

Environmental Consciousness and young people: Creation of a tool (mobile application) for its development in the framework of an Erasmus+ program

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Abstract

Shaping environmental consciousness among young people worldwide and changing their habits regarding the protection of the environment, is crucial in order to maintain a viable planet. In this context, reinforcing the educational community on educating new generations potentially has a multiplier effect for reducing our environmental footprint. In this paper we present the “Eco Schools app”, an application for Android and iOS mobile phones that we created to collect "BIG" data for the 10 eco-friendly Eco-Schools topics. The use of this application in schools will be a tool for developing young people's environmental awareness and the basis for an international policy to stimulate sustainable development, changing the behavior of students-citizens.

Keywords: environmental consciousness, Eco Schools application, “Big Data”

1. Introduction

The United Nations endorses our evolving problem of behavioral change and has composed a list of 17 sustainable development goals which have to be achieved in order to maintain our planet. In between the lines we can read that collaboration between countries and partners to tackle these important issues is fundamental.

The first step in changing behavior on an international basis is education, since one first needs to know what is done right now and what kind of behavior is needed in the future to prevent the environment from crumbling. Knafo and Galansky (2008) found a positive relationship between learning about the environment at school and the level of environmental concern. Researchers have concluded that educating students about the environment can influence their future behaviors. The age-stability theory assumes that adolescents' social and political attitudes are already strongly developed by the time they leave secondary school (Sears & Funk, 1999). Therefore, the development of positive environmental attitudes in childhood is an important element in shaping behaviors in later life (Ballantyne, Connell, & Fien, 2006; Meinhold & Malkus, 2005).

According to Zelezny and Schultz (2000), environmental consciousness consists of a belief system that refers to specific psychological factors related to individuals' propensity to engage in pro-environmental behavior. Environmental consciousness has been explored as a construct measuring the awareness of environmental issues and, in most studies, it has been explored in the relationship to action, often in a pro-environmental direction (Jiménez Sanchez & Lafuente, 2010). Sharma and Bansal (2013) defined environmental consciousness as a mental state related to environmentally friendly behavior. Gathering ecological data and reflecting about the results also raises environmental awareness (Braschler, 2009) and can connect children to nature in a way that lasts a lifetime (Sagarin and Pauchard, 2012).

2. Research Objectives

2.1 State of the art

Environmental sustainability has become a major social issue (Wilson & Knoop, 2002). As environmental sustainability is largely about human choices and actions, each individual has a great deal to contribute towards environmental change (Mayer & Frantz, 2004).

The approach of promoting sustainable behavior through teachers activities fall within the scope of various research programs. The projects “Vervyschool” (Brogan et al., 2015) and Zemedes (Gaitani et al., 2015), focuses on School buildings within which it was developed software that advises users to optimize it consumption of energy as well as related tools and methodologies. Also, the project School of the Future (School of the Future, 2016) results in one a series of guidelines on energy saving practices in an instructor environment. A real-world IoT Deployment is spread in 3 countries (Greece, Italy, Sweden), monitoring in real time 18 school buildings in terms of electricity consumption and indoor/outdoor environmental conditions. The data collected is used as input in educational scenarios, whose goal is to educate and attempt to transform the behavior of students through a series of trials conducted in the educational environment.

The Foundation for Environmental Education (FEE) created a label for schools worldwide to show that they are stimulating environmental behavior by creating the ECO schools label (www.ecoschools.global). ECO schools are nowadays active within 51000 schools in 67 countries worldwide. Each country has its own organization or company which is allowed to give out the ECO schools label on behalf of FEE. The schools (see <http://www.ecoschools.global/seven-steps/> for information in a clip on what ECO schools is about) have to follow a seven step program in which they strive to change the behavior of their students, personnel and all involved with the school (eg. parents, partners, internships et cetera). The Eco-Schools Seven Steps methodology is a series of carefully engineered measures to help

schools maximize the success of their Eco-School ambitions. The method involves a wide diversity of individuals from the school community - with students playing a primary role in the process. Big data could be retrieved from this program to get insight into what kind of problems schools have on an environmental scale. This could be used to prepare changes on an international scale in order to make an actual change via school programs. The issue is that at the moment it is not possible to retrieve this data, since there is no technical solution which can be used by all schools. To solve this problem we focused on building an App for the Apple Store and Android, which will be used by the 51000 schools worldwide to retrieve the data from the Environmental Review (step 2 of the seven steps method of Eco-Schools) to get insight into the environmental issues which schools face in changing the behavior of their students. Eco-Schools facilitate contact between participating institutions not just at the national level, but also internationally. These links provide an opportunity for schools to share environmental information. In 2018, Eco-Schools was recognized as one of the world's 100 most inspiring innovations in Education, and one of the Top 10 in Sustainability by HundrED.org. Five schools from Greece, Sweden, the Netherlands, Hungary and France followed the seven step program whilst the App is built, they pilot the use of the App as well as the new process of working in a uniform manner between the ECO schools organizations. They gave feedback on the use of the App, the questionnaires within the ECO schools App and the process as a whole. To test the process and the App was necessary to work transnationally, since the process and App will be used worldwide.

