OUTSTE(A)M

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# OUTSTE(A)M Learning Scenario:

# Let's sail off the island!

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4-6 year old pupils

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# Let's sail off the island!

## Summary

Pupils can help a survivor escape from a deserted island by assisting her in various challenges. Pupils will build balance scales, compare different weights and materials, try to transport water, and find out which materials float and which sink. Finally, they will build the ideal boat for the survivor!

## Keywords

*Scale, Sinking, Floating, Buoyant force*

## Aim

Pupils will learn how to compare the weight of objects, understand how much liquid different containers can hold, and explore which materials sink or float. They will also use this knowledge to build their own boats with materials that float.

## License



## Overview

| | |
|---|---|
| **Subjects** | Science, Technology, Engineering, Arts, Mathematics, Social sciences |
| **Topics** | Inquiring about natural materials' properties |
| **Age of pupils** | 4- 6 years old |
| **Preparation time** | ~ 1.75 hours (15 minutes per activity) |
| **Teaching time** | ~4 hours |
| **Teaching materials** | **Online materials and resources**<br><br>**Activity 1 "Introduction and aim"**<br><br>• Expressive movement article, e.g. link: Expressive Movement - for a quantum leap in your child's learning abilities (keytolearninginternational.com)<br><br>**Activity 2 "Balance Scales"** |

- How to make a scale article, e.g. link: https://www.wikihow.com/Make-a-Balance-Scale-for-Kids

**Activity 6 "Building a boat"**

- The engineering design process (optional), e.g. link: https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-process-steps

**Activity 7 "Meet a Marine Biologist"**

- Video interview with a STE(A)M specialist in the field of marine biology, two versions available for 2-5 year olds: http://files.eun.org/scientix/Kate-Larkin-Marine-Biologist-2-5-years.mp4 and 6-9 year olds: http://files.eun.org/scientix/Kate-Larkin-Marine-Biologist-6-9-years.mp4

## Physical materials

**Activity 2 "Balance scales"**

- A completed model of a balanced scale ("How to make a scale" article), A3 paper posters, paper cups, cords, twine, scissors, hangers.

**Activity 3 "Comparing weights"**

- Materials from around the playground (e.g., wood, stones, leaves, wooden sticks, plastics etc.), A3 paper posters, markers.

**Activity 4 "Water Race"**

- Containers (out of plastic bottles), spoons, cups, plastic bottles.

**Activity 5 "Sinking and Floating"**

- Double entry table (Annex 2).

**Activity 6 "Building a boat"**

- Materials from around the playground and other supporting materials such as glue, playdough, rubber bands, and straws.
- Digital camera, iPad or similar device to take photos of the boats throughout the design process.

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| **Guiding comments** | 1. The Learning Scenario is intended to serve as a **guide and framework** for your own planning. Based on your context and the interests and needs of your children, you may choose to adjust this Learning Scenario accordingly. You are free to extend, repeat, adapt, rearrange some activities or spend more time in them as you see fit ().<br>2. **The core activities** in this Learning Scenario are **Activity 1** "Introduction and aim", **Activity 3** "Comparing weights" and **Activity 5** "Sinking and Floating", both leading to **Activity 6** "Building a boat**".** All other activities are complementary and lead to deeper understanding of the topic.<br>3. **The materials and resources** mentioned above are suggestions. You may choose to use different ones based on yours and your pupils' needs or use them in different activities than the ones they are introduced in.<br>4. **Part of the story** used in this Learning Scenario refer to a survivor of a shipwreck who reached the shores of a deserted (abandoned) island. Given your pupils' sensitivity to distressing themes, you may want to adjust the story. |

## Learning objectives

- Investigate about **weight** by comparing two different objects at a time or different sizes of the same object.
- Explore the concept of **capacity** by comparing different water volumes on containers (same size).
- Discover objects' **density** by inquiring about different materials in sinking and floating situations.
- **Build their own boats** taking into consideration all the materials' properties.

