Instructions

1. Place two of the books standing on their bottom edge at a distance from each other (approximately 30 cm).
2. Place the string over the books with the center of the string in between the two books and the ends hanging over the far side of each book.
3. Push on the center of the string.
4. Observe.

- What happens if you push down on the string? (*The string will just fall as it is not supported*).

5. Place each end of the string under a stack of books.
6. Push on the center of the string once more.
7. Observe.

- What type of forces would be in the string? (*Pulling (tension)*).



Approfondissez!

- Demandez aux élèves de se mettre deux par deux. Face à face, avec leurs pieds à environ 0,5 m l'un de l'autre ils devraient se tenir par les mains.
- Les élèves éloignent leurs corps l'un de l'autre sans bouger leurs pieds
- Quel type de force les élèves ressentent-ils dans leurs bras? (Comme le pont suspendu, ils ressentiront des forces de traction (tension))

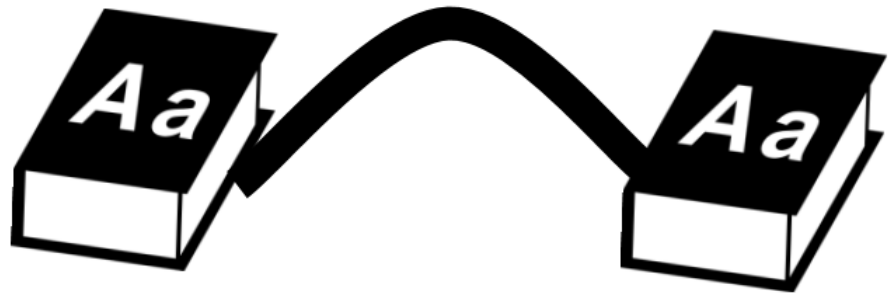
Pont en arc

Matériel

- Two books
- One strip of cardboard (approximately 30 cm long X 3 cm wide)
- Ten pennies

Instructions

1. Place the books at a distance from each other so that the cardboard can be placed between them in an arch shape.
2. Place the cardboard strip between the two books so that it has an arch shape.
3. Stack pennies in the center of the cardboard.
4. Observe.



- What happens to the cardboard as more pennies are stacked? (*starts to bend and collapse towards the 'water'*)
- What type of forces would be in the cardboard? (*Pushing - compression*)
- Can this shape withstand more weight than the flat ('post and beam') type of bridge? (*yes*)
- Try it out by placing the cardboard strip flat along the top of the books.

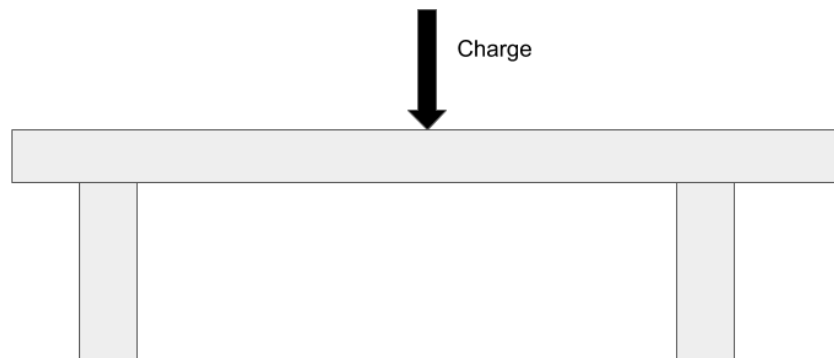
Approfondissez!

- Demandez aux élèves de se mettre deux par deux. Face à face, avec leurs pieds à environ 0,5 m l'un de l'autre, ils devraient ensuite mettre leurs mains en contact les uns avec les autres par-dessus de leurs tête (imitant un pont en arc).
- Les élèves peuvent alors s'appuyer l'un sur l'autre.
- Quel type de force les élèves ressentent-ils dans leurs bras? (Comme que le pont en arc ils sentiront pousser des forces - compression)

