

Title	Mimar Sinan's Bridges and Computational Thinking	Time	90 minutes
Subject:		English Language, Math, Internet Literacy	
Aims		<p>Students will learn about Mimar Sinan and his contributions to architecture, focusing on his bridge designs.</p> <p>Students will understand the basic principles of bridge construction.</p> <p>Students will apply computational thinking to design and solve problems related to bridge construction.</p>	
Key CS elements:		Decomposition; Pattern recognition; Abstraction; Algorithm design.	
Age group :		12-14 years old	
Learning situations:		Activity type:	extracurricular
Resources:			
<p>images or slides of Mimar Sinan's bridges</p> <p>Video/animation on bridge construction</p> <p>Building materials for bridge activity (e.g., paper, straws, tape, string)</p> <p>Weights for testing bridges</p> <p>Projector/Screen for visual presentations</p>			
Learning development:			
<p>1. Introduction to Mimar Sinan and His Bridges (15 minutes)</p> <p>Discussion:</p> <p>Begin by asking students what they know about bridges and their importance.</p> <p>Introduce Mimar Sinan, emphasizing his role as a chief architect during the Ottoman Empire.</p> <p>Show images of famous bridges designed by Mimar Sinan, such as the Süleymaniye Bridge and the Mostar Bridge.</p> <p>Discuss the significance of these bridges in their historical context and their architectural features.</p> <p>Key Points:</p> <p>Mimar Sinan's contribution to architecture.</p> <p>The engineering and aesthetic qualities of his bridges.</p> <p>The cultural and historical impact of these structures.</p>			

2. Basic Principles of Bridge Construction (20 minutes)

Lecture and Demonstration:

Explain different types of bridges (e.g., beam, arch, suspension) and the forces they must withstand (compression, tension, etc.).
Discuss materials used in bridge construction during Sinan's time and in modern times.

Interactive Activity:

Show a short video or animation explaining how forces act on different types of bridges.

Engage students in a discussion about why certain materials and designs are better for specific types of bridges.

3. Introduction to Computational Thinking (15 minutes)

Lecture:

Define computational thinking and its four key components: Decomposition, Pattern Recognition, Abstraction, and Algorithm Design.

Explain how these principles can be applied to engineering problems, such as bridge construction.

Examples:

Decomposition: Breaking down the problem of building a bridge into smaller parts (e.g., materials, design, load capacity).

Pattern Recognition: Identifying patterns in successful bridge designs.

Abstraction: Focusing on the essential features of a bridge that contribute to its strength and stability.

Algorithm Design: Creating a step-by-step process to design a bridge.

Algorithm Design for Building a Model of Mimar Sinan's Mostar Bridge:

Step 1: Research and Study the Mostar Bridge

Begin by learning about the design, structure, and historical significance of the Mostar Bridge, including its arch shape and materials used by Mimar Sinan.

Step 2: Select Materials for the Model

Choose the appropriate building materials for the model, such as paper, straws, tape, and string, to replicate the key features of the bridge.

Step 3: Design the Bridge Structure

Sketch a basic blueprint of the bridge, focusing on replicating the main arch and overall structure of the Mostar Bridge.

Divide the model into segments: the arch, supporting columns, and road surface.

Step 4: Build the Bridge's Base and Supports

Use straws or sturdy paper rolls to create the foundational pillars and supports.

Ensure the base is stable before moving to the arch construction.

Step 5: Construct the Arch

Carefully shape the arch using flexible materials like straws or curved paper strips.

Attach the arch to the supporting pillars, ensuring it is strong and evenly balanced.

Step 6: Reinforce the Bridge

Add tape or string to reinforce the connections between the arch, pillars, and the road surface.

Make sure that the arch structure is solid and capable of bearing weight.

Step 7: Add the Road Surface

Attach a flat surface across the top of the arch for the road, ensuring it is securely fixed to the structure.

Step 8: Test the Strength of the Bridge

Gradually add weights to the model bridge to test its strength and stability.

Record how much weight the bridge can hold before showing signs of stress or collapse.

Step 9: Analyze the Results

Discuss how the model reflects the design principles used by Mimar Sinan and how the materials chosen influenced the strength and stability of the bridge.

Step 10: Make Adjustments

Based on the test results, make necessary adjustments to improve the bridge's design or strength, reinforcing weak areas or modifying the structure as needed.

4. Bridge Design Activity (30 minutes)

Group Activity:

Divide students into small groups. Each group will design their own bridge using the principles of computational thinking.

Provide materials such as paper, straws, tape, and string.

Ask students to:

Decompose the task by identifying the essential components of their bridge.

Recognize patterns from the examples they've studied.

Abstract the key features that will make their bridge strong.

Design an algorithm (a step-by-step plan) to build their bridge.

Guidance:

Encourage students to think critically and test different designs.

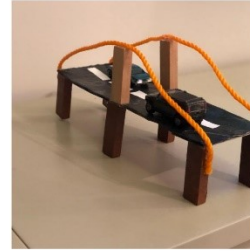
Emphasize the importance of iteration – testing and refining their designs.

5. Testing and Reflection (10 minutes)

Testing:

Have each group present and test their bridge by placing weights on it.

Discuss as a class which designs were most successful and why.



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Reflection:

Ask students to reflect on how computational thinking helped them in their design process.
Discuss how Mimar Sinan might have used similar problem-solving techniques in his work.

6. Conclusion (5 minutes)

Recap:

Summarize the key points of the lesson, highlighting the connection between historical architecture and modern problem-solving techniques.

Encourage students to think about other areas where they can apply computational thinking.

Homework:

Assign a short essay or project where students research another bridge designed by Mimar Sinan or another famous architect and analyze it using the principles of computational thinking.

Assessment:	Participation in discussions and activities. Quality of group bridge designs and presentations. Reflection on the use of computational thinking in the design process.
Expected results:	This lesson plan combines historical knowledge with practical engineering skills, encouraging students to apply computational thinking to real-world problems, just as Mimar Sinan might have done.
Notes:	