## Lesson Plan

| Name of activity | Procedure | Duration | STEM criteria code |
|---|---|---|---|
| **Activity 1 "Introduction and aim"** | Gather pupils outside in the playground, and narrate:<br>"Once upon a time, there was a marine biologist who was studying the ocean *("a marine biologist? Yes, a very special scientist!")*. She owned a small | 10' | A1, A2, E3 |

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| Art Education (Drama) | boat. One day she was at the open seas and she rowed… sometimes slowly… sometimes faster! During this peaceful voyage, the sea began to rage until the waves were huge, and then suddenly after a storm her boat sank. Then she swam to the shore very fast. At some point she got tired and decided to stay a little on the surface of the water. Then she continued swimming faster and faster until she reached an abandoned island! She is now trying to build her another boat to leave the island… but first, she has to deal with some difficult challenges. For this she needs our help. Are you ready to help our survivor leave this abandoned island?"<br><br>During the storytelling, encourage pupils to use the "Expressive Movement" method. Pupils can express different emotions throughout the story (fear, determination, happiness), movements (sinking, swimming), and represent different stages of the story (having an idea) etc.<br><br>This story sets the stage for all the following activities in this Learning Scenario.<br><br>**Adaptation:**<br><br>For pupils with additional support needs that might not process oral language well, you may choose to use puppets or dolls to support the different stages of the story. | | |
| **Activity 2 "Balance scales"**<br><br>Engineering (Design), Technology (Balance scale) | Benefiting from the momentum built during the previous activity, pupils will now design and construct their own balance scales. In this way they will explore further and deepen their understanding of the concept of weight and measurement.<br><br>Use the story from the previous activity and introduce the survivor's 1st challenge.<br><br>"The survivor needs to create a balance scale (show pupils a balance scale) to weigh different objects and materials she found on the island. She can then | 45' | A2, B1, B2, B3, G2 |

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| | use these materials to build a boat and leave the island. She can usually guess which object is heavier, but sometimes she thinks a big leaf is heavier than a small rock. What do you think? Why do we need to use a balance scale instead of other scales?<br><br>Ask pupils to provide ideas on why it is important to compare weights. Then ask pupils to share any experience they have with using scales. Finally, prompt them to share ideas on how we can create or obtain balance scales, like the survivor's one, without using any digital scales like the ones we have at home. Here are some indicative questions:<br><br>• Have you ever seen a balance scale?<br>• Why do we need a balance scale?<br>• Can we use our hands instead of a balance scale? Why? Why not?<br>• How could we build our own balance scale? What material do we need?<br><br>Divide pupils into groups of 5–6. Ask them to design a balance scale on an A3 poster using markers. Then, with support as needed, have them build their own balance scales using the poster as a guide. Provide the materials and clear instructions. Before they start, let pupils have a look at this article that shows each step of making a balance scale to help them understand the process and inspire their designs.<br><br>**Adaptation:**<br><br>If there is no internet access or device available, you may want to print the steps presented in this article and present pupils with photocopies to explore instead. | | |
| **Activity 3 "Comparing weights"** | Pupils use the balance scales they made earlier to compare different materials and weights. To enrich learning, take them to a nearby beach or green outdoor area like the survivor's island in the story. This | 45' | A2, A3, B2, B3, F5 |

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| Science (material science), Maths (comparing, sizes, measurements) | setting provides natural materials for hands-on exploration.<br><br>Once pupils are settled, ask: "Now that we have our balance scales, how can we test them? What materials can you find here? What materials might the survivor find on the island?"<br><br>After discussing answers and setting safety rules, allow pupils to collect materials using the resources listed earlier in this document. Back in the playground, ask them to sort the items into groups (e.g. stones, leaves, sticks).<br><br>Pupils then compare different sizes and types of materials using their balance scales. In groups, they record their results on A3 posters using the materials already provided. Finally, support pupils in sharing their findings in a whole-class discussion and record the class conclusions on a new A3 poster.<br><br>**Parent support**:<br><br>Inform parents in advance about the outdoor activity and, if needed, invite extra staff to help supervise pupils during outdoor exploration.<br><br>**Adaptation**:<br><br>If a beach is not available, use another outdoor area such as a park or schoolyard. If outdoor learning is not possible, carry out the activity indoors or through pretend play by asking pupils to imagine they are on an island. | | |
| **Activity 4 "Water race"**<br><br>Science (water volumes), Maths (measurements) | Pupils now work on the second challenge. Use this prompt: "We know which objects are heavier, but the survivor wonders if she could build a boat from small rocks. What do you think? How can we test this and help her choose materials that float?"<br><br>As pupils share ideas, show them empty plastic containers without explaining their purpose. Support them, if needed, to realise they can test whether | 45' | A1, A3, B1, B2, B3 |

