Open for Whom? Universities and Citizens Science; and Citizen Science beyond Universities

… Is there a new role for academic and research libraries to support Citizen Science?

We talk a lot about open/FAIR data in Europe. How can we make sure that open/FAIR data standards are also implemented in Citizen Science projects? And what are the best approaches to promote the use of open science practices in Citizen Science projects — open access publication, open data, use of open source software, etc.? There is still a need for more guidelines, training and support.

And for us in the OpenAIRE project the question are on how OpenAIRE could facilitate Citizen Science and how to embed Citizen Science output in the OpenAIRE infrastructure? How could we serve Citizen Science training needs? How could we strengthen communities of practices learning from each other, sharing best practices and collaborating? And what about Citizen Science beyond universities?

*In OpenAIRE, we have launched The Open Schools Journal for Open Science (**https://ejournals.epublishing.ekt.gr/**) — the first European peer reviewed scientific journal, which accepts original papers written by school age students from secondary schools across Europe under the mentoring of their teachers on all aspects of Science, Engineering and Technology. Publication is free of charge and the journal publishes articles in various languages. The articles are peer-reviewed by researchers and through this process students develop critical thinking skills and learn more about the importance of supporting their opinion. Three journal issues have been published so far with 59 articles. And before the end of the current school year we plan to publish 80 more articles.*

We have also launched a Schools Seismic Data network that consists of 65 seismometers installed in Bulgaria, Cyprus, Greece, Israel, Italy, Portugal and Turkey. And we have populated the seismic data database with more than 20,000 recordings in the form of waveforms stored in SAC formal files. There are more than 150 schools involved in different initiatives focusing on the analysis of the data: location of the epicentre of the earthquake, development of early warning algorithms, the Earth tomography, analysis of seismic and volcanic earthquakes, design and construction of home-made seismometers, etc. This project offers school students unique educational opportunities for scientific data analysis.

But how can we use of the seismic data provided by schools? What if students are given the challenge on how to provide insights to distant places and send warnings to other schools? In October 2019 we have launched the first phase of the Hackquakes in collaboration with the Institute of Geodynamics, the National Observatory of Athens, the ATHENS Research and Innovation Center, the ELLAAK Organization and Ellinogermaniki Agogi, to show how open science and open data can be used to benefit society and at the same time to trigger and include students in the process.

We have started with the fact: Seismic waves from the earthquake in Albania at 14: 04: 25.2 (UTC) on September 23rd, 2019 first arrived at the school seismograph in Igoumenitsa at 14: 04: 58.4 and after half a minute at the school seismograph in Athens at 14: 05: 36.0. And our question was: Could Igoumenitsa's school send a warning to the school in Athens before the earthquake arrived? Could the Tirana school be the first to alert the two schools?

School teaches were introduced to the basic concepts of earthquakes and alerted on the importance of early warning in emergencies. The Infrastructure coordinator of Hellenic Data Service provided guidance on how to host open data from the school seismograph network to be re-used in a variety of ways by the learning community, and how this data through the Python programming language could provide an early warning system for earthquakes. Teachers will come back with their students for the second phase of Hackquake to work together and to develop an early warning system. And the best team will win a school seismograph.

*Our third area of activities supports Nobel Prize Physics in the classroom with ZENODO. A series of educational activities are being developed and documented, that utilize data from large research infrastructures in the field of Physics (VIRGO, KM3NeT, CERN) and provide learners with the challenge to analyse these data and to help optimize the operation of these large scale research infrastructures by doing 'noise hunting'. Students are asked to locate sources of noise in the data sets and perform tests on their effectiveness (e.g. identification of bioluminescence events in deep ocean environment, or earthquake signal identification in the VIRGO detector). The outputs of these activities are being uploaded in the **FRONTIERS Community in ZENODO**, along with datasets used and online tools available. This process has already involved 20 teachers from 20 schools in Europe and our plan is to reach out to over 100 teachers.*

These are just some of the areas that we will be looking at and exploring in the coming year via online discussions and face-to-face meetings, such as a Citizen Science workshop co-organized with the European University Association in the end of March – beginning of April next year. Join us if you would like to get involved!

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