

Didactic scenario

1. Title

"All day they were building it ... in order not to collapse." Building bridges.

2. Keywords

STEAM, engineering, bridges, preschool education, problem solving

3. Basic information

STEAM Subject: Engineering

Typical interaction time with the instructional scenario in teaching hours for in-school work: 6 hours

General description of the script:

Phases	Stage	Time
"Discovering Bridges"	Preparatory stage	45'
"Time travel"	Preparatory stage	25'
"Learning about the different kinds of bridges"	Implementation stage	25'
"Becoming bridge engineers"	Implementation stage	45'
"Bridges in fairy tales"	Evaluation stage	45'
"Building Bridges"	Evaluation stage	35'

Age group: Kindergarten (4-6 years) in the Greek education system.

Estimated difficulty level :

Very easy	Easy	Moderate	Challenging	Very Challenging
		X		

Teaching resources

Material: Books, posters, paper plates, sticks, bricks, straws, modeling clay, plastic cups, tongue depressors, paper carton.

School infrastructure: a PC with peripheral devices (speakers, printer, scanner), Internet connection and installed software.

Additional material from external sources/online tools:

Internet Services: Youtube kids

Online Concept Mapping Application: [coggle . it](https://coggle.it)

Search Engine: JuniorSafeSearch

Earth mapping program: GoogleEarth

Learning support platform: learning apps

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4. Educational Problem

The idea of the scenario about engineering (construction of bridges) came up by the systematic observation of children's free play in the “building material” classroom corner. More specifically, teachers noticed the difficulties that children faced in building bridges in order to pass over cars or animals. Aiming to face these specific challenges, they proposed activities adapted to the specific needs and interests of the children in order to improve their skills in solving problems and in building bridges. They also incorporated STEAM concepts into the activities, by discussing about the forces that act on bridges such as tension and compression and by using simple terms that children could understand on how some shapes and structures provide greater stability, creating thus a more effective and engaging learning experience.

5. Learning Objective (-s)

1. To enhance construction problem solving skills.
2. To understand the concept of engineering as a field that includes the design and construction of frame structures.
3. To improve their fine motor skills through hands-on construction of materials and to use imagination and creativity in bridge design.
4. To understand what a bridge is and its purpose
5. To provide a vocabulary related to bridges and their structures and learn about basic engineering concepts such as stability.

6. Phases of the Scenario

Phase 1

Title: "Discovering Bridges"

Indoor	Outdoor	Mixed
X		

Phase duration in minutes: 45'

Detailed description of the scenario phase:

A) A strange visitor comes to our class to state his problem and discuss with us how to find a solution. It is about the doll-mascot, the beaver “Kastoriadis”, who went to the forest to collect wood for his house construction. But taking his way back he had to pass through the river as the bridge was collapsed. The woods were too heavy that, that fell into the river and couldn’t make it to move them. In order to deal with the huge problem that was created, he decided to ask for our help. We are therefore called to invent ways of restoring the bridge so that it becomes possible for the beaver to return home and be able to build his house. After narrating the event, the beaver together with the kindergarten teacher raise concern of the effects of the bridge’s failures on human life. This is followed by a deep discussion through which children's prior knowledge about the ways in which animals and people use bridges is detected and the first column of the KWLH (Know, Will, Learn, How) chart is filled in with their initial ideas.

B) Then the children watch an interactive video (Plaka bridge collapse: <https://www.youtube.com/watch?v=OArfbZFvsOM>) related to the collapse of the Plaka bridge, an event that took place in N. Artas and which the beaver told the children. While watching the video there are interactive questions, which heighten their interest.

C) Finally, we enrich our knowledge about bridges by using the Google Earth program through which we are virtually transported to various bridges around the world and observe the size, shape, distance from land. Earth mapping program: Google Earth

Activity Sheets: KWLH Outline Board, Earth Mapping Program: Google Earth, Internet Services: YouTube kids

Phase 2

Title : "Time Travel"

Indoor	Outdoor	Mixed
X		

Phase duration in minutes: 25'

Detailed description of the scenario phase:

Students go in the “computer corner” and sit in a way that all students have visual access to the screen. The purpose is to focus on the construction and characteristics of the bridge of Arta by watching the video <https://www.youtube.com/watch?v=lgOSnedhJxs> on the internet, which visualizes the legendary bridge in 3D. We focus on the characteristic architectural elements of the structure and introduce new vocabulary (Pedestrian bridge, stone bridge, arch bridge, arches, pedestal).

Activity sheets: Pictures from the internet related to the new vocabulary introduction, Internet Services: YouTube kids.

Phase 3

Title: "Learning about the different types of bridge "

Indoor	Outdoor	Mixed
X		

Phase duration in minutes: 25'

Detailed description of the scenario phase:

We gather in plenary and look at different types of bridge pictures online. In particular we focus on suspension bridges, cable-stayed bridges, pontoon bridges and girder bridges.

Activity sheets: Pictures from the internet, activity in learning apps.
<https://learningapps.org/display?v=pr4fxu8hn23>

Phase 4

Title: "Becoming Bridge Engineers"

Indoor	Outdoor	Mixed
X		

Phase duration in minutes: 45'

Detailed description of the scenario phase:

Aiming to explore the different types of bridges we gather in plenary and discuss each type of bridge focusing on key concepts such as balance, stability and support. Then children are divided into 4 groups ensuring active participation of as many children as possible and at the same time development of multiple forms of interaction. Team 1 will try to build a bridge out of paper plates and sticks. The 2nd group of straws and modeling clay, the 3rd of wooden bricks and the 4th of plastic cups and tongue depressors. The children become "bridge engineers" and try to build their bridge with the materials given and check their stability at the end.

Activity Sheets:

Craft materials: 1st group (Paper plates, craft sticks, glue, small animals), 2nd group (Plastic straws, modeling clay, animals), 3rd group (Wooden blocks), 4th group (plastic cups, tongue depressor)

Phase 5

Title: "Bridges in fairy tales"

Indoor	Outdoor	Mixed
X		

Phase duration in minutes: 45'

Detailed description of the scenario phase:

We gather in plenary and discuss with the children if there is a way we could change the end of some fairy tales. If we could help the heroes / heroines overcome some difficulties. On the occasion of the story of Little Red Riding Hood from the classic fairy tale, we discuss in plenary the difficulty faced by the heroine and wonder what the outcome could be if there was a bridge and she didn't have to go through the dark forest. Then, through brainstorming, we ask questions about the materials we could use to make the bridge stable for the heroine of the fairy tale. We decided the type of bridge and worked as a team to build it.

Activity sheets: List of materials that the students will choose for the construction of the bridge.

Phase 6

Title: "Building Bridges"

Indoor	Outdoor	Mixed
X		

Phase duration in minutes: 35'

Detailed description of the scenario phase:

The students are invited through a simulation game to build bridges (Game-Construct a bridge: <https://www.gameflare.com/online-game/construct-a-bridge/>). Through the activity, the students will put the engineering concepts into practice and articulate what they have learned. At the end, they will complete an evaluation questionnaire created by the teacher in which the children, with the help of the beaver, evaluate all the teaching intervention, the knowledge acquired, the skills, their experience in groups and the degree of success in completing the actions.

Activity Sheets: Game-Construct a bridge: <https://www.gameflare.com/online-game/construct-a-bridge/>

7. Evaluation Methodology

With the evaluation activities, we seek to examine whether the above objectives of the cognitive teaching object we had set were achieved, if they were sufficiently supported by the activities that preceded them and if the expected learning results are obtained.

1. Initial assessment: Before the learning process begins, students record on the KWLH table what they know about bridges and what they expect to learn about them.

2. Formative assessment: This is a continuous process that takes place several times before the completion of the learning process. The appropriate tools (games, visual creation materials) are provided in order to have a clear picture of the learning process in relation to the learning goals.

3. Final or summative assessment: Self- and peer-assessment rubrics.

A) Young students gather in plenary where they discuss, exchange opinions and record their newly acquired knowledge by completing the KWLH diagram. The kindergarten teacher reads the children's records from the chart columns and use the "then I thought - now I know" thinking routine technique that encourages the children to identify changes in their skills and knowledge. The board is posted in the classroom so that the children can use it for improvement in another phase.

B) Finally, we encourage the outdoor learning experience. In particular, children explore and build bridges using natural materials such as stones and branches. In addition, parents are also involved in the scenario with whom we share the learning goals and encourage them to participate with the children in similar activities at home. In this way we want to strengthen the continuity between learning experience both at school and home.

All creations about bridges are going to be exhibited. At the same time, articles about the final results will be posted to the kindergarten's blog.

8. Additional resources for the teacher

Folder: "All day they were building it ... in order not to collapse." Building bridges. _ Additional resources for the teacher