"How we boost science in the cities"

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Abstract

The PULCHRA project explore the open schooling concept in the theme "Cities as urban ecosystems" and in view of creating new partnerships in local communities to foster science education for all citizens. Schools, in cooperation with other stakeholders become agent of community well-being, taken the theme to be explored encompasses the natural environment, the built environment and the socio-economic environment in cities. This is of great importance, taken that the urgency of cities to be approached as urban ecosystems is underestimated and limitedly linked to science education for all citizens. The open learning course (https://pulchra-schools.eu/lessons/) allow the widening of the stakeholders following the project and benefiting from the educational resources and the overall approach for cities as urban ecosystems. The course supports the deepening of knowledge of the stakeholders and other end users who follow the project. An important part is building trust in the scientific approach based on experience. Engaging in environmental education has a direct impact on the community and the personal life of the participants.

Keywords: science, cities, SDG's, education, open schooling, motivation, activation, creativity, innovation, community well-being.

1. Introduction

Nowadays, being able to gain the interest of citizens and especially young people to turn to science is the main concern of many research (Visvizi et al, 2018).

1.1 Purpose and Objective

We are living in the "urban century". According to the projections of the European Environment Agency (2020) by the year 2030, 75% (on the average) of Europeans will live in cities. As a result of urbanization, a number of environmental, climate, social and economic problems develop, directly affecting the quality of life of people and resulting in social disparities. Cities are more than agglomeration of buildings. They are instead "living organisms" which face environmental threats and the impacts of climate change. They exchange heat, mass, energy, information, ideas and culture.

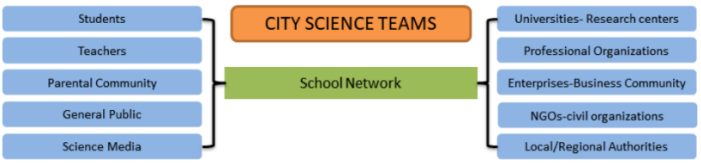
It is to this end, that cities are addressed as urban ecosystems, which in the context of humans and their environment, can be regarded as a complex system of: (a) the natural environment, (b) the built environment and (c) the socio-economic environment.

Furthermore, the perspective of the cities as urban ecosystems is directly linked to the Sustainable Development Goals of the United Nations as well as a number of recent European Union strategies for:

(a) Nature Based Solutions (NBS)
(b) Circular economy in cities
(c) Low carbon economies by the year 2050
(d) Climate Friendly Cities and
(e) Smart cities.

The school develops a City Science Team (teachers and students), also involving stakeholders to enrich the Science Team on scientific, technical,
innovative and social aspects. Roles are assigned to the students. The school also forms the City Science Reporters Team, in view of communicating the project and its results.

Table 1: Science team formation



The above group has a goal, to collaborate, to exchange views, to transmit knowledge and findings, to understand, to interact and to create an innovative action. Helps for increasing the skills of individuals, groups and communities to make better decisions for themselves and to understand and use opportunities for societal participation. This capacity is relevant to environmental decision-making. One crucial implication of this definition of empowerment is that it acknowledges that the individuals and the community are connected.

6 schools from Cyprus have been selected for participation in the program. In the map below, you can find the 6 schools in which we received the applications to participate in the program. Also, you can see the location of schools based on areas by province:

Map1: Participating schools in Cyprus

2. Methods

The methodology is based on pilot themes (termed as City Challenges) which create know-how, built trust in the science approach based on own experience, facilitate skilled use of tools and support community building as they are based upon the identity of the communities in which they take place. A City Challenges (technological) Platform is developed to bridge partners, schools and stakeholders; mixed Science Teams and students acting as City Reporters will explore and disseminate the City Challenges respectively.

2.1 Exploring the subject and defining the project idea

The following topics were given for the groups and each school organized from the scratch the action that it would like to deal with since it affects the neighborhood, the citizens, residents, students and their parents.

