Alicia MANSILLA SANCHEZ & Elina MORAITOPOULOU

Open Science Project

Introduction

Open Science School (OSS; http://openscienceschool.org/) is an association aiming to promote Citizen Science at any level. Citizen Science should be considered as a symbiosis and coevolution between scientists and citizens. This means that scientists should primarily contribute in raising public awareness around fundamental scientific concepts as well as latest scientific research. As a second step, citizens should be able from their side to contribute to scientific research by providing researchers with data.

Citizen science is a wide concept that includes several different subparts: **open-science** (i.e. usage of open source tools for sharing and collaborating on scientific research), and **participatory science**.

With this purpose, OSS aims at building and implementing scientific workshops at high schools in order to engage students in environmental research and problem solving. Thus, students are asked to collect samples, analyze and map data and brainstorm about further applications and usage of this data. Still, there are some gaps to be bridged and questions to be answered within this process, such as: “How can student’s data be utilized (i.e. mapped and visualized) so that they constitute a real contribution to scientific research?

Considering these concepts as well as the above problematic, our team was inspired by online collaborative platforms and started designing and developing an open source application for **environmental data documentation and mapping**.

Description

Step 1: “The Scientific Lab Protocol”

Students are given a research protocol related to an environmental issue: **Microalgae and our Environment.** Find a brief description below:

‘Microalgae are microscopic algae, typically found in freshwater and marine systems living in both the water column and sediment. Microalgae produce approximately half of the atmospheric oxygen and use simultaneously the greenhouse gas carbon dioxide to grow photoautotrophically. They are the base of the food web and provide energy for all

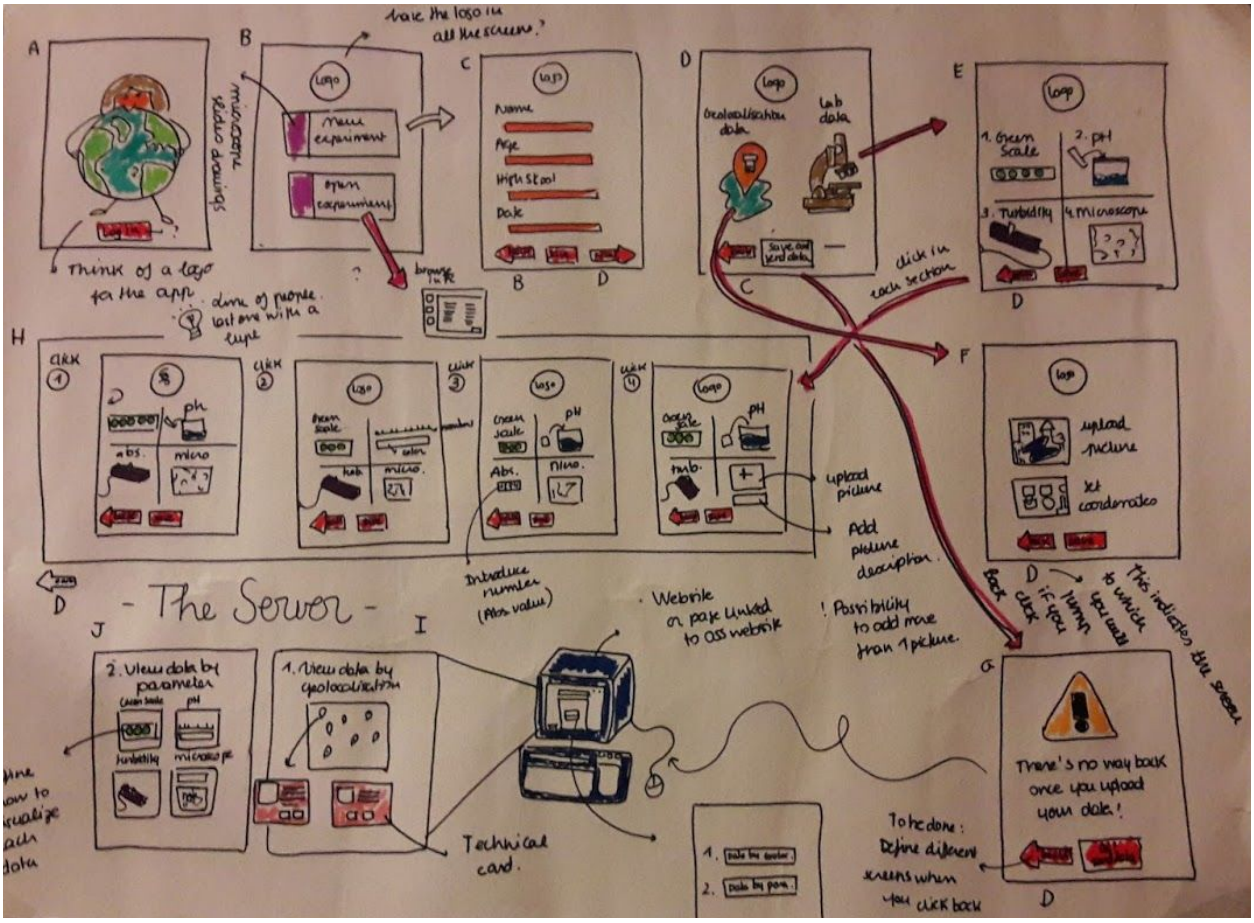
the trophic levels above them. These microorganisms have been employed as monitors of heavy metals in freshwaters. Copper inactivates the electron transport between the photosynthetic proteins and mercury can inhibit the lipid biosynthesis. They can also be very sensitive to the use of pesticides in neighboring lands, reducing the population of microalgae after a certain threshold of pesticide. On the other hand, a too high concentration of microalgae can be dangerous for the environment. An algal bloom is a rapid growth of microscopic algae or cyanobacteria in water, often resulting in a coloured scum on the surface, that can be even viewed by satellite. Algal blooms can be caused by a high concentration of fertilizer in lakes, rivers or coastal waters. High concentration of microalgae can produce toxins harmful for humans and fish. Long-term monitoring of different attributes of water, such as the apparent colour, transparency and fluorescence, by using low-cost devices and the aid of citizens, helps to detect changes taking place in aquatic environments in a rapid way, without the need of costly and time-consuming water quality analyses.'

