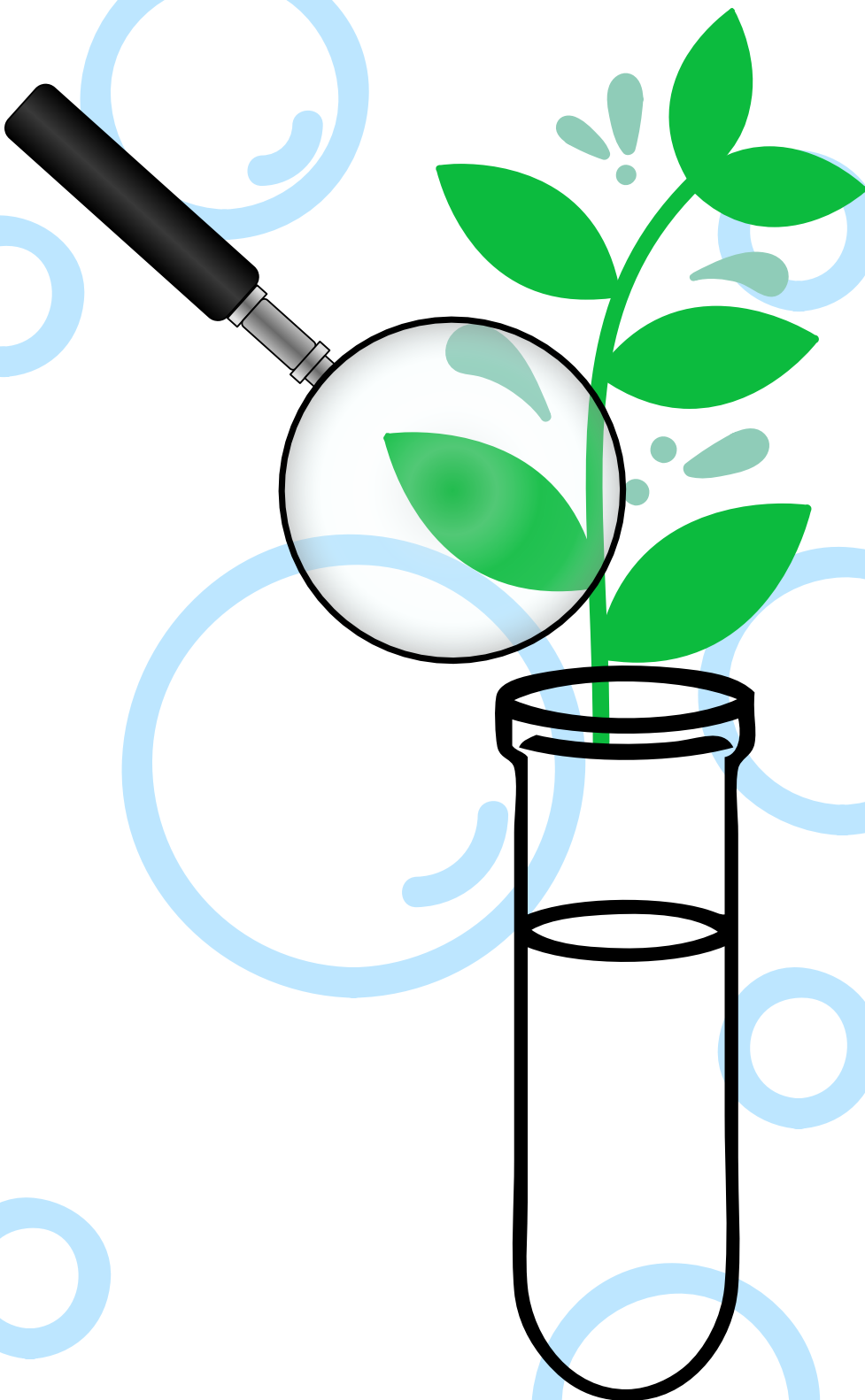


Science in Nature

**Non formal Education E-booklet
for workshops connected to Science in nature**



Introduction

This e-booklet contain 2 workshops, which have been implemented inside the project Sea is Life 7, as part of a volunteer personal project. This project was supported by Udruga Argonauta and took place in the School of Murter Island, Croatia but also in a primary school of Zadar.

