Truss bridge

General information			
Respective blueprint	Truss bridge		
Description	In this lesson, pupils will build a truss bridge. Students will discover the main characteristics and the historical background of its invention.		
Learning objectives	At the end of this sequence, pupils will be able to : • Cite the characteristics of a truss bridge • Put the invention and development of the truss bridge into a historical context		
Related curricular subjects	Mathematics – Sciences – Art – History - Engineering		
Duration			
Level of difficulty	Basic	Medium	Advanced
	☐	☐	☑
Inclusivity guidelines			
How to integrate students with SLD	• Formulate short, simple instructions that only require one action at a time. For example, connect these two triangles by adding two sticks to the lower part. • When you give instructions (written), highlight the word of action so pupils know what they are expected to do → In this example, **connect** these two triangles by **adding** two sticks to the lower part. • Here, it's really important to show the expected result of the manipulation. • When creating groups, try to place students who are having difficulties with students who are generally more advanced so that they can help each other (a dyspraxic student will have a lot of difficulty with cutting tasks).		
How to integrate students who work faster	Ask the students to research examples of truss bridges still in use today. They can present their findings to the class orally or with a poster.		

Step-by-step description of the lesson

Step 1: Introduction	**Estimated time: 1 hour**

- **Group discussion – 15 min**

Start the session by asking the pupils some questions: "What is a bridge?", "What are bridges used for?", "Have you ever seen a bridge where? "Do you often use bridges? "Do you know any famous bridges?"

Discuss the answers as a group and highlight the importance of bridges in our daily lives.

- **Introduction to truss bridges – 45 min**

The teacher shows the pupils photos of famous truss bridges (Truss Bridges_Introduction) and asks them to identify the similarities between them in groups of 2 (Truss Bridges_Introduction).

Give the students paper and coloured pencils.
Ask them to draw a lattice bridge based on what they've seen in the photos. Encourage creativity.

Step 2: History and characteristics of truss bridges	**Estimated time: 25 min**

The first truss bridges appeared in the **United States** around 1820. At the time, timber was abundant, so it was widely used for bridge construction. From 1850 onwards, truss bridges were made of steel, a much stronger material than wood.

➔ It could be interesting to locate the United States on a world map and the year of the first appearance of Truss Birdges in a timeline.

Several types of truss have been developed over the years, but the basis of the truss bridge is the assembly of **triangles**, which reinforces the bridge's strength.
Triangles are among the strongest structures because the load is distributed over the three sides.

Truss bridges were also appreciated for their lightness and aesthetic appeal.
Unfortunately, many truss bridges were built with lighter vehicles in mind. Modern traffic can be too heavy. For this reason, many older truss bridges

have been replaced by concrete or suspension bridges, and those that remain often have warning signs indicating their maximum weight capacities. Truss bridges are still regularly used in low-traffic areas and are sometimes seen as pedestrian bridges.

Step 3: Construction of the bridge	**Estimated time: 1 hour 30**

- **Preparation – 5 min**

Form groups of 2-3 students and distribute the materials and construction plan.

- **Construction – 50 min**

The pupils follow the construction plan, with the teacher moving between the different groups to help the pupils if necessary.

- **Testing – 25 min**

Each group tests the strength of their bridge with a different object (which they have weighed beforehand).

Step 4: Feedback on the activity and evaluation	**Estimated time: 30 min**

- **Feedback – 10 min**

Students complete a document to self-assess their ability to participate in group work and to give feedback on the activity they have experienced.

- **Evaluation – 20 min**

The teacher may decide to assess (formatively or certifiably) participation in the group activity.
An assessment of the knowledge acquired during the sequence may also be carried out.

Assessment activities

Activity 1: Self-assessment activity

Ask the students to self-assess their performance during the group activity using the grid (Self-assessment grid).
Self-assessment encourages learning and improves performance. Self-evaluation is systematically formative. It aims to highlight areas for improvement.

Activity 2: Assessment of knowledge acquired

After a long sequence (of several sessions), it may be helpful to carry out a formative (or summative) assessment of the knowledge acquired. Here are some examples of questions you could ask.

1. Name the main characteristics of a truss bridge.
2. Locating the appearance of truss bridges on a timeline.
3. Locate the United States on a world map.