Project goal: Contribute to the sustainable development goals of the United Nations, by collecting and creating big data, based on the Eco-Schools program by developing an app.

Description: Access the Eco-Schools Environmental Review. Participants comply to a 7-step process to improve sustainability in their school. Step 2 is carrying out the Environmental Review which will help to form an action plan. This mobile app helps you to identify your schools current environmental impact and highlights the good, the bad and the ugly.

- The aim is to investigate the environmental issues in school.
- Access the 10 main themes which should be reviewed annually.(Energy Greenery, Water, Food, Mobility, Litter & Waste, Building & Surroundings, Hygiene, Safety, Communication).
- Complete the review by rating statements on sustainability and environmental education.
- Submit ratings in order to be able to compare findings with other students, schools and countries.
- The results of the Environmental Review will inform “action plan”.

2.2 Architecture system of application

The app development contains 3 phases:

- Phase 1 - app: Creating a questionnaire to collect data-sets that cover all the sustainable topics in line with the goals of the United Nations(2015) and ISO 9001 (<http://www.iso.org>). These are developed with help of students, schools and Eco-Schools NL.
- Phase 2 - app: Creating a database to store the collected data, compliant to the European General Data Protection Regulation, this is effective since 2018. (Figure 1)

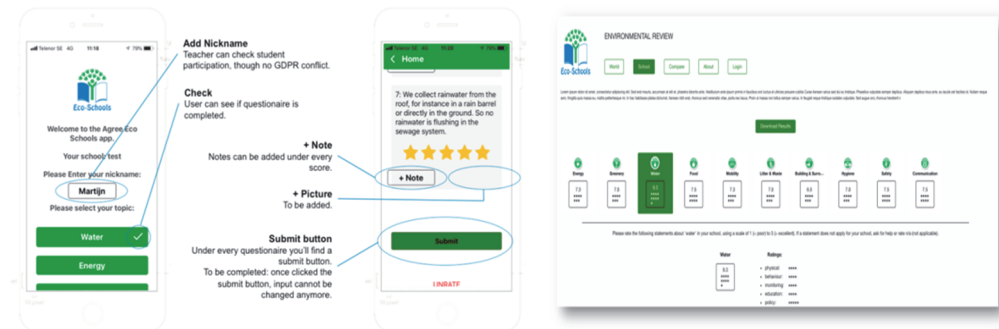


Figure 1. Screenshots from mobile app and the dashboard

- Phase 3 - web: The idea is to display the collected data in a logical, feasible and understandable way to the schools who participate in the Eco-Schools program so they can retrieve their own results, and compare them with other users.

The dashboard (Figure 1)

- explains the homepage which shows the number of participants using the app
- gives an overview of results worldwide
- gives access to data about the country but not specific schools
- gives a teacher login so he/she can log in, fill in school details, add groups or classes, create a unique pin per group to manage the groups efficiently and monitor progress for individual progress.
- allows teachers to invite colleagues to join the app and they can benefit from the same features.

Results can be downloaded in a format cvs, or pdf, or excel. Students cannot access school data by themselves. Big data could be retrieved from this program to get insight into what kind of problems schools have on an environmental scale. This could be used to prepare changes on an international scale in order to make an actual change via school programs, (Figure 2).

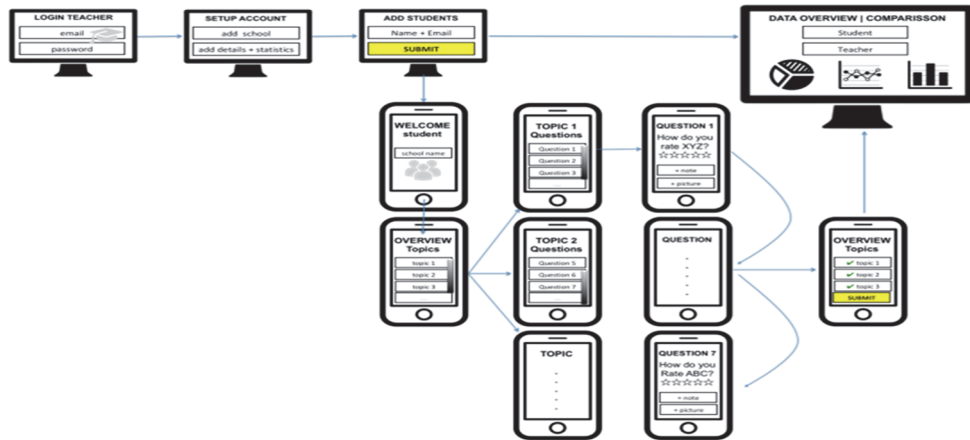


Figure 2. Description of the “Eco Schools” app for collecting “BIG DATA”

