CROPS MOOC

CITIZEN SCIENCE PROJECT PLANNING WORKSHEET

Scientix® is the community for science education in Europe. It is an initiative of European Schoolnet (EUN) that aims to promote and support a Europe-wide collaboration among STEM teachers, education researchers, policymakers and other educational stakeholders to inspire students to pursue careers in the field of Science, Technology, Engineering and Mathematics (STEM).

Funded by the European Union

Project funded by the European Union. Views and opinions expressed are those of the author(s) only and do not necessarily reflect those of the European Union or the granting authority (REA). Neither the European Union nor the granting authority can be held responsible for them.

Introduction

This template is designed to help you plan your citizen science Learning Scenario and select the most suitable citizen science project for your students based on alignment with your educational goals, the skills of your students and the resources available to you.

General Information

PROJECT NAME	HackAir – Air Quality Citizen Science Project
EU MISSION	Climate-Neutral & Smart Cities
LOCATION	School surroundings and local community (outdoor areas near roads, parks, neighbourhoods)
TIME COMMITMENT	Approximately 1 week of short sessions (4–6 class hours in total).

Purpose of the Project

The HackAir project aims to better understand how air quality varies across different locations and time periods by collecting a large number of measurements from citizens. Researchers want to identify patterns and trends in concentrations of particulate matter (especially PM2.5 and PM10) in urban and suburban areas. By combining many local measurements, they can build a more detailed and accurate picture of air pollution than would be possible using only a few official monitoring stations.

Another key goal is to raise awareness about air quality and its impact on health and daily life. By involving citizens—especially students—in the data collection process, the project encourages people to observe their environment more critically and to reflect on how human activities (such as traffic, heating, and industry) influence air pollution. In the long term, researchers hope that this greater understanding and the open sharing of data will support better decision-making, inspire local actions to reduce pollution, and contribute to the development of more climate-neutral and healthier cities.

Benefits of the Study

The study offers important benefits for participants (students and citizens), researchers, and the wider community.

For **participants**, the project provides an opportunity to actively engage in real scientific work rather than only learning about science from textbooks. Students develop practical skills in data collection, critical observation, and the use of digital tools such as the HackAir app. They also strengthen their mathematical and statistical competences by working with real measurements instead of artificial examples. At the same time, they become more aware of air quality issues and how these can affect their health and daily lives, which can motivate them to adopt more environmentally responsible behaviours.

For **researchers**, the involvement of many citizen scientists generates a much larger and more detailed dataset than they could collect alone. The measurements obtained through HackAir help researchers to identify local variations in air pollution, validate models, and monitor changes over time. This richer data source can improve the accuracy of scientific studies and support the development of more effective environmental policies and interventions.

For the **wider community**, the project increases transparency and awareness around air quality. Open access to locally collected data allows citizens, schools, and decision-makers to better understand pollution levels in specific neighbourhoods. This knowledge can inform discussions about traffic planning, urban design, heating practices, and other measures aimed at reducing emissions. In the long term, such citizen science initiatives can contribute to healthier living conditions and support the goals of climate-neutral and more sustainable cities.

Topic Suitability

The HackAir project is fully aligned with my teaching objectives and the mathematics curriculum for first-year secondary school students. The curriculum emphasises the development of statistical skills such as data collection, organisation, graphical representation, and the calculation of measures of central tendency and dispersion (mean, median, range, variance, standard deviation). HackAir provides authentic, real-world data that allows students to apply these concepts in a meaningful context rather than through abstract numbers.

The project also supports broader curriculum goals such as developing critical thinking, interpreting