Attachments
• Self-assessment grid • Introduction

References

- Pont en treillis. (2022). In Wikipédia. https://fr.wikipedia.org/w/index.php?title=Pont_en_treillis&oldid=199275594
- 411answers. (s. d.). Quels sont les avantages et les inconvénients des ponts en treillis ? Consulté 22 août 2023, à l'adresse https://fr.411answers.com/a/quels-sont-les-avantages-et-les-inconvenients-des-ponts-en-treillis.html

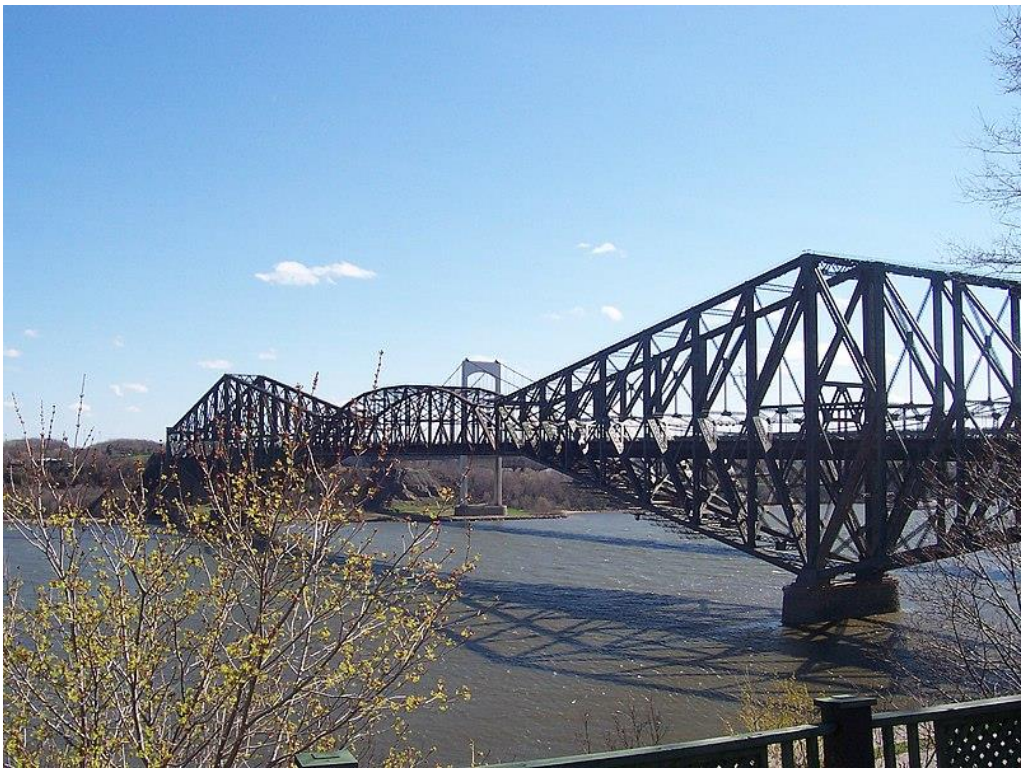

Figure 1 Savard, S. (2006). A view of the Quebec Bridge from the Parc Aquarium du Québec (Quebec City, Quebec, Canada). Wikipedia. https://commons.wikimedia.org/wiki/File:Pont_de_Qu%C3%A9bec_vu_du_Parc_aquarium_du_Qu%C3%A9bec.JPG

