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D5.7 Education materials

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Executive summary

This report details three games (The Fish Gymkhana; Fighting for Survival; A Trout Journey) that have been designed by AMBER project members to fulfill deliverable “D5.7 Educational Materials.” Their purpose is to educate both children and adults on the importance of connectivity in rivers, particularly for fish migration, and to highlight the aims of AMBER in promoting connectivity. They have been specifically designed to enable adaptation to different cultural contexts and easy translation into different languages.

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(* denotes Principal Investigator)

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1. Introduction

The aim of this deliverable is to develop educational tools for children that enable them to understand the importance of fish migration and to popularise the aims of the AMBER project. Researchers at the University of Oviedo (UNIOVI) designed this set of collaborative educational activities detailed in this deliverable. Activities are organised by the age of participants. The purpose of these materials is to share the applied knowledge generated from AMBER in an open and participatory way. These materials are on the Project website (<http://amber.international/>) so that teachers of early childhood, primary and secondary education levels can freely download them. Indeed, anyone interested in river environments, flora and fauna, and water resources can use them as well. All the games we present here are easily transferable to the classroom context and are specifically designed to be flexible and open, so that teachers can adapt them to their geographical, linguistic and educational circumstances. Drafted in a pedagogical framework and written in English (the official language in the AMBER Project) the expressions and use of language has been designed to enable simple translation into the native languages of the users. All the games are original and not adapted from previously developed games.

The first game is called **THE FISH GYMKHANA**. It is designed for children aged 5 to 12 years. The aim of this activity is to create awareness of the importance of preserving rivers, where participants can recognise local flora and fauna, in a cooperative learning environment.

The next game, entitled **FIGHTING FOR SURVIVAL: THE MIGRANTS**, is aimed at adolescents between 12 and 18 years old, to make them conscious of the importance of habitat connectivity.

Finally, the game **A TROUT JOURNEY** has an expanded age range from small children to mature adults. The goal of the game is to *personally* experience, as if one was a trout, the effects of the barriers and other problems such as climate change in the trout's home, the river.

Each game features an introduction that allows participants to situate themselves in the context of the game, learn its rules and have fun while they learn. A set of related images promotes intuitive knowledge. They represent both the game procedures and the educational content related to natural sciences and environmental education shared in the European curriculum of these education levels. These games are not limited to a single unique interpretation but are sufficiently versatile to allow teachers or players to adapt them. Thus these educational materials can be employed easily and effectively in different settings.

Dissemination of educational materials is part of the Dissemination Plan (D5.6). WFMF and AMBER beneficiaries will promote them through:

1. Publishing articles on the games in national teacher magazines, thus publicising the games and AMBER.
2. Publicising and promoting the educational material at AMBER events and presentations, particularly where the public are involved.
3. Promotion on social media including Twitter and Facebook.

Uptake of use and interest in educational material will be monitored by examining number of downloads and any other usage information (e.g. email requests).

2. The Fish Gymkhana (Ages 5 to 12)

Authors: Elena Arbolea, Sara Fernández, Laura Clusa and Laura Miralles. University of Oviedo, Spain.

2.1 Instructions

Dams and reservoirs divide populations of fish species along European rivers. As a consequence, there are genetic, morphological and ecological differences between populations upstream and downstream. Sea trout (*Salmo trutta*), Atlantic salmon (*Salmo salar*), twaite shad (*Alosa fallax*), and European eel (*Anguilla anguilla*) are some of the affected species whose populations have been fragmented or reduced, and reservoirs are now considered as good angling locations. For improving local awareness about the importance of preserving migratory fish in European rivers, we have designed a game 'The Fish Gymkhana' for people of various ages living near dams and reservoirs. To play it, players should think like a migratory fish. The activity's aim is the awareness about the importance of preserving rivers in a cooperative learning environment, where participants can recognise local flora and fauna.

To play 'The Fish Gymkhana' have any number of teams, each team of two to six players. Each team will choose the name of a migratory fish species as an identifying logo. They are given three pieces of paper: a map with the route, a set of clues and their meanings, and a quiz with simple questions –some of them posed from a fish's perspective. All participants start the game at the same point, but each team leaves every 10-20 minutes (depending on the number of teams, age and pathway ease). The objective is to find and follow the path indicated by the clues and arrive safely at the end –where the game's organizers will be waiting happily for them with treats or toys. The members of each team work in a cooperative and coordinated way: checking the map, looking for clues, answering the questions in the quiz, from the beginning to the end of the game.