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| | materials float. Explain that this is how they will help the survivor.<br><br>Tell pupils they will test this through a game. Divide them into 2–3 teams and give each team identical empty containers. Set up a water race: teams carry water from a central tank using a specific tool (e.g. spoons, cups, bottles) and fill their container. The race lasts 5–10 minutes.<br><br>At the end, ask pupils to compare how much water each container holds and discuss which tool worked best. Use their results to decide the winning team.<br><br>This activity introduces pupils to the concept of volume. | | |
| **Activity 5 "Sinking and Floating"**<br><br>Science (sinking and floating) | "Now, we have large containers filled with water. How can we test the survivor's ideas? What do you think about all these different materials (show them the materials that were gathered in Activity 3)? What material will float better? What about the wooden sticks? Will they float or sink? What about the rock, paper, plastic, etc?".<br><br>Tell pupils that they will continue working in the same groups as they did in the previous activity. Let them know that now they will make predictions about each material they obtained in Activity 3 (wooden sticks, rock, etc). Use a double entry table to gather all pupils' predictions in one place (see Annex 2).<br><br>After pupils gather their predictions, prompt them to test the materials and correct their predictions when necessary.<br><br>Finally, pupils discuss in small groups which material would be best for building a boat. Support them as needed and help them share their ideas in a whole-class discussion. Extra staff should be present to guide discussions and support pupils at this age. | 30' | A1, A2, A3, B1, B2, B3 |

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| **Activity 6 "Building a boat"**<br><br>Engineering (Building the boats), Arts (Designing the boats) | "Now, the survivor is almost ready to leave the island… but… do you want to build the ideal boat for her?"<br><br>Divide pupil into 5 small groups with the goal to design (in an A3 paper poster) and then build their own boats. Give each team a different type of the material from the ones that were tested in the previous activity (e.g., paper, rocks, wooden sticks, leaves) and supporting material such as glue, playdough, rubber bands, and straws).<br><br>When pupils are ready, help them present their designs in the plenary session. Then invite them to put their boats to test (in the water containers). After that pupils will be ready to decide which material is better to build a boat and why.<br><br>After pupils finalise their products, tell them to take photos of their boats using a digital camera, iPad, or similar device. These photos will allow them pupils to recall memories of their learning and share the story of their experience working on the project at a later point even if they decide to take their boats home.<br><br>Finally, tell pupils that they will be joining a science festival at school during which, they will be presenting their boats to their parents.<br><br>**Adaptation**:<br><br>Consider following the engineering design process when guiding pupils to create their boats. In this case, adapt your activities (in an age-appropriate way) to include a session where pupils report on their plans to each other, amend their design, build, test and adapt them further. | 30' | A1, A2, A3, B1, B2, B3, C2, F2 |
| **Activity 7 "Meet a Marine Biologist"** | At a later point, after pupils enjoy their exhibition and some time playing with their boats, invite them to learn more about a Marine Biologist by watching this video interview (http://files.eun.org/scientix/Kate-Larkin-Marine-Biologist-2-5-years.mp4 and 6-9 year | 30' or as needed | A1, A3, B1, B2, B3, F4, E3 |