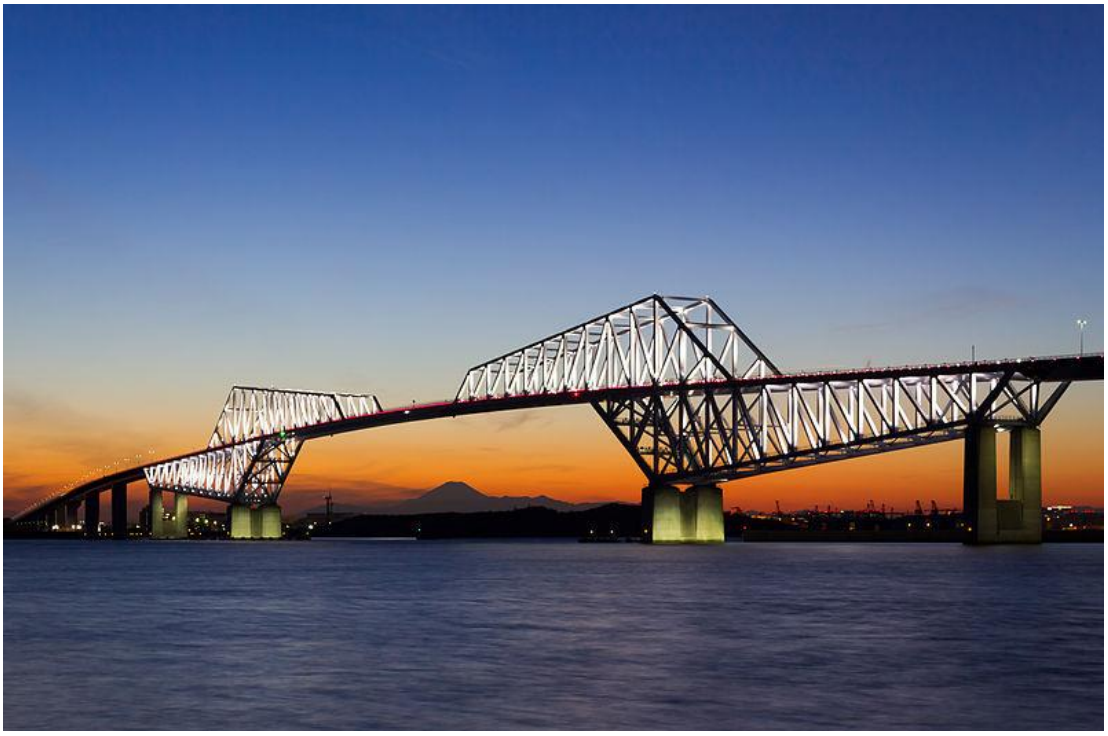

Figure 2 Tokyo Gate Bridge. (2015). Wikipedia. https://commons.wikimedia.org/wiki/File:Tokyo_Gate_Bridge_2.jpg

Figure 3 Photo of the Astoria-Megler Bridge from the South ramp. Architectural projection made with hugin. (2008). Wikipedia. https://commons.wikimedia.org/wiki/File:Astoria-Megler_Bridge01_2008-02-26.jpg

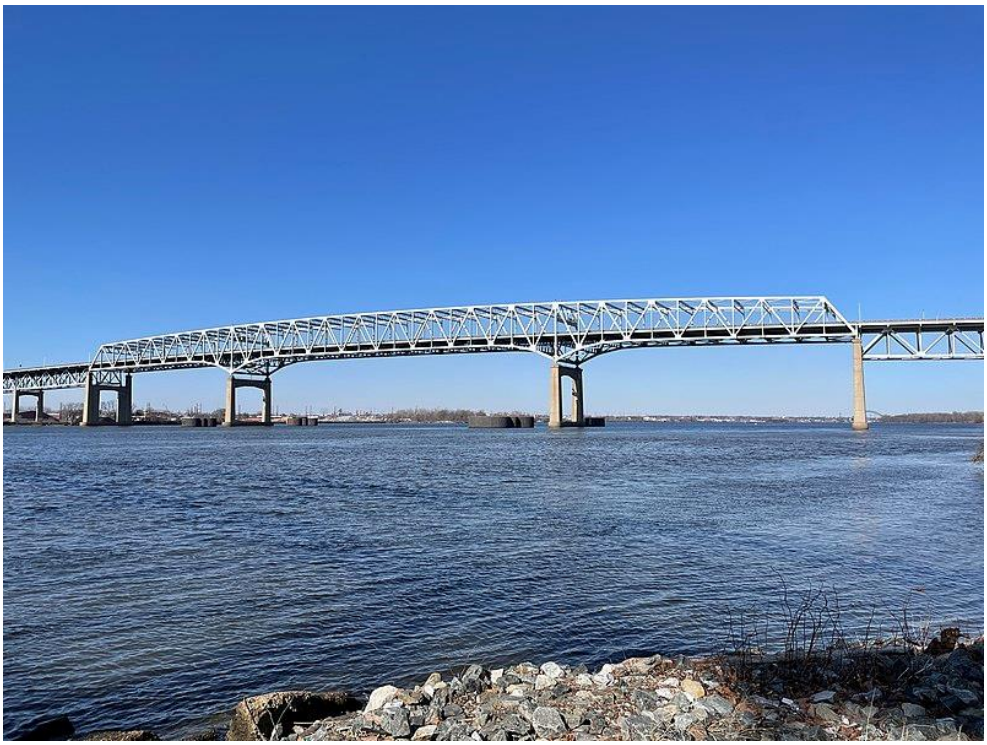

Figure 4 The Betsy Ross Bridge over the Delaware River viewed from the Pennsauken Township Boat Ramp in Pennsauken Township, New Jersey. (2022). Wikipedia. https://commons.wikimedia.org/wiki/File:Betsy_Ross_Bridge_from_Pennsauken_Township_Boat_Ramp.jpeg

What similarities have you noticed between all the bridges?

.....

.....

.....

.....

.....

.....

.....

Co-funded by the European Union

Self-assessment grid

Work in group

	☺	😐	☹
I took part in organising and carrying out the task.			
I cooperated actively within the group.			
I respected the other group members at all times.			
I was able to recognise and accept the skills and knowledge of the other members of the group.			
Everyone took part in our group discussions			
We asked the other members of our group for help when we needed it.			
I respected the deadlines			
I've finished my work.			
I've made an effort and I did my best			
I knew how to ask for help when I needed it			
The manipulation helped me understand the concepts			
I'm proud of my work and the result I've achieved			
I enjoyed taking part of this activity !			

☺ = Absolutely / 😐 = Partially / ☹ = Not at all

Teacher's comments :

……

……

……

……

……

……

……

……

STEAM IN TIMES

DiSCLAIMER

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Co-funded by the European Union