With the help of 3 young volunteers, Cvita, Lucija and Klara the presented workshops has been tested before to be applied in classroom situation. They also participated in the teaching process of the project, by giving lessons about science in 2 classes.

During March 2019, 2 lectures and related workshops have been hold in Murter school, for the 8th grade and 7th grade classes. Then one of this lecture and workshop have been implemented in the context of the National Science Festival of Croatia, in Zadar, the 9th April 2019. This year the topic of this festival was The Colors.

This e-booklet present the material needed, and how to proceed to organize these 2 workshops: the first one is dedicated to a natural dying technique of fabric using vegetables. The Second is about creating a reusable sponge using old socks and a weaving technic.

As the implementation of this project come from a personal project and approach, in order to protect this work the lectures gave in classes are not presented in this e-booklet. Nevertheless, if you want to have access to the lecture corresponding to the workshop, feel free to contact me by mail at morgane.mauduit@gmail.com.

Vision and Goals

Sciences has always been present in the scholar program, but taught in a formal way: Learning formula/equations, models which can be abstract for many students. In our opinion, science is much more connected to our daily life than we can imagine, and is not so complicated to understand. We are surrounded by sciences, from biology until quantum mechanics, we just have to open our eyes to notice that and be amazed. Our living environment, nature, is a big source of inspiration for the scientists all over the world. Since the prehistoric times, Human being is searching to understand the mechanism of the nature, and still today many mysteries about nature are unsolved. By making this project, I wanted to open the eyes of the teenagers and put the light on the science they can find in their daily life. For example, where do colors come from? The colors they use for their artistic class, clothes, pen... Or what is the life of the sea sponge they could find on the beaches of Murter Island...

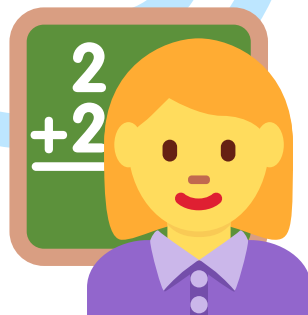
The main objective is to encourage children to develop an interest in science, but also:

- To make children participate and be active during a science lecture,
- Develop their creative mind, and show them that science is also connected to art and creativity.
- Show them that science can be fun, useful and interesting. Make them understand that they are surrounded by science, from physics, biology to chemistry.
- Give them some knowledge in sciences (marine biology, chemistry, physics, ...).
- Show that science is not so hard and can be done at a little scale, in a kitchen for example, and with daily products.
- Teach to children new craft techniques such as weaving.

Project Organisation



1 Topic



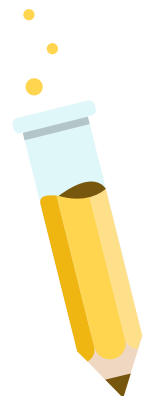
Lecture

45 minutes



Quiz

on Kahoot
10 minutes



Workshop

1h30 - 2h00

1. Colors in Nature

Workshop: Dye with plants

Goals during the lesson:

- Explain the stories of discoveries of the different colors used by human being, from Prehistoric time with 3 colors, until nowadays with 30 000 colors.
- Give the definition of a pigment, in term of chemistry.
- Put the light on the fact that the coloring and fabric industry is the second most polluting industry in the world.
- Show the principle of the last scientific researches, using bacteria to produce pigments in a really less polluting way.

Goals during the workshop:

- **Make discover to the participants the natural way to dye fabrics**, using vegetables and spices that they can find in shop.
- **Teach them a dying technic** from Africa.
- **Use a protocol**, like in laboratory, to make the workshop.
- Develop the interest of participant for colors in nature, show them the **link between arts and sciences**.
- Increase their creativity through a manual activity