2.3 Description of the procedures followed concerning the app’s creation

The questionnaire was created in October 2017 with template questionnaire which is used from Eco Schools Netherlands. A team of 10 teachers chose questions from this questionnaire so as to cover sustainable topics in line with the goals of the United Nations & ISO 9001. To further optimize the content validity and language of the items, a pilot study was conducted in which 45 students aged 16–18 years old participated. The students were asked to mark items that they had difficulties with when completing the survey. Two focus group discussions with five and eight respondents, respectively, were then conducted to identify problematic items and to discuss interpretations and suggestions by the students on how to improve the identified items.

After the pilot study, further language edits were made to improve the respondents' understanding of the questionnaire items. In January 2018, the questionnaire which was created in the way mentioned above was given to 75 students (15 from each of the 5 participating countries) so as to evaluate it regarding the clarity of the questions, the comprehension of terms and their correct expression. These 75 students gave feedback so as the appropriate corrections will be made.

In March 2018 a student exchange took place to evaluate the app. 48 students from Greece, Hungary, France, Sweden, the Netherlands came together in Maassluis (Netherlands) tested Beta Version of the app which includes the corrected questionnaire. The students worked in small teams. Each team checked one of the topics in the app and had a look on phase 1 end phase 2.

Feedback gathered from this meeting from students: 1) Submit button per survey/questionnaire. 2) Add comments, 3) Add picture, 4) Check: Language UK; check

spelling and grammar and goal of the questions (clear questioning – summative), 5) Spelling and grammar, 6) Reason of questioning (clear, unambiguous and in line with the total questionnaire). Feedback briefed to the development team.

In October 2018 the second students exchange organized in Lamia, Greece. 48 students tested and evaluated the Eco-Schools app. The timeline (Fig.4) was explained to them to give context on where we are now in the development process.

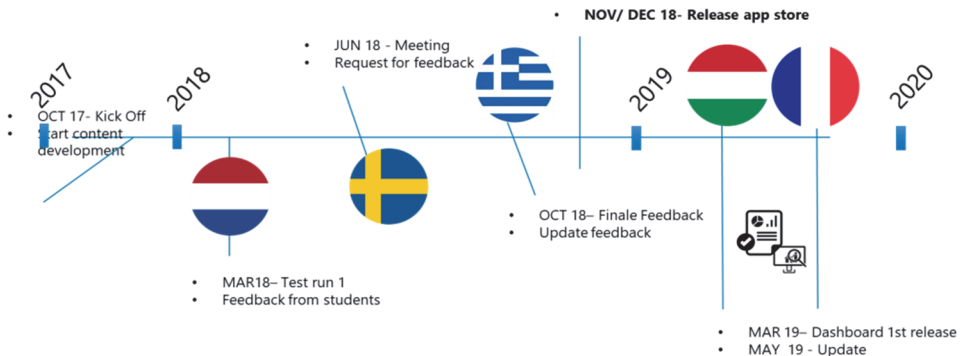


Figure 3. *The timeline to create, evaluate and getting feedback of the app*

The students evaluated the app and gave feedback focusing on: 1). what is good, what works well? 2). what needs to be improved? 3).Keep an eye on the design, does it work for you?

The students worked in small teams. Each team checked one of the topics in the app, and had a look on the user experience. The workshop ended with a group discussion, which results in the following point of action: 1). Check if the app stores data, if you're not able to complete all questionnaires at once. In this test version, it sometimes did, and sometimes did not. >> It should store the answers given. 2). 'n/a' "no answer", should be explained and should have a different color, because red gives the impression you gave a wrong answer. 3). Check if there is a possibility to explain difficult words/ jargon - via an eye with a dictionary or an image. 4). Is there a way that if a series of questions within one topic not applies on a school, the related questions can be hidden? 5). Can we put a submit button under every topic? This improves the user experience, because it gives you the sense of progression, and finishing something. 6). If you use the home button, on android devices the app quits. Needs to be fixed. 7).The design was praised for its simplicity. Icons/ colors can improve the user experience to see that they're working in one topic. Feedback gathered from this meeting briefed to the development team.

In March 2019 the 3rd students exchange took place in Hatvan, Hungary. In line with our planning, this is phase 3 of the development process. We are now looking into:

What is for users, the most important to compare their own data with?