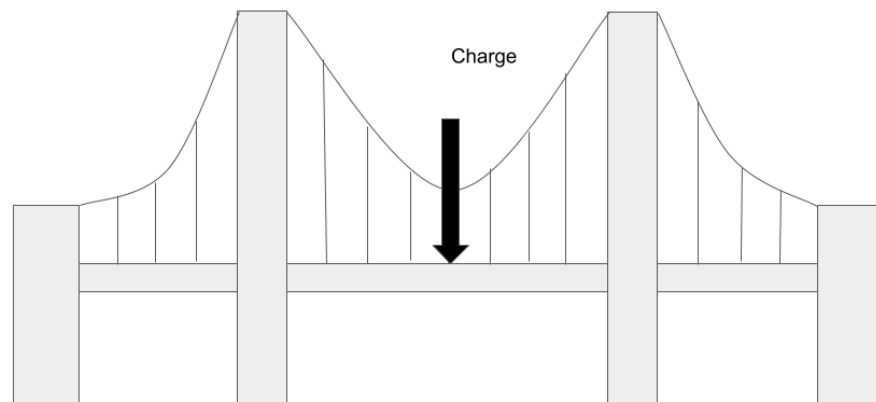
FEUILLE D'ACTIVITÉS

Utilisez des flèches pour indiquer où les forces agissent sur les ponts quand une charge est appliquée au centre de chaque pont.