Materials








Map

The organisers must consider the participant's ages i.e. don't set departure and arrival points that are too long, difficult or dangerous for the youngest children playing. Our recommendation is to design a simple map of the area where 'The Fish Gymkhana' is going to be played. Preferably located along a river or reservoir (taking health and safety into account and ensuring adequate supervision).

Sign code

Teams will find signs marked on the ground, walls or trees with chalk or something similar (or laminated card) along the route. These signs should be easy to erase afterwards. The type of signs should be repaired by the organizers prior to the game... At least a few signs of each type should appear on the path, including several clues that will depend on the particular zone and country where the game is played.

The signs and their meanings may be (just examples):

	Right direction		Hurry up!
	Wrong direction		Observe surroundings
	Wait for 5 minutes		Find the clue and solve it!
		Finish line	

Quiz

The quiz contains questions about characteristic elements that the players will find along the path, noticeably in the points marked with “Observe surroundings” signs.

Nearby the points marked with “Find the clue and solve it” a paper, cardboard or plastic card is hidden, with a question related with local migratory fish, historical fishing in the region, year of reservoir construction or whatever fun topic the organisers can think of. Indeed, the participants can check on the Internet with their smartphone to find the answer, if all the teams have access and can use a smartphone.

The organizers must be sure the clue cards are easy to find by players. The players should leave the card in the same place where they found it. All the questions in the quiz should be answered (correctly or not) for a team to gain a treat at the end of the game.

Wrong answers do not matter because they are opportunities to learn, though they should not be aware of this at the start. The right answers should be given/explained to them at the end, and the organisers can celebrate and be open to new ideas or different answers that the teams may have. The aim is for players to understand trout life and reach the end point i.e. to think and feel like a trout!

After the game

The organizers can encourage the participants to help them with a fun after game activity by erasing the signs, cleaning the zone and leaving the nature in the same state or better than when they arrived. It's healthy, it's outdoors exercise! The organizers can bring bags, gloves and other materials for cleaning up.

Let's play 'The Fish Gymkhana'!

2.2 The game



Fish Gymkhana

Think like a fish in a fragmented river

Sara Fernández
Laura Clusa
Elena Arboleya
Laura Miralles

© AMBER Education Materials

First played in World Fishing Migration
Day (Rioseco, Spain, May 2016)

Why migratory fish are important for us

Food



Fishing



Nature



Migratory fish you already know



Identifying:

Salmon, sturgeon, sea trout, European sea bass, lamprey, European eel...

Migratory fish species

E.g. Atlantic Salmon



Great distances
in the Ocean

From sea to
rivers...



When they return to the river...they find barriers

- ➡ Dams, reservoirs: water and energy supply.
- ➡ In Spain: we have more than 1200 reservoirs and dams!
- ➡ Asturias: 20 dams
- ➡ Upper Nalon River: 'Tanes' and 'Rioseco.'



But...are all of them impassable?

Trout: jumps obstacles up to 1 m high
Salmon: between 4-5 m... no higher



Lets think like a migratory fish to understand how difficult is migrating in a fragmented river!



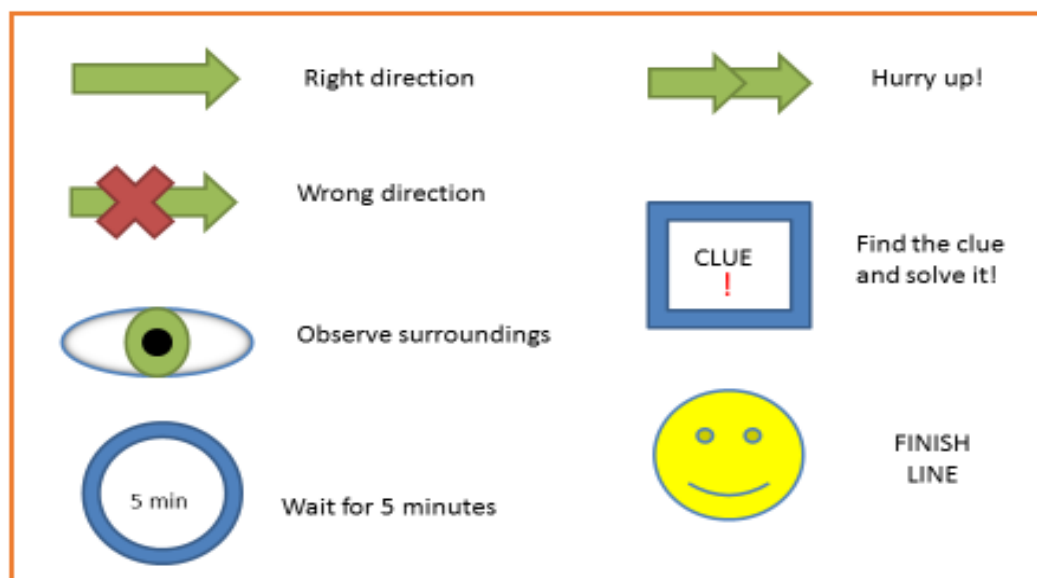
Following clues and solving mysteries,
we are going to live one hour from a fish's perspective



Materials: a MAP with the route



Materials: Signs code



Materials: Quiz



Materials: Clues



Let's play The Fish Gymkhana!



**All images used come from Creative Commons Licence and Laura Clusa*

3. Fighting for survival: THE MIGRANTS (Ages 12 to 18)

Authors: Elena Arboleya, Marta Muñoz-Colmenero and Eduardo Dopico. University of Oviedo, Spain.

3.1 Instructions

Along European rivers, migratory aquatic species struggle to go back to their spawning grounds to lay their eggs and thus reproduce. Rivers throughout Europe are fragmented by barriers to migration e.g. weirs and dams. These impede certain aquatic species, such as the Atlantic Salmon, in completing their life cycle successfully.

Migratory bird species can also be affected by other types of barriers. For example, tall noisy windmills or the busy air space around airports can inhibit bird migration. It is important for society to know which migratory species inhabit catchments throughout Europe, how to identify those species, where they spawn, and what their relationship is with the rest of the ecosystem. If young Europeans can explain this in their own words to adults, it will raise the awareness, and adults will come to understand the importance of preserving and reconnecting European rivers.

School activity on local fish and birds

Prior contact with teachers should be made to discuss the best way to introduce the importance of habitat connectivity to the target age class. Game activities like this are appreciated by students of all ages, so the proposal should be well accepted. With a teacher's help, the story of barriers to migrant species can be explained to the students, highlighting some examples based on nearby rivers: how barriers affect fish populations that cannot migrate upstream, and how other species from our catchments, like birds, can fly over those river barriers but may find different barriers as well. The aim of this activity is to locate fish and bird species upstream and downstream of a river barrier and to study their taxonomic, morphological and ecological characteristics.

Participants in this activity will be organized into small teams, from two to six people. At least one member from each team will have a smartphone or digital camera with geo-referencing capability. A visit to the closest dam will be organized from the school. Each team will look for fish and bird species upstream and downstream. They will take photos and videos over a variable period (from one day to several weeks, depending on school's schedule and possibilities).

Once the participants are satisfied with their collection of photographs and videos, each team will identify the observed species. They will inquire about their taxonomy: scientific, common, and local (if any) name; identify their main morphological and ecological characteristics (what they do eat, when they do migrate, where they do nest...). They will use field guidebooks, reliable websites, mobile applications or whatsoever resource they need.



All information and material collected may be presented as posters about local fish and bird species. Each poster contains the photographs taken by participants and maps with its geolocation. These posters will be a good tool for teaching/learning about fluvial ecosystems and for discussing barriers. The posters can be introduced to local community through online social networking and public exhibitions in educational and cultural centers. Students can explain how to take photographs of local species and how to identify them in face-to-face or online meetings, encouraging people to do the same wherever they are.

Let's play!

3.2 The game

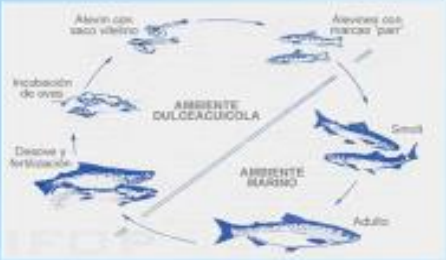




Atlantic Salmon, a migratory fish species

Swimming great distances from the river where they are born to the sea...
...then from the sea back to their natal rivers

Complex life cycle








Barriers in rivers

High reproduction effort:

- Making nests (*redds*) in the river (although they don't have hands!)
- Sexual stimulation
- Egg laying





Dams and reservoirs make it even quite difficult

It is necessary to establish shelters in the rivers where there is no fishing

Remember:

Fish is the main food source for many animals,

such as **otters** (*Lutra lutra*)

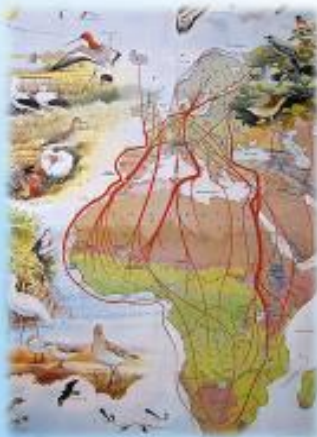


and **herons** (*Ardea cinerea*)



in river ecosystems

There are other migratory species in our valleys



Like Atlantic Salmon, many species of birds migrate to overwinter abroad, then come back home to reproduce



But.... they may also find barriers in their routes

Activity on local species of fish and birds



Divide the class into two teams to study the migrants of our valleys



Team
FISH



Team
BIRDS

Go out there!

Search for fish and birds upstream and downstream a reservoir, and:


- ✓ In your notebook, write down data about fish and birds
- ✓ Identify species
- ✓ Ask locals for more information
- ✓ Take photos and videos






Inform your class mates about your discoveries!


Prepare posters with data, information and photographs collected...




Author: Elena Adameiro, University of Oviedo, Spain



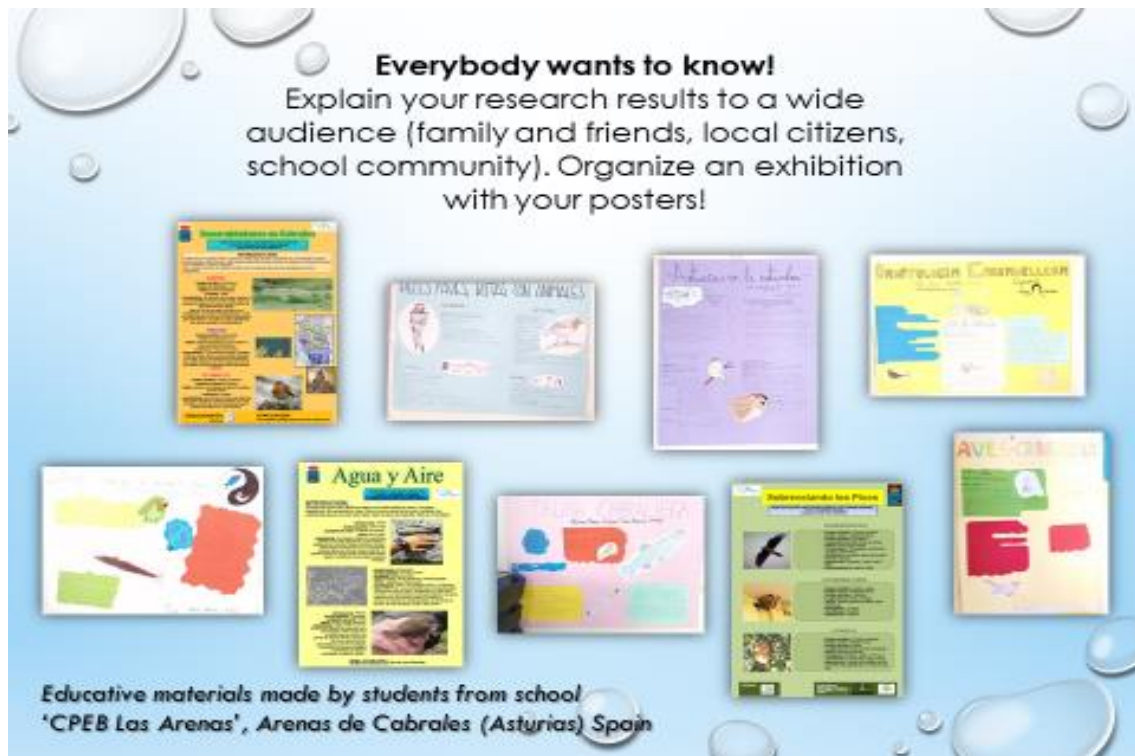
Author: Elena Adameiro, University of Oviedo, Spain



Author: Elena Adameiro, University of Oviedo, Spain



Author: Elena Adameiro, University of Oviedo, Spain



4. A Trout Journey (Ages 5 to 100)

One to eight players or one to eight teams

Authors: Laura Miralles & Eva Garcia-Vazquez. University of Oviedo, Spain

4.1 Instructions

Requires: these instructions, a dice, the board, pencil and paper.

Rivers throughout Europe, and indeed worldwide, are a source of water, hydroelectric power and sport or leisure, and rivers are home to many living creatures. Rivers are also affected by climate change. In this game we will travel the river waters from the eyes of one of their most well-known inhabitants: **Salma** the Brown Trout. **Salma** is a native European fish, born in the clean headwaters of a river. At the start of the game, in her youth, **Salma** lives behind rocks and hunts yummy invertebrates. When she is strong enough she tries to go downstream to grow chubby in the ocean, then comes upstream again to find a handsome mate and lay lots of eggs and to have healthy baby trout. On her travels she will find obstacles, dangerous encounters and pleasant adventures. Let's go with her and enjoy an unforgettable journey in her home river.

Like in the 'Game of the Goose', **Salma** the Brown Trout is a board game where the board represents the route of the river. **Salma** starts upstream (square #1) and goes downstream on the game board to the Sea (square #62).

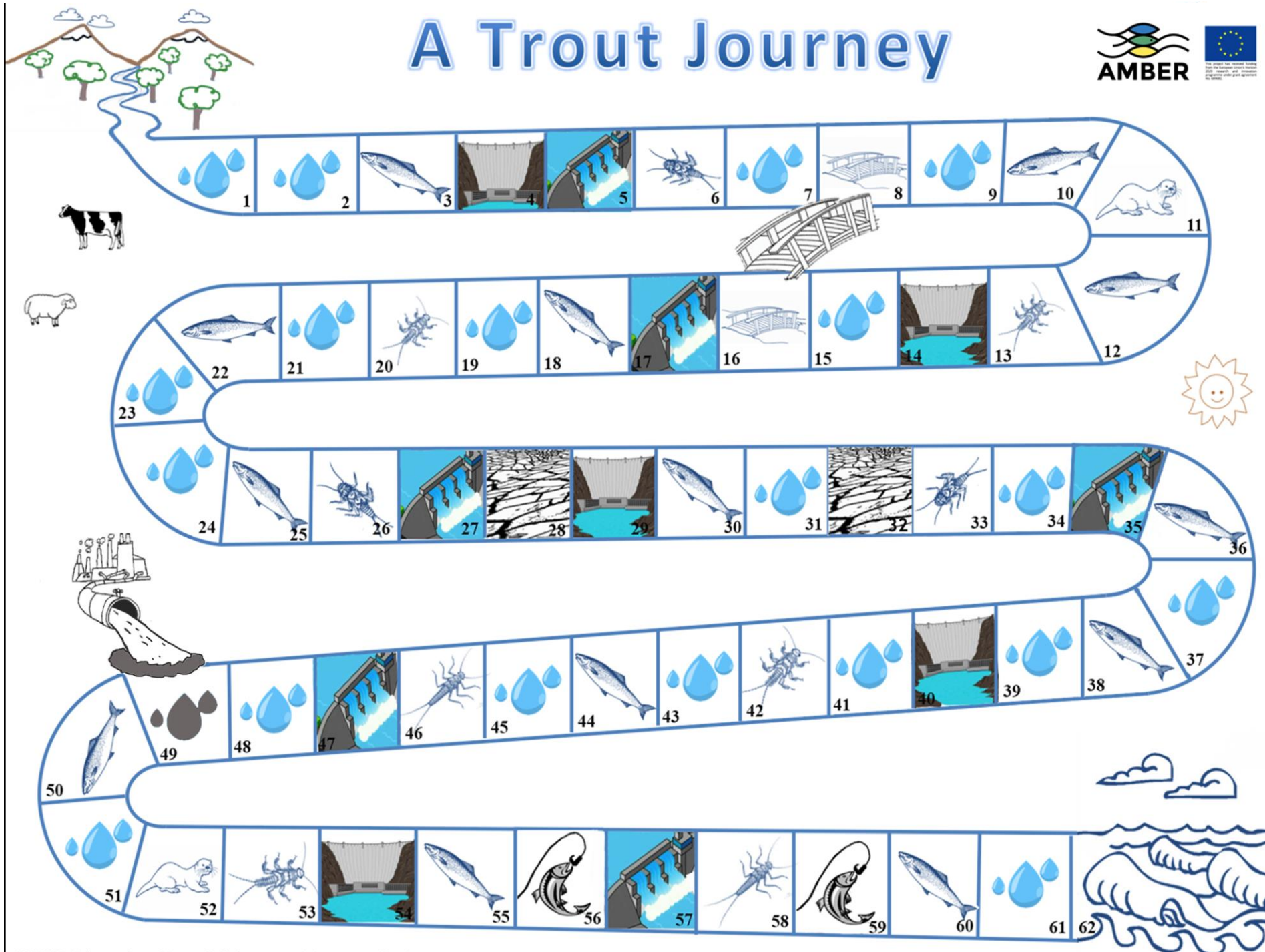
This game can be played individually or in teams. Roll the dice by turns. Move your playing piece along the 62 numbered spaces, starting from square#1.

The next page shows what you must do when you land on a certain square with an image (fish, dam, otter etc.). You can also earn 'water bonuses' on certain squares. These water bonuses can help you in some situations, so keep track of the number of water bonuses the players have with a pencil and paper.

Enjoy!!!

4.2 The game

A Trout Journey



If you land on:



1. **Jumping trout:** Salma is happy and swims fast. The player can **jump to the next trout**; except if it is the last trout on the board (downstream)



2. **Macroinvertebrate:** Good food - plenty of energy. So, you can continue with your journey, **roll the dice again**.



3. **Bridge:** Salma can rest a while under the bridge and recover energy... Take a shortcut to the next bridge (**can go to next bridge either upstream or downstream**).



4. **Dam without a fish ladder:** Sorry but you cannot go downstream. Start again from square#1 if you are on the first dam. Otherwise go back and **re-start from the previous (upstream) dam without a ladder**. Dams have big reservoirs of water behind them so you can **take one water bonus**.



5. **Dam with a fish ladder:** You can continue but need some time for jumping this obstacle. **Lose one turn**. Dams have big reservoirs of water behind them so you can **take one water bonus**.



6. **Drought:** There is no water in the river and Salma has to wait until the next rain. **Lose two turns**. If you have water bonuses, you can pay one and continue playing.



7. **Pollution:** The water is polluted and Salma cannot swim in it. **Lose one turn**. If you have water bonuses you can pay one and continue playing.



8. **Otter:** Salma meets Lutra the Otter, who likes brown trout very much; to eat! Salma has to swim fast not to be eaten. **Throw the dice again and if the number is odd you can escape downstream** (move that number downstream), but **if it is even you must escape upstream** (move that number upstream).



9. **Fishing rod:** Salma is caught by a fisherman. The fisherman puts Salma in a bucket! If you have two water bonuses, you can fill up the bucket for Salma to jump out -and start from the beginning. **If you don't have water bonuses, Salma ends in the oven or deep-fried!** The player is out of the game!

5. References

- Brock, C. (2017). Global curricular legacies and challenges for the twenty-first century. *Journal of International and Comparative Education (JICE)*, 126-138.
- Dopico, E. & Garcia-Vazquez, E. (2011). Leaving the classroom. A didactic framework for education in environmental sciences. *Cultural Studies of Science Education*, 6(2). 311-326.
- Dopico, E., Linde, A.R. & Garcia-Vazquez, E. (2013): Learning gains in lab practices: teach science doing science, *Journal of Biological Education*, 48(1). 46-52.
- Education, Audiovisual and Culture Executive Agency (2011). *Science Education in Europe: National Policies, Practices and Research*. Brussels: EACEA P9 Eurydice.
- Kulpa, A. (2017). Applied Gamification: Reframing Evaluation in Post-Secondary Classrooms. *College Teaching*, 65(2), 58-68.
- Liefländer, A. K., Fröhlich, G., Bogner, F. X., & Schultz, P. W. (2013). Promoting connectedness with nature through environmental education. *Environmental Education Research*, 19(3), 370-384.
- Marín-Díaz, V., López-Pérez, M., & Maldonado-Berea, G. A. (2015). Can Gamification be introduced within primary classes? *Digital Education Review*, (27), 55-68.
- Miralles, L., Moran, P., Dopico, E. & Garcia-Vazquez, E. (2013). DNA Re-Evolution: A Game for Learning Molecular Genetics and Evolution. *Biochemistry and Molecular Biology Education, Bambed*, 41(6). 396-401.
- Murray, J., Lunenberg, M., & Smith, K. (2017). Educating the Educators: Policies and Initiatives in European Teacher Education. In *A Companion to Research in Teacher Education* (pp. 651-666). Springer Singapore.
- Nah, F. F. H., Zeng, Q., Telaprolu, V. R., Ayyappa, A. P., & Eschenbrenner, B. (2014). Gamification of education: a review of literature. In *International conference on hci in business* (pp. 401-409). Switzerland: Springer.

6. Download educational materials

All these educational materials can be found and downloaded (citing the source) from the amber project website:

<http://amber.international/>