- School vs School: The data of your own school with another school?
- School vs Country: The data of your own school, with the average of the country?
- School vs Continent: The data of your own school, with the rest of the continent?
- School vs World: The data of your own school, with the average of the world (all participants)

We use a questionnaire to find out what is most important to our users. The results of the outcome will be leading in the development process. 35 students attended the workshop and are representing our group of users (a few lost connection; which explains the decreasing number of votes).

Table 1. Results of comparisons I

Q1. What do you really want to compare? – If you have only one choice, it’s a ‘need to have’.			
School vs School	School vs Country	School vs Continent	School vs World
6	11	11	7
Q2. What do you want to compare? – This is your second best choice, or if you changed your mind, your first choice. It is now a ‘nice to have’.			
School vs School	School vs Country	School vs Continent	School vs World
7	18	7	3

Note: In the 1st question some students were in doubt. After a short group discussion, school vs country, seemed most important to the group. After the 2nd question we can see the opinion shifted to a clear school vs country vote. (Table 1)

We held another group discussion, to clarify what the students meant. Interesting comment was that two things are mentioned: 1).School vs School is interesting when there is a competition between rivalry schools, ‘you want to be better’ than your neighbor. 2).School vs Country is most interesting, because in reality these schools have the most (circumstances) in common, and are therefore a good benchmark. 3). It’s fun to compare your school with a continent or the world, though they find it a bit meaningless in the sense that they know the comparisons might not be fair, since there are many differences between countries.

To check the output from these first questions we continued the questionnaire with 2 more questions (Table 2) to double check what is most important to the students:

Table 2. Results of comparisons II

Q3. School vs Country – Is this comparison a nice or a need to have?	
Nice to have	Need to have
9	25
Q4. School vs Continent – Is this comparison a nice or a need to have?	
Nice to have	Need to have
19	15

Note: Q4 seems to be an odd one out if we look at what the students mentioned earlier. After a group chat, the group recognized that the global data, are data from all the participants. Now you're able to benchmark yourself to the worldwide average. Though no needs to see detailed information.

We concluded the questionnaire with 2 last questions (Table 3) to find out what the students find important on a comparison never mentioned before:

Table 3. Results of comparisons III

Q5. Country vs Country – Is this comparison a nice or a need to have?	
Nice to have	Need to have
13	22
Q6. Continent vs Continent – Is this comparison a nice or a need to have?	
Nice to have	Need to have
27	8

With these last 2 questions, we found out that, since the project funded by the European Union, it's nice to check differences between countries, though a comparison between continents doesn't seem important. This is again supported with the argument that the differences are too big.

2.4 Conclusion

Based on the described development and validation processes, an app have been provided. Big data could be retrieved from this program to get insight into what kind of problems schools have on an environmental scale. This will be used to prepare changes on an international scale in order to make an actual change via school programs. At the start of the new school year, September 2019, all Greek Eco-Schools get the unique opportunity to carry out the Environmental Review on a smartphone! The “app” helps to collect information about school, and let eco-team determine on which sustainability themes school can improve. The more students participate, and share their findings, the more will get balanced and reliable data on the performance of school if it comes to sustainability themes (water, electricity, litter and waste, etc.). This will help the eco-team make an action plan, to make school more sustainable.

Acknowledgments

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Περίληψη

Η διαμόρφωση της περιβαλλοντικής συνείδησης των νέων σε όλο τον κόσμο και η αλλαγή των συνήθειών τους όσον αφορά την προστασία του περιβάλλοντος είναι ζωτικής σημασίας για τη διατήρηση ενός βιώσιμου πλανήτη. Στο πλαίσιο αυτό, η ενίσχυση της εκπαιδευτικής κοινότητας όσον αφορά την εκπαίδευση των νέων γενεών μπορεί να έχει πολλαπλασιαστικό αποτέλεσμα για τη μείωση του περιβαλλοντικού μας αποτυπώματος. Στην παρούσα εργασία παρουσιάζουμε την εφαρμογή "Eco Schools app", μια εφαρμογή για κινητά τηλέφωνα με λειτουργικό Android και iOS που δημιουργήσαμε για τη συλλογή δεδομένων "BIG DATA" για τα 10 φιλικά προς το περιβάλλον θέματα των Eco Schools. Η χρήση αυτής της εφαρμογής στα σχολεία θα αποτελέσει εργαλείο για την ανάπτυξη της περιβαλλοντικής συνείδησης των νέων και τη βάση για μια διεθνή πολιτική που θα τονώσει τη βιώσιμη ανάπτυξη, αλλάζοντας τη συμπεριφορά των μαθητών-πολιτών.

Λέξεις κλειδιά: περιβαλλοντική συνείδηση, εφαρμογή Eco Schools, "Big Data"