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INTEGRATING CITIZEN SCIENCE INTO THE EDUCATIONAL SYSTEM

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Abstract: *Although Citizen Science is usually associated with scientific fields, such as ecology and environmental sciences, this paper highlights the benefits of introducing Citizen Science (CS) into the educational system. The challenge is to incorporate CS in all levels, especially in schools and higher education institutions that are oriented towards humanitarian studies. Critically reviewing existing CS projects, the author argues that Citizen Science supports critical thinking, cooperation and teamwork, ethical reflection and social awareness and that its role in providing additional value to existing educational practices and methodologies, should be more broadly recognized.*

Keywords: *Citizen Science, Educational research, Innovation, Values*

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INTRODUCTION

Irwin (1995) introduced the term Citizen Science (CS) in the 1990s, suggesting that citizen science is not only a science data gathering discipline, but a method to promote equity in the powerful world of "knowledge" and "knowledge production" by bridging the division between scientists and the public and creating a more inclusive and supportive community. More recently, Haklay (2013) categorized citizen science by levels of participation, ranging from "crowdsourcing" to "extreme" citizen science, where the public contributes to both design and analysis of research.

While the origin of CS lies in ecological and environmental sciences, studies have proved that it offers substantial, benefits for schools and academic institutions focused on the humanities. Citizen science refers to the active participation of non-professional individuals in scientific research, typically through data collection, observation, or analysis (Bonney et al., 2009).

Early models emphasized public contributions to ecological monitoring, but now the concept has since expanded to include projects across disciplines—including astronomy, history, linguistics, and the digital humanities. This propagates social consciousness by engaging students with real-

world problems such as climate change, conservation, or public health—topics that are increasingly central to modern social studies curricula (Hecker et al., 2018). This supports interdisciplinary learning based on observation, reflection, historical awareness, and civic participation, all being integral parts of language, arts, history, and social studies curricula. Finally, Citizen Science requires no specialized equipment or advanced scientific training, thus making it easy to apply in educational establishments with limited resources.

CS Projects – Overview in the specialized literature

Through extensive literature review, several CS projects were studied and critically appraised as to their contribution to increasing the value and quality of education provided in educational institutions around the world.

Table I presents some information on CS projects that have been successful in adding value to the educational outcome, in different circumstances.

Table I : Summary of Citizen Science Programs in Education

Program Name	Education Level	Focus Area	Use in Education	Reference
GLOBE Program	Elementary to university	Environment, Earth science	Students collect environmental data (e.g., weather, soil) for global research.	Butler & MacGregor (2003), globe.gov
eBird	Middle school to university	Ornithology, ecology	Students track bird sightings and migration patterns; data used in research.	Sullivan et al. (2009), ebird.org
iNaturalist	Middle school to university	Biodiversity, ecology	Students document species with photos; learn taxonomy and conservation.	Nugent (2018), inaturalist.org
Zooniverse	High school to university	Astronomy, history, biology, more	Students assist in data classification (e.g., galaxies, wildlife).	Simpson et al. (2014), zooniverse.org
School of Ants	Elementary to high school	Entomology, urban ecology	Students collect ant samples; explore invasive species and taxonomy.	Lucky et al. (2014), schoolofants.org
Project BudBurst	Elementary to university	Botany, climate science	Students observe plant phenology to study seasonal changes and climate effects.	Henderson et al. (2012), budburst.org

Source-adaptation of Butler & MacGregor (2003), Sullivan et al. (2009), Nugent (2018), **Simpson et al. (2014), Lucky et al. (2014), Henderson et al. (2012),**

Participants to the GLOBE Program have the opportunity to access resources in teaching and learning materials, mainly oriented to scientific protocols. Participants submit their observations and get support from a network of collaborating professionals to an extensive GLOBE database. In Romania 11 Schools and Informal Education Organizations participate from different regions of the country. Indicatively : Adult Searching for Science, Carmen Silva High School, Colegiul National Mircea cel Batran, Department for Extracurricular Activities, Gheorghe Sincai High School.

Projects like *Zooniverse* invite students to transcribe archival records, analyze historical documents, or tag photographs from past eras—activities that sharpen analytical reading, enhance historical literacy, and contribute to ongoing scholarly efforts (Simpson, Page, & De Roure, 2014).. Published reports and assessment documents reveal that the most important outcomes for the participating establishments and students include empathy, historical literacy, and attention to detail.

Other platforms such as *iNaturalist* are used not only to study biodiversity but also to inspire storytelling, poetry, and reflective journaling that connect students with their local environments (Nugent, 2018). These participatory approaches promote "place-based education" that situates learning in local context and personal experience (Smith, 2002). In this, particular case students write descriptive essays, poems, or digital stories achieving learning outcomes such as vocabulary expansion, creative writing, ecological and civic awareness.

Project *BudBurst,* is based on learning about plants and phenology, monitoring the life cycle of plants and discovering the connections between humans and their natural and urban environment. Recently the project has managed to develop material and participatory projects that allows individuals and groups to understand, in practical terms, the impacts of climate change.

Even quite specialized program such as the one operated by the *School of Ants* is very successful in exploring why invasive species and local history are necessary to understand seasonal change in historical or indigenous contexts.