Materials needed



Ingredients

- beetroots
- onions peels
- red cabbage
- curcuma
- vinegar
- baking soda

Materials

- sauces pan
- spoons (forks)
- scissors
- square of 15*15 cm of cotton
- ropes



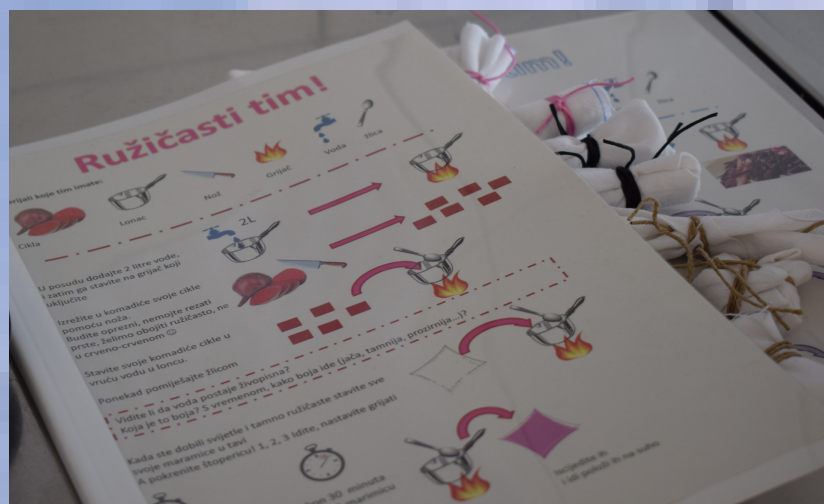
Pedagogic supports

Protocol for each color preparation in English and Croatian

<https://drive.google.com/drive/folders/1ViHkJP4rGZ-n1JKXAAMtm6obEIAQg-1g?usp=sharing>

Kahoot quiz

https://drive.google.com/open?id=1_S4rhz5gCnyF6B72eOne23aTKH0_11j5



Notes:

This workshop can be adapted if necessary. Instead of using a kitchen and a boiling time, it is possible to use a kettle, make boile the water and pour it on the ingredients: It is working!

How to proceed

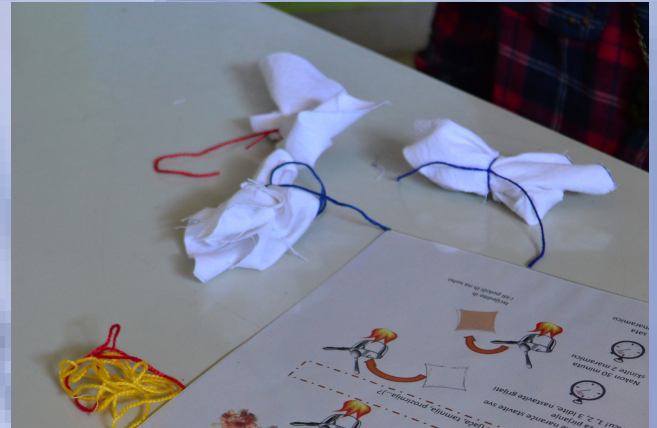
1) Preparation of the fabric (dying technic)

The first step of this workshop is the preparation of the fabric, in order to create color shape on it during the dying process.

This technic is called batik and is usually used in Africa.

Several pieces of white piece of fabric are given to each participants, and also little pieces of ropes.

Using the ropes and folding the fabric, the participant create knots (they should be tight).



2) Preparation of the coloring baths

With the help of the protocole of the workshop, the participants must prepare the different coloring baths for the dying process.

The quantity of coloring materials can be adapt following the principle:

The more coloring materials, the higher the concentration of color, the bighter the final result will be



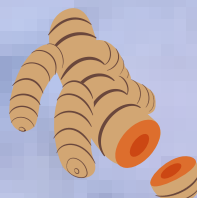
Color index of this workshop:



- Pink
- Purple
- Green
- Blue



- Brown
- Yellow



- Bright yellow



- Bright pink

How to proceed

3) Kahoot Quiz

During the boiling time of the coloring bath (10-15 minutes) a quiz is proposed to the participants. For this workshop the questions of the quiz are about the lecture previously made, few days ago, in the class. It allows to check if the participants could remember some facts about the lecture.



4) Discussion

Ask the participants to put carefully their pieces of fabrics in the different color baths.