Within this context, they are asked to collect a water sample, measure multiple parameters from it and finally send out their identification data, turbidity, pH, and green scale to a server that will plot all these data on a map.

Step 2: "Data collection"

So far, data from students has been collected in paper forms, sometimes not even pre-designed. This makes it difficult data documentation and storage but alsa data analysis and openness. Given this situation, our idea was to work on an Android application through which students were able to update all the data collected during the protocol to a server, so that it could later be analysed and visualized easily. The App interface has to be easy to use, interactive and intuitive, and must be developed using an open source engine.

Step 3: App Mock-up



Name: *To be decided*

Description: Students will have to create a personal profile and with it Log In the application. They will have the option of either create a new experiment file or to open an existent one to complete it. After filling in a form with few basic information, they will have the option of either uploading **Geo-localisation Data** or **Lab Data**. First refers to the place where the water sample was collected. Second refers to results of green scale, pH, turbidity and microscopy tests. Once the student will have uploaded all the results, she/he will be able to send it to a server, that will collect all data coming from the different students in the different High Schools. Data will be accessible online and the would be displayable both by geo-localisation, where each geographic location in a map will contain all the data from the sample taken there, or parameter (green scale, pH...).
Where? The idea is to make the data accessible online, like a tab on the already existent OSS website.

Step 4: "App Development"

For this project, we are going to use the **MIT App Inventor 2** (http://ai2.appinventor.mit.edu/), an open source application creator made by MIT. MIT App Inventor lets you develop applications for Android devices using a web browser and either a connected phone or emulator. It is also possible to use the Site to store your work and keep track of your projects.

Licences :

Collaborators:

- **Mourdjen BARI,** game design programmer at the CRI, is currently collaborating with us in the process of App development with MIT App Inventor 2.
- **Juanma Garcia Arcos**, PhD student and OSS founder, collaborates with us in the App design by giving us access to the different types of data obtained from students.