Discussion

The analysis above indicates that citizen science has been successful in promoting inquiry-based learning, hands-on engagement, and increased scientific literacy (Bonney et al., 2009; Ballard, Dixon, & Harris, 2017). Educational research also shows that citizen science improves not only content knowledge but also student motivation, confidence, and environmental awareness (Gray et al., 2012). Scholars such as Smith (2002) have highlighted the link between humanities education and interdisciplinary learning, by advocating that place-based learning links the classroom content to the local context and experience—an approach closely aligned with many citizen science projects that rely on field observations or historical analysis tied to specific locations. In other words since humanities education emphasizes interpretation, empathy, cultural context, and civic understanding, it benefits tremendously when students critically examine texts, create local narratives and live experiences from multiple perspectives.

Interdisciplinary education literature also highlights the value of integrating scientific and humanistic thinking. According to Repko (2012), real-world problems require students to navigate across domains of knowledge, blending empirical observation with narrative, ethical reasoning, and cultural understanding.

In order to develop Citizen Science in different educational field it is necessary to emphasize civic engagement, cultural engagement, critical thinking in according with the figure 1.

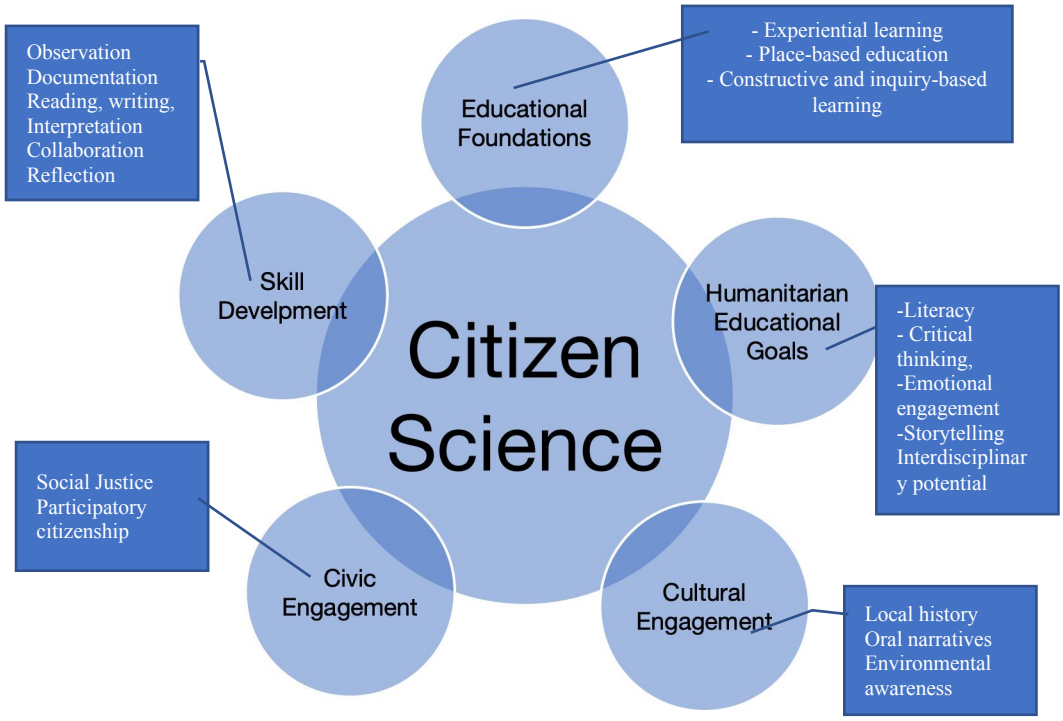

Figure 1. Defining Citizen Science
Source: own processing

Citizen science naturally supports such integration, particularly when projects are adapted to highlight reflection, storytelling, or historical interpretation.

CONCLUSION

Over the past years Citizen Science has traditionally, been associated with science education. However, many studies and reports from CS organizations (presented above) show that CS can serve as a transformative educational tool in humanities-oriented schools by fostering interdisciplinary learning, enhancing student engagement through real-world participation, and promoting civic awareness, historical literacy, and reflective practices.

Citizen Science has proved an innovative educational tool for enriching humanities education by bridging experiential learning with interdisciplinary projects involving community participation and engagement. In this way, although CS is aligned with environmental and scientific fields, it now expands and serves disciplines such as history, literature, and social studies, demonstrating its versatility and relevance to education in general. By embracing CS, humanities educators can bridge the gap between traditional academic content and lived experience, since students can become not just learners, but contributors to knowledge, history, and social change, by participating in real-world research and data acquisition. In addition, students contribute to broader knowledge communities; develop critical thinking, ethical awareness, and a deeper connection to their local and global environments. Hecker et al. (2018) argue that as CS expands into new fields, its role in supporting critical thinking, ethical reflection, and social awareness, fostering a sense of place, identity, and civic engagement among students, becomes even more important.

The above-described transition does, of course have challenges. These center around teachers and educators who need to adapt and adopt Citizen Science methodologies as tools for engagement, reflection, and active learning across diverse disciplines. Teacher preparedness and training,

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curriculum alignment and standards, time, technology and accessibility limitations, should all be taken into account.

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