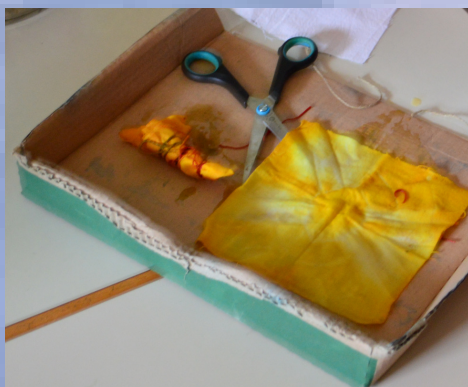
It is needed to mix the color bath time to time. To make this time of waiting more efficient, the story of the Blue Jeans, can be told to the participants. The story is available on this link, in the document "Workshop dye with plants":

<https://drive.google.com/drive/folders/1ViHkJp4rGZ-n1JKXAAMTm6obEIAQg-1g?usp=sharing>

5) Disclosure of the results

To reveal the color results, the pieces of fabrics should be took off the bath (be careful it is hot).

Then, the ropes must be cut, and the piece of fabric open carefully, on a flat support (table for example).



In order to obtain different results in term of shading of colors, it is possible to take off from the bath, the fabric at different time. Following the principle:

The longer the fabric stay in the bath, the brighter the color.

How to proceed

6) Bonus: pH indicator

After having take off and open all the fabric, it is possible to add a chemistry principle explanation:

With the blue pieces of fabric from the red cabbage it is possible also to create 2 new colors: bright pink and bright green.

The red cabbage is consider as a pH indicator, it means this vegetable is able to translate by color changing, the acididy of a liquid.

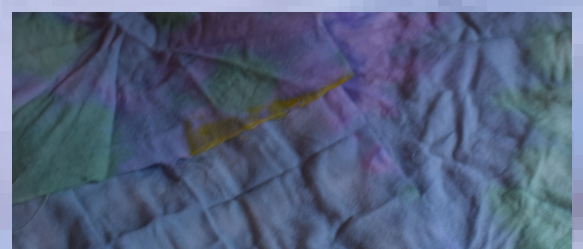
If the blue red cabbage is in contact with an acid, the color will turn from blue to pink.

If the blue red cabbage is in contact with a base, the color will turn from blue to green.

- The most famous acid liquid that you can find in your kitchen is the white vinegar. It can be used pure on the dyed fabric by the red cabbage.
- About the base, it can be also be found in the kitchen: the baking soda. The baking should be diluted in some water and applied directly on the blue fabric.



Results



2. Sea sponges

Workshop: Create a reusable sponge

Goals of the lesson:

- Make discover the ecosystem of the sea sponges, their habitats, how works their organisms, and their role in the sea ecology.
- Create an awareness about the overexploitation of the sea sponges for the human consumption.
- Explain the interest of scientist for the sea sponges, and the opportunities they can provide in research, especially in the medicine field.

Goals of the workshop:

- Develop the creative mind of the participants, especially to find solution in the nature overconsumption problems.
- Use and apply the famous principle : Recycle & Reuse
- Learn to the participants the technique of weaving