Table 2: City Challenges Themes and Topics

City Challenge	Theme	Indicative topics
1	Powering Cities without Harming the Climate	Climate Neutral Cities, Clean energy and energy efficiency
2	Buildings for the Future City	Climate Neutral Cities, Green Buildings, urban heat adaptation and mitigation, thermal comfort
3	Regenerating Urban Space to connect People in a Healthy Environment	Sustainable urbanization, nature based solutions, air quality, public spaces
4	From waste disposal to resource efficiency – Circular economy at the city scale	Waste management, resource efficiency, circular economy
5	Mobility Patterns that support Community Development	Climate Neutral Cities, green transport, air quality, social cohesion
6	Innovation for Social and Environmental Benefit	Smart city, carbon footprint, earth observation, big data

2.1.1 Science Team formation

Each school has created and categorized their team (external collaborators and stakeholders) in order to select the correct team that could help them in the implementation action.

2.1.2 Created and activated the science reporters team

The 1st Open School Event has been organized on the 26/01/21 with the title Making a PULCHRA World, which was attended by the stakeholders of our team who presented issues of promotion Sustainable Urban Mobility in Cyprus, Sustainable Development, and Urban Planning as well as Zero Waste to Landfill actions. The science reporter team from each school, presented the topic that they chose and the relevant actions in the 1st Open Event – Making a PULCHRA World which the OUC organized.

2.2 Research design

The program focuses on a new attractive approach to introduce environmental issues considering SDGs, Circular Economy in secondary schools in order to increase environmental performance of students:

(a) Bringing new scientific knowledge for the city as an urban ecosystem and facilitating participation of citizens of all ages in scientific discovery;

Picture 1: Research implemenation-Ethnomartyras Kyprianos Lyceum

(b) Preparing educational courses and materials for all the topics that the project will approach in order to be able to inform all involved, of all educational levels and ages.

(c) Building trust in the method of science through the own experience of participation, thus strengthening the awareness that building an own point of view and establishing own decisions on comprehensible evidences is personally and societally more effective.

Picture 2: Waste compositional analysis in Apeition Lyceum Agros

(d) Establishing concepts to recognize the strong links of the natural environment, the built environment and the socioeconomic environment. Understanding these links is essential to identify the own capacity to participate in shaping the own living environment. To this end PULCHRA aims at building a learning, exploring and activation network, which allows to experience and understand the urban ecosystem as living organism.

(e) Developing knowledgeable, innovative and participatory communities able to cope with and actively contribute to addressing current and anticipated challenges at the city scale. Taking note of the similarity of challenges arising from societal, economic and environmental change in most cities in Europe and worldwide, is essential to recognize the benefit from international collaboration in order to cope with these (Mostovoy et al., (2021).

(f) Developing the City Science Teams, i.e. mixed teams of stakeholders in view of co-identifying key issues and codefining solutions for urban ecosystem management.

(g) Raising attention and public awareness of the importance of urban ecosystem management among the schooling community, scientists, policy makers, and general public (City Reporters).

This model methodology builds a bridge between issues learned in the school context and carries these over to real life situations. For doing so, participating students will act as researchers and to this end interact with a pool of parties, which will potentially support their project related activities and provide information and guidance for the exploitation of issues learned at school: local authorities which may describe how these issues relate to city needs and priorities, University units which may provide, among others, scientific mentoring and data, local SMEs specializing in environmental technology, ICT, etc., NGOs with activity in related fields, etc.

3. Results

3.1 Transparency – Accessibility – Participation:

Key features to gain the active participation of young people is to have transparency through the actions that they choose. Their accessibility to available data helps them broaden their horizons. Participation allows them to get in touch with the field of knowledge they have chosen, facing the difficulties that may arise, giving solutions to the problems they face.

3.2 Open physical labs:

The purpose is to share knowledge and experiences among those involved, to exchange views, to work together to provide solutions to the challenges that they face and to understand how the environment and human beings interact and interdependent, linked to the SDG's. By participating, individuals have the opportunity to meet global challenges through the initiatives they undertake.

3.3 Open events:

Shared their experiences and discussed further their results, with the aim of informing the general public about their actions and exchanging views.

3.4 Co- creation:

We motivated the general public, the local authorities, the policy makers to participate and give their own views, perceptions and knowledge on the subject. Teamwork always results in better findings (Molnar, 2021).

4. Discussion

Participants are actively involved in applying science to practice. Today's young people are interested about the science, they are active, they are willing and open to different views. They just need the right knowledge and the next step is to prove their skills.

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