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| Science and Social Sciences (STE(A)M careers) | olds: http://files.eun.org/scientix/Kate-Larkin-Marine-Biologist-6-9-years.mp4). This video interview explains the tasks and responsibilities of this STE(A)M career and is meant to inspire further curiosity.<br><br>After pupils watch the video interview, lead a discussion based on what they have seen and their interests. Focus specifically on the career's contribution and relevance and make connections to activities of this Learning Scenario and the survivor as its main protagonist.<br><br>**Adaptation**:<br><br>This video interview is part of the OUTSTE(A)M Job Profile "Marine Biologist". Pupils may find it difficult to follow this video interview, as the language and terminology used might be challenging to understand. To support their learning, you may want to prepare pupils in advance by introducing key vocabulary, pausing the video to encourage discussion and address questions, providing a glossary of terms to refer to during the interview. Additionally, you might consider inviting a marine biologist or other scientist into the classroom for an in-person career talk, presented in a more age-appropriate and engaging format. | | |
| **Provision for free play** | A station with a large variety of materials (e.g., wood, plastic, rock, marble, foam, paper, etc) including water containers and a balance scale will foster pupils' free play, during which they can deepen their understanding of the concepts addressed in this Learning Scenario (compare weights, materials, and sizes and examine freely the concepts of sinking and floating). They will also have access to scissors, tapes, straws, playdough to build different kind of boats. | As needed | |

## Assessment

Assessment helps you, the teacher, see where your pupils are doing well and where they need more help, allowing you to adjust your teaching methods. Assessments also give pupils feedback on their strengths and areas of improvement.

**Formative Assessment**

- During activities, take photos at different stages of pupils' work. At the end of each activity, pupils will be asked to present their products/outcomes and reflect on the main concepts addressed with the help of these photos. This process will be facilitated by encouraging pupils to justify their answers and explain their thinking.
- Pupils will create a presentation poster by drawing in pairs on A3 paper posters their reflections and other highlights from the activities that past. After glueing all the A3 paper posters together, pupils will present (one child each time) their work and will be asked to support their reasoning.

This feedback will be used to assess pupils' understanding and guide instruction.

**Summative Assessment**

A summative assessment will take place during the final class with the presentation of the final outcomes (boats). This will be organized as a short exhibition where pupils can present their work to parents. Additionally, pupils will present pictures of their work taken during each activity with a tablet.

## Pupils Feedback

At the end of each activity, pupils take part in a short sharing time. The teacher shows photos taken during the activity and asks simple questions (e.g. "What did we do?" "What worked?" "What was hard?"). Pupils explain their work using words, gestures, or pointing. They are also encouraged to say what they liked or did not like about the activity.

## Teachers' remarks

This Learning Scenario was tested and managed to keep the children's interest throughout the activities. Finally, there were slight deviations between the actual and planned times for each activity.

## Reflection on practice

### STEM Strategy Criteria

This Learning Scenario contributes on a broader scale to the development of a STEM School strategy: https://www.stemschoollabel.eu/criteria.

## A. Introduction

☒ [A1] Personalisation of learning

☒ [A2] Problem and project-based learning (PBL)

☒ [A3] Inquiry based Science Education (IBSE)

In this Learning Scenario, pupils use elements of PBL as they familiarise with the concepts of sinking and floating through the experience of solving open-ended problems through group collaboration. There are also elements of IBSL as pupils are asked to inquire in material properties, to make hypotheses, predictions and present the outcomes of their investigation.

## B. Curriculum implementation

☒ [B1] Emphasis on STEM topics and competencies

☒ [B2] Interdisciplinary instruction

☒ [B3] Contextualisation of STEM teaching

This Learning Scenario focuses on the interdisciplinary approach and STE(A)M approach, which is reflected in the proposed activities. Also, pupils are asked to test in practice (build a boat) the knowledge they acquire during the first activities (scale, measuring, floating, sinking, etc.).

## C. Assessment

☒ [C1] Continuous assessment

☒ [C2] Personalised assessment

Pupils are asked to provide feedback and ideas at the end of each activity (continuous assessment). Feedback is also given to the whole class after each activity and to each pupil individually during formative assessments at the end of the activities (personalised assessment).

## D. Professionalisation of staff

☒ [D1] Highly qualified professionals

☐ [D2] Existence of supporting (pedagogical) staff

☒ [D3] Professional development

Teaching staff is specialised in STEAM, has experienced with science projects and outdoor learning settings. Additionally, our school provides avenues for all staff's professional

development, especially on teacher capacity building and STEAM learning in early childhood education trough team workshops and seminars.