Materials needed



- Old socks
- Scissors
- Weaving System



Pedagogic supports

- Kahoot quiz, available on this link

https://drive.google.com/open?id=1_S4rhz5gCnyF6B72eOne23aTKH0_11j5



How to make the weaving support

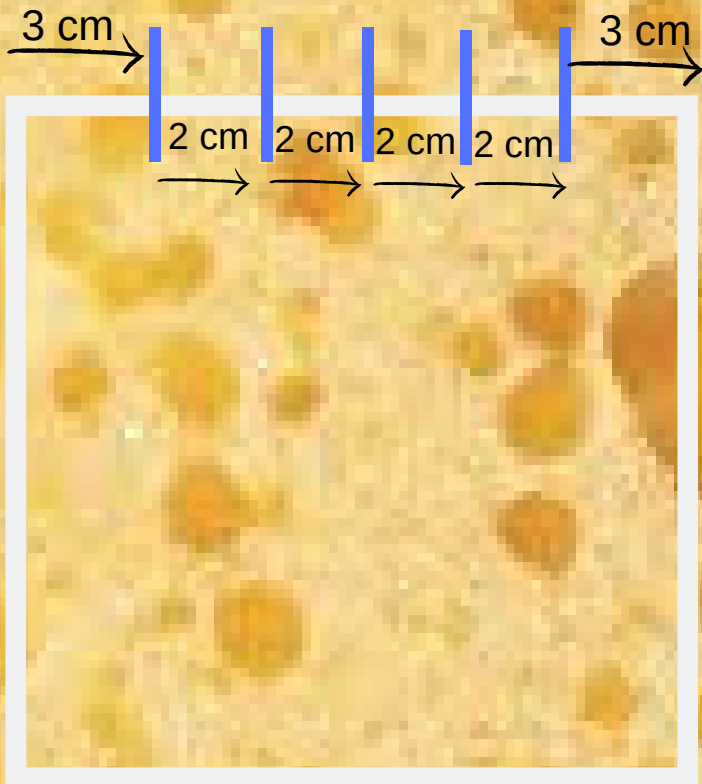


Materials:

- Flat strong support (thick cardboard) 20cm*20cm
- Ruler
- Pen
- Hot glue
- Cutter
- Clothe pins (10 for 1 weaving support)

- The first step is to break the clothe pins into 2.

- On the cardboard, using the ruler and the pen, draw a square of 14cm*14cm. Then, make marks following these measures on the diagram:



- Repeat these measures on the 4 sides of the square.

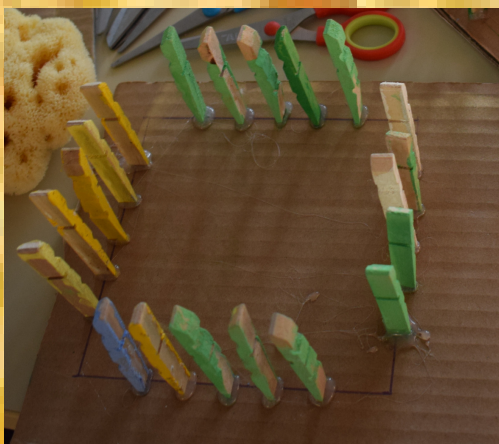
- Using the cutter, make a vertical slit on each mark (not deep enough to pierce totally the cardboard)

- Fix in each slit an half of a clothe pin with the hot glue.

Notes:

The size of the system can be adapted according to the final size of the sponge that you want to obtain

The ideal materials for the weaving support would be a square of wood and iron nails.



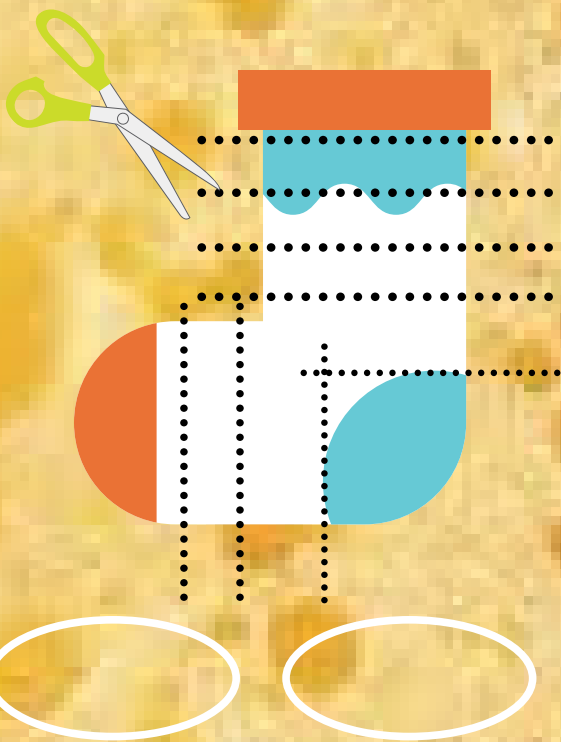
How to proceed

1) Kahoot quiz

In order to introduce this workshop, a quiz is proposed to the participants. For this workshop the questions of the quiz are about the lecture previously made, few days ago, in the class. It allows to check if the participants could remember some facts about the lecture.



