LESSON PLAN

BRIDGE - BUILDING A STRONG BRIDGE FROM NATURAL MATERIALS



Subjects: Science, Mathematics, Design and Technology
Age Range: 5–7 years

Relevant issue / problem to solve: How can we safely and conveniently overcome an obstacle when we encounter it on a path or in the forest?
"You cannot cross a stream or a ditch—what should you do?" How can obstacles be overcome?

Message for the Child:
Children want to cross a stream, but there is no bridge. Can we help them?
Can you build a one-meter-long bridge that will not collapse and can hold 5 kg?

Planned Activities: Part 1 – Exploration; Part 2 – Plan implementation; Part 3 – Outdoor lesson; Part 4 – Conclusions

Knowledge and skills to be acquired:
Children will:

- understand that structures must be strong enough to support weight;
- be introduced to simple engineering concepts: stability, support, and weight;
- learn that different natural materials (branches, sticks, stones, leaves) have different properties—some are stronger, more flexible, longer, or more stable than others;
- notice cause-and-effect relationships (what helps a bridge stand and what causes it to collapse).

Children will develop the following skills:
• Problem-solving – they will look for ways to build a strong bridge.
• Construction and engineering – they will build, strengthen, and improve their structures.
• Exploration and experimentation – they will test, observe, and compare different solutions.
• Creativity – they will suggest ideas, modify the structure, and look for new solutions.
• Fine motor skills – they will strengthen finger muscles and coordination by holding, pressing, and placing smaller details. They will also improve flexibility of finger movements by twisting, tying, and arranging materials of different shapes.
• Collaboration – they will work in groups, discuss, and share ideas.
• Communication – they will explain how they built the bridge, what worked, and what did not.

Required Resources/equipment: Wooden sticks, branches, twigs, tree bark, pinecones, moss

Follow up plans: when planning a playground, use bridges and try building them from different materials. Use stones, sand, and soil.

Part 1 – Exploration | 1–2 lessons

Teacher actions: observe real bridges; stimulate children's curiosity about the model; ask open-ended questions; document children's hypotheses; ensure inclusive participation.

Student actions: observe examples of bridges, explore natural materials, compare their properties, plan and discuss the structure of the future bridge, and listen to peers.

Key questions: What makes something strong? What do you think will happen if we change the shapes? Why?

Expected Learning Outcome	Children create a bridge connecting two banks of a stream or ditch that does not collapse and can hold a toy animal. They test several solutions and improve the structure if the first attempt fails. They explain in their own words why one bridge is stronger than another. They observe and name what happens to the bridge when the weight or shape changes. They collaborate with other children, discuss, and share ideas. **Methodological note: The teacher explains the success criteria; the children describe what success looks like and check their own progress.**
Engagement:	**Children observe:** • real bridges in the environment (while walking or driving); • pictures and photos of different bridges (arched, wooden, suspension); • how things stay in place when they have supports underneath. • Children watch short videos about construction, educational videos about engineers, builders, and bridges, and images showing how something is built from beginning to end (see videos in the appendix). **They browse / explore:** • picture books about the city, roads, and construction; • encyclopedias for children (about buildings and transport); • cards with images and simple questions ("What holds the bridge up?", "What would happen without support?"). **Methodological note: The teacher encourages curiosity through open-ended questions; children observe, discuss, and connect with previous experience.**
Making assumptions	• Children predict which bridge will be stronger. • Before building the bridge, they make assumptions. • They think about what will help the bridge not collapse. • They predict which bridge will be stronger. **Methodological note: The teacher encourages prediction without correction; children explain their reasoning.**
Comparison and evaluation	• They compare the properties of different natural materials and their suitability for bridge building. • They evaluate which bridge is the strongest and why. • They notice how the shape of the structure affects bridge stability. • They compare different building methods and their results. • They discuss which materials held the weight best. • They evaluate the strength, height, length, or stability of their own bridges and those built by their friends. • They draw conclusions about what they could improve next time. **Methodological note: The teacher supports comparison using prompts; children justify their choices with evidence.**

Part 2 – Plan Implementation | 1 lesson

Teacher actions: support planning without giving solutions; help children follow the steps; encourage testing and improvement; introduce simple algorithmic thinking (first–then–after that).

Student actions: plan the bridge together; choose materials; build step by step; test with weights; discuss failures and improvements.

Key questions: What should we build first? Where should the supports go? What could we change to make it stronger?

Expected Learning Outcome	Children compare and evaluate the strength of bridges, explain the results, and suggest improvements. **Methodological note: The teacher explains the success criteria; the children describe what success looks like and check their own progress**
Engagement	Children suggest ideas, discuss them with each other, and plan together how they will build the bridge. **Methodological note: The teacher encourages curiosity through open-ended questions; children observe, discuss, and connect with previous experience.**
Choosing the plan design	• Children choose a bridge-building plan or design according to their ideas. • Children think about what the bridge will look like (length, height, width, with supports, etc.). • Children discuss solutions with friends and reach a group agreement. • They assess what will be needed to build the bridge (number of sticks and branches, shape, location). **Methodological note: The teacher helps children make group decisions; children negotiate and agree on the plan.**
Preparing / creating the plan	• Children should discuss the task and the goal. • Plan what kind of bridge it will be and where to start. • Prepare the place and materials for the bridge (tie branches into bundles). • Build the bridge according to the plan. • Test the bridge – can it hold 5 kg? • Fix, strengthen, and test it again. • Discuss the result. Think about how it could be improved and what could be changed. **Methodological note: The teacher observes and scaffolds; children construct, test, improve, and repeat.**
Evaluation of the work	Children should test and evaluate: Is the bridge strong – does it not collapse? Does it hold weight – can the bridge support 5 kg? Is it stable – does the bridge stand firmly without wobbling? Is there enough support, and is the bridge wide enough? **Methodological note: The teacher guides reflection; children evaluate strength, stability, and improvements.**

Part 3 – Practical / Outdoor Lesson | 1–2 lessons

Teacher actions: organize roles; ensure safety; help children with physical limitations; encourage role rotation; provide quick reflection during testing.