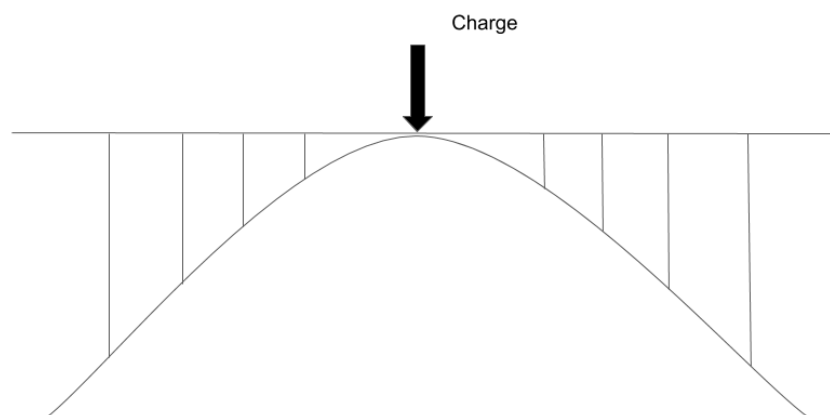
Pont à poutre



Pont suspendu



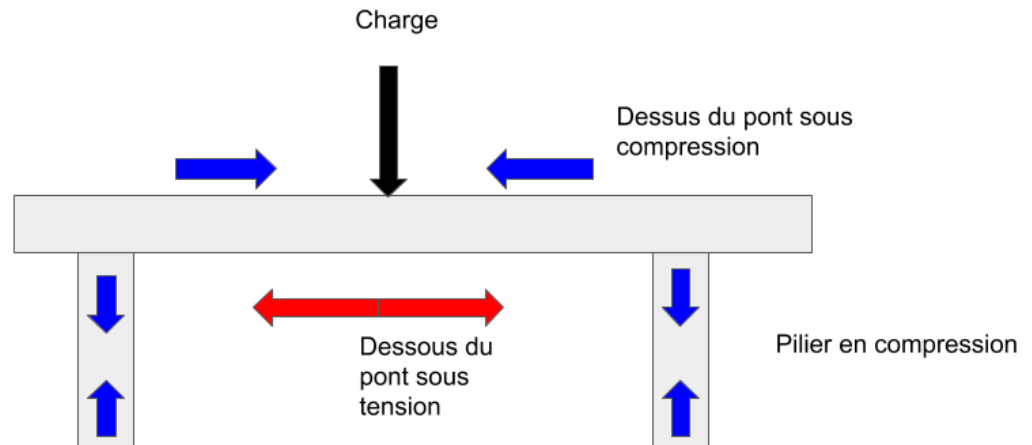
Pont en arc



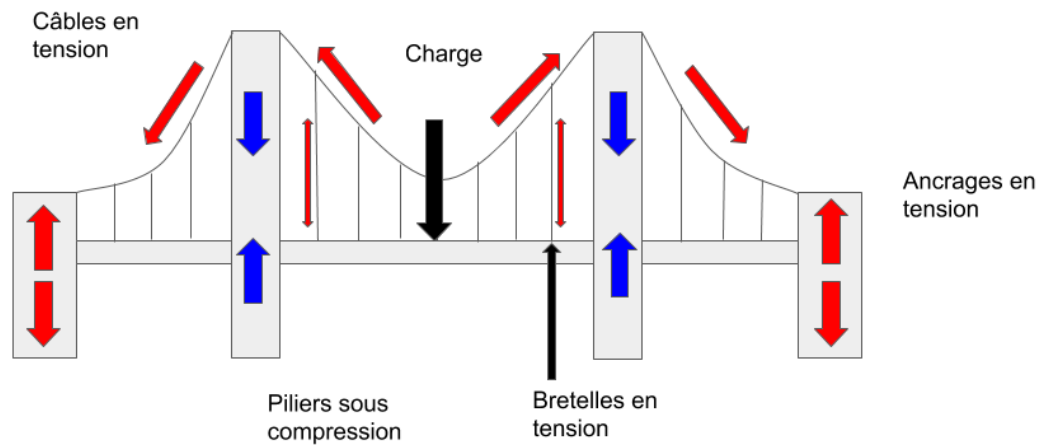
FEUILLE D'ACTIVITÉS - RÉPONSES

Utilisez des flèches pour indiquer où les forces agissent sur les ponts quand une charge est appliquée au centre de chaque pont.

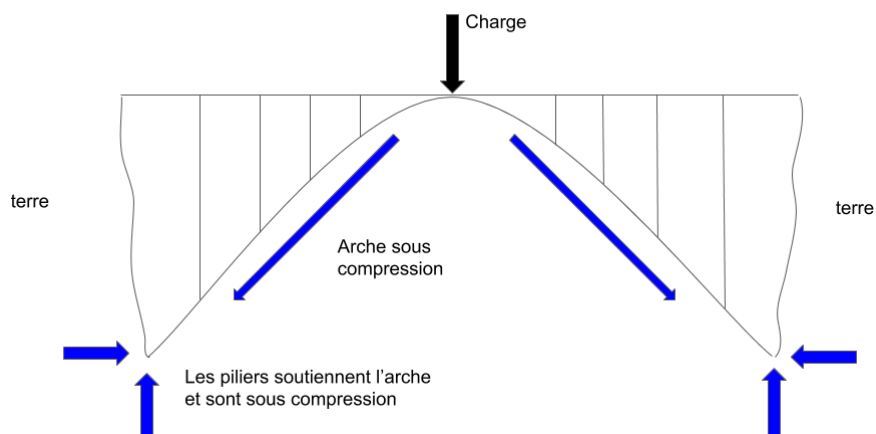
Pont à poutre



Pont suspendu



Pont en arc



APRÈS VOTRE VISITE

RÉFLEXION

Objectif d'apprentissage

Have students reflect upon their time at the museum, the bridges they built and how the bridges performed when tested.

Matériel

- **Tableau de résultats – si disponible**
- **Photos de ponts completes – si disponible**

Instructions

Discuss with students results from the bridges that were built in the workshop. What worked well? What didn't work? What challenges were there? Did the bridges that were the most successful in testing have anything in common? Did the bridges that were the least successful in testing have anything in common?

ACTIVITÉ – CONSTRUIS UN PONT SUSPENDUS

Objectif d'apprentissage

To build a suspension bridge that is capable of supporting a load.

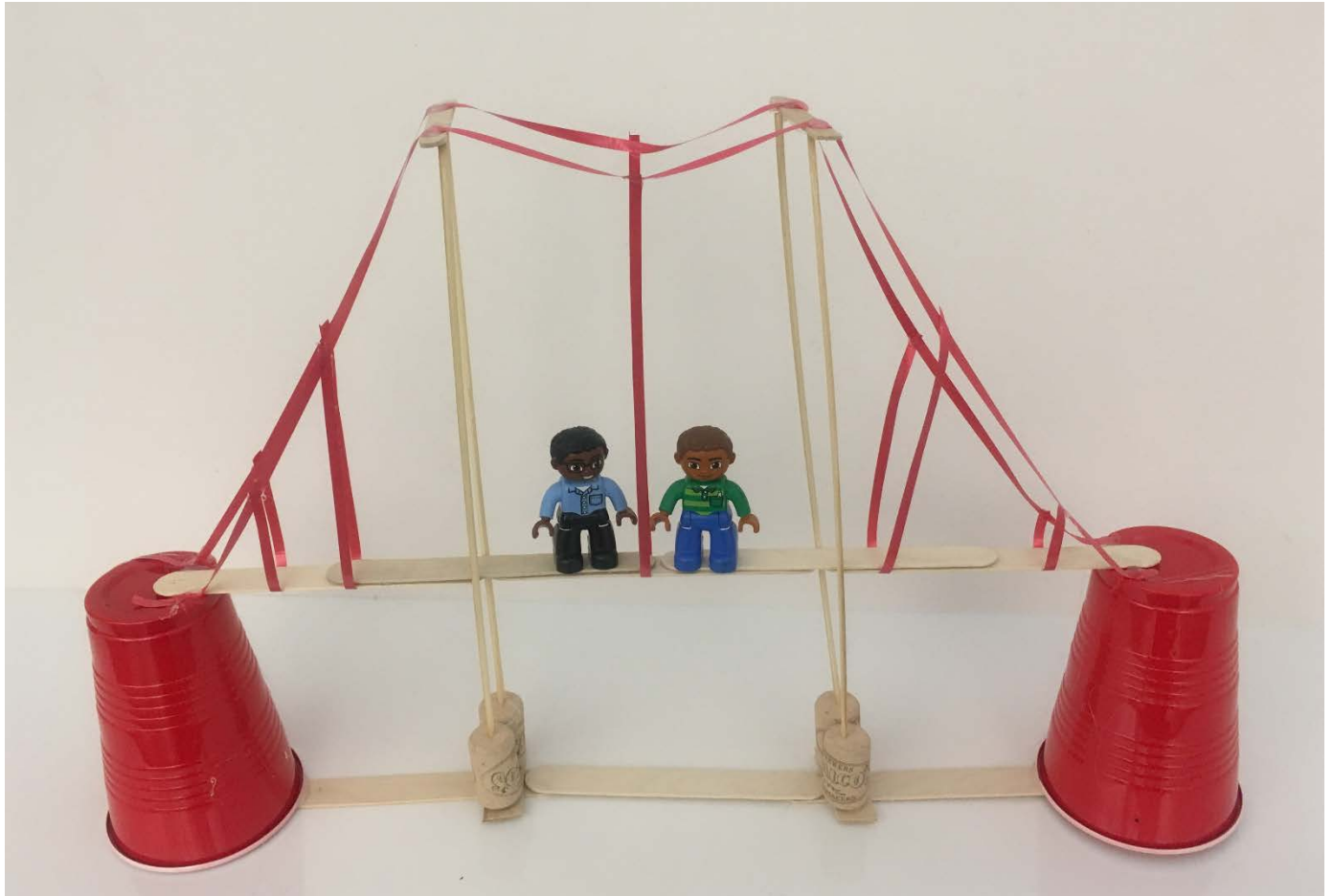
Matériel

- Whatever type of recycled/craft supplies that can be collected: string, cardboard, empty toilet paper rolls, popsicle sticks, straws, pencils, clothespins, bullnose clips, paper clips
- Glue, tape, scissors, hot glue guns (if available)

Instructions


1. Discuss with students that you want them to build a suspension bridge and describe which materials will be available.
2. Agree with students what the requirements will be for the design of the bridge: what distance does the bridge need to span? How much load you want it to carry? Etc. (Our example bridge had a minimum span of 30 cm and was able to support a load of at least 50g)
3. The building of the bridges can either be done in groups or individually.
4. Remind students that they must consider the support posts as well as what they will use to make the roadway.
5. Students can draw a plan of the bridge that they will build.
6. Have students build their bridges.
7. As a class discuss problems that were encountered during the building of the bridges and how these problems were overcome.

Exemple:



Approfondissez!

- Si le temps, tester les ponts et voir comment ils font face à une charge appliquée.
- Une autre partie importante des ponts suspendus est leur stabilité. Quelle est la stabilité des ponts? Discutez avec les élèves de la façon dont la stabilité peut influencer sur la vie du pont. Comment le pont réagirait-il s'il y avait de forts vents? Regardez l'échec du pont Tacoma Narrows (<https://www.youtube.com/watch?v=nFzu6CNtqec>). Ce pont a échoué parce que les ingénieurs n'ont pas entièrement pris en compte les charges de vent sur le pont. Dans la nouvelle construction le pont a été repensé pour permettre au vent de mieux circuler au lieu d'avoir des zones solides qui résistent au vent (même la route incluait des ouvertures pour permettre au vent de s'écouler). Des entretoises de raidissement ont également été ajoutées.



Sources d'images:

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