2) Preparation of the socks



The first step of this workshop is to prepare the socks to be able to produce a sponge. For the old socks, we asked the participants to bring some to this workshop, even a tights can be use. For more fun, the socks can be exchange between the participants in order to create color combinations. To make a sponge, the socks need to be cut in thong of 2 cm approximately. The heel and the extremity of the socks should be removed.

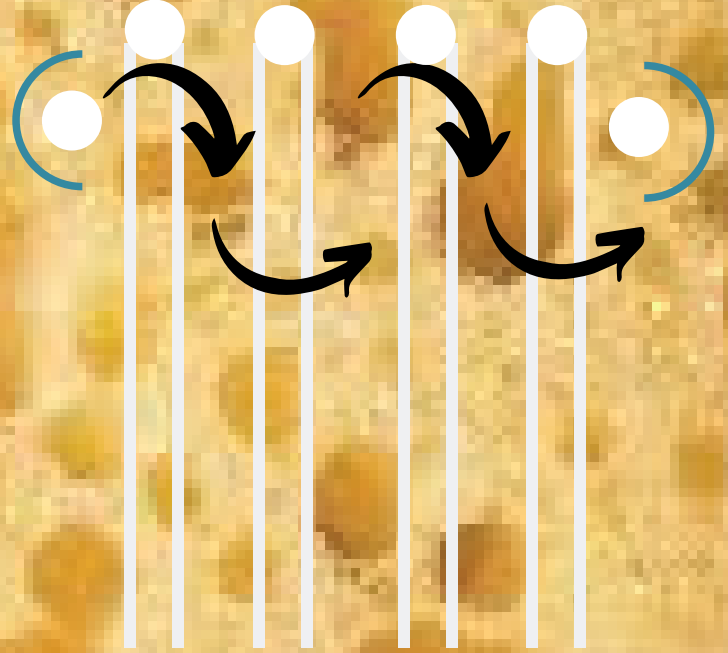
3) Weave the sponge

The thong of socks need to be a bit extended by streaching them. They should be put horizontally, between 2 clothe pins (as show on the picture). At this step, half of the weaving support should be used (5 thongs of socks).



How to proceed

Then, in order to weave the sponge, 5 thongs of socks need to be add.



In order to be more precise, and have a visual help, you can check with video from youtube, on this link:

<https://www.youtube.com/watch?v=q-f1tThjxEI>

4) Information about this sponge

This sponge is called a tawashi (word which means sponge in japanese). I can be used for daily cleaning, as a classical plastic sponge. A tawashi can be reuse a long time, because when it is dirty, you can put it in the washing machine, and continue to use it. It is possible to make this kind of sponge with different material, to have more skratchy texture for example.

This sponge is an alternative for the plastic sponges, which are not reusable and pollute the planet.

Thanks

A special thank goes to the 3 young volunteers who helped the author to implement this project. They gave really good advices and ideas in order to develop interactive lectures and interesting workshops. We hope that this good experience will provide them new knowledges and tools for their future.

We would like to thank the primary school of Murter, to the principle, the teachers, and the employees, for their cooperation and warm welcome for this project (which required a lot of materials and locals).

A warm thank goes to the association Maraška of the primary school of Zadar, who welcome us warmly, in great conditions, in the context of the Science Festival.



ARGONAUTA

**Association for Nature and Environment Conservation
and Sustainable Development**

Pijaca Društva seoske izobrazivosti bb

HR - 22243 Murter

Hrvatska

Tel/fax: +385.(0)22.434.827

mail@argonauta.hr

Credits

This project is funded by ERASMUS+.

This publication has been produced with the assistance of the ERASMUS+ Programme of the European Union. The contents of this publication are the sole responsibility of ARGONAUTA and can in no way be taken to reflect the views of the European Union.



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Erasmus+

Workshops author: Morgane Mauduit (EVS Volunteer)

Workshops implementation: Morgane Mauduit

Ivana Marin

Klara Rameša (8th grade student)

Cvita Božikov (8th grade student)

Lucija Lovrić (8th grade student)

Booklet design: Morgane Mauduit

**For any questions concerning this project please contact the author at:
mauduit.morgane@gmail.com**