Student actions: build, test, measure, observe, and record results; cooperate while carrying out roles; provide feedback to other groups.

Key questions: Are the supports the same height? What happens when we add more weight? Where did it start to bend?

Expected Learning Outcome	Children will learn to plan and build a structure, test its strength in practice, solve problems, collaborate with others, and evaluate the results of their work. **Methodological note: The teacher explains the success criteria; the children describe what success looks like and check their own progress.**
Engagement	There are about 10 children. We divide them (by drawing cards or by letting them choose roles) into: • Builder – arranges and connects parts of the structure, shapes the bridge, and places the supports. • Materials collector – gathers branches, sticks, and stones. • Testers – place the weight on the bridge and observe whether it holds or falls. • Measurement specialist – measures the length, height, or width of the bridge. • Decorators – decorate the bridge with natural materials. • Photographer / activity recorder – photographs the building process or the result. Every 10–15 minutes, children switch roles and each one tries: • Builder • Materials collector • Tester • Measurement specialist • Decorator • Photographer **Methodological note: The teacher encourages curiosity through open-ended questions; children observe, discuss, and connect with previous experience**
Practical part (hands-on activity)	Children find a gap (for example, between two garden beds or mounds), inspect the place, and show where and how they will build. Observe the area: assess the distance between the “banks” and accessibility. Discuss: How wide should the bridge be? Should the bridge be high? What should be done so that it does not collapse? Children decide exactly where the support will be. Assess how many materials will be needed for construction. Discuss how to make both sides the same height. Mark the place with sticks. Build two strong columns of equal height. Measure the bridge. **Methodological note: The teacher ensures safety and inclusion; children work practically while rotating roles.**
“Circle” – reflection and discussion	What did you like most about building the bridge? What was the most enjoyable part of today’s activity? What helped the bridge stand? What was the hardest part of creating it? Did your bridge hold 5 kg? Why? How did you decorate your bridge? Why did you choose those decorations? If you built another bridge, what would you do differently? How did you work with your friends? What helped the team work together better?

	Did you help one another? How? What new things did you learn today? If you could build a bridge from different materials, what would you choose? What kind of bridge would you like to test next? (see: bridge testing sheet) Methodological note: The teacher facilitates discussion; children express what they have learned.

Part 4 – Conclusions

Teacher actions: facilitate reflection; connect learning with real life and sustainability; praise effort and teamwork; suggest future tasks.

Student actions: share experiences; reflect on what was successful; suggest improvements; connect learning with other materials and seasons.

Key questions: What helped your bridge remain strong? What would you do differently next time?

Feedback	The teacher will observe and praise children's effort and engagement, identify what each child has achieved (for example, planning, collaboration, creativity), ask reflective questions ("What helped the bridge stay up?"), and encourage further exploration and testing of other solutions.
Observation and improvement	The teacher observes children's engagement, planning, collaboration, and problem-solving skills, records what worked well and where difficulties arose, and in later activities provides more examples, clearer criteria, and additional practical tasks to strengthen structures. Children will be able to apply their experience when building other structures (bridges made of bricks, LEGO, or cardboard), planning actions, testing and correcting solutions, collaborating, and solving everyday problems.

Appendix (if needed) may include checklists to help children assess whether the bridge meets certain criteria (height, strength, length).

https://www.youtube.com/watch?v=5l4I-caLoxY

https://www.youtube.com/watch?v=x3BlGFwAzZY

https://www.youtube.com/watch?v=oVOnRPefcno

https://www.youtube.com/watch?v=BXDP6ZJ6ams



BRIDGE TESTING SHEET

TEAM NAME: _____

MY NAME: _____

1. BRIDGE MEASUREMENT

QUESTION	ANSWER
BRIDGE LENGTH (CM):	_____ CM
HOW DID WE MEASURE?	☐ RULER ☐ STICK ☐ WE GUESSED
ARE BOTH SUPPORTS THE SAME HEIGHT?	☐ YES ☐ NO ☐ ALMOST

2. BRIDGE TESTING

PLACE THE WEIGHTS ONE BY ONE, 1 KG AT A TIME, AND MARK THE RESULT.

KILOGRAMS	HOLDS ✔	BENDS	COLLAPSES ✖
1	☐	☐	☐
2	☐	☐	☐
3	☐	☐	☐
4	☐	☐	☐
5	☐	☐	☐

HOW MANY KG DID THE BRIDGE HOLD?

CIRCLE THE NUMBER: 1 2 3 4 5

3. OBSERVATION

WHEN DID THE BRIDGE START TO BEND? _____ AFTER _____ KG

WHEN DID IT COLLAPSE? _____ AFTER _____ KG

WHERE WAS THE WEAKEST POINT? _____

WHAT SHOULD BE STRENGTHENED? _____

4. TEAMWORK

DID WE COLLABORATE WELL?

☐ 😊 YES

☐ 😐 SOMETIMES

☐ 😕 WE NEED TO TRY HARDER