## E. School leadership and culture

☒ [E1] School leadership

☒ [E2] High level of cooperation among staff

☒ [E3] Inclusive culture

Teaching staff is encouraged to support each other and work together through school projects and internal seminars. They are also encouraged to participate in local, national and European contests and projects as a school team. Regarding practices of inclusive culture, this Learning Scenario features a female marine biologist (survivor) who needs the pupils' help to overcome specific challenges. This is the base that give way to all activities that follow. In addition, this Learning Scenario is implemented in the school yard and reduces any barriers for pupils with mobility difficulties. Finally, the approach of free experimentation and group work is used to help pupils with learning difficulties.

## F. Connections

☐ [F1] with industry

☒ [F2] with parents/guardians

☐ [F3] with other schools and/or educational platforms

☒ [F4] with universities and/or research centers

☒ [F5] with local communities

After the end of this Learning Scenario an exhibition will be organised for pupils to share their new knowledge and end products with their parents where pupils will have the opportunity to present their final outcomes to their parents. Additionally, there are connections to research centers since pupils are learning more about the STE(A)M career Marine Biologist.

## G. School infrastructure

☐ [G1] Access to technology and equipment

☒ [G2] High quality instruction and classroom materials

Our school offers high quality instruction materials that staff members can utilize to create personalised resources for the pupils to work in groups or individually.

## About OUTSTE(A)M

OUTSTE(A)M is a project funded by the European Union's (EU) Erasmus+ programme under the Grant Agreement (101133868), running from 1 January 2024 to 31 December 2026. Coordinated by European Partnership aislb (EUN), a network of 30+ education ministries, OUTSTE(A)M brings together four partners to develop a toolkit that will help teachers and educators promote high quality outdoor learning experiences using a STE(A)M approach.

## About Scientix

Scientix®, is the number one community for science education in Europe. It aims to promote and support a Europe-wide collaboration among STEM teachers, education researchers, policymakers and other educational stakeholders to inspire students to pursue careers in the field of Science, Technology, Engineering and Mathematics (STEM).

# Annexes

## Annex 1. Example of key vocabulary for pupils.

This is some indicative vocabulary that might be useful for pupils (and you, teachers!) to get accustomed to before or during the activities.

**Survivor:** A survivor is someone who is still alive after something difficult or dangerous happened, like a shipwreck or being stuck on an island.

**Marine biologist:** A marine biologist is a person who studies the plants, animals, and life that live in the sea or ocean to understand it better.

**Abandoned island:** An abandoned island is an island where no one lives there anymore.

**Weigh:** To weigh something means to find out how heavy it is. We weigh things to compare which object is heavier or lighter.

**Measurement**: Measuring is finding out how big, long, heavy, or full something is. We use numbers to do that. We measure to get the size, weight, or volume of things.

**Scales**: Scales are tools we use to weigh things, to see how heavy they are. You might have scales at home to weigh food or people.

**Balance scales:** Balance scales are a type of scale with two sides. You put objects on each side and see which side goes down. That tells you which one is heavier.

**Float:** If something floats, it stays on top of the water and doesn't sink. A balloon or a plastic bottle might float on water.

**Sink**: If something sinks, it goes down under the water. A rock or metal might sink because they are heavy.

**Volume:** Volume means how much space something takes up, especially liquids like water. We can measure volume to see how much water different containers can hold.

**Prediction:** A prediction is a smart guess about what you think will happen before you test something!

## Annex 2. Prediction of materials' floating capacity.

This worksheet was created by the teacher/author of this Learning Scenario using a word processing programme (i.e. MS Word).

| | FLOATING  | SINKING  |
|---|---|---|
| ROCK  | | |
| WOODEN PLANK/STICK  | | |
| PLASTIC BOTTLE  | | |
| PAPER CLIP  | | |
| FOAM SHEET  | | |

For this age group, each object should be shown with both a word and a picture. Pupils can mark their predictions using stickers, drawings, or simply an "X" to show whether they think it will sink or float. You can also provide flashcards for pupils to exchange or encourage them to add alternative materials to test. This allows for more exploration and comparison while keeping the activity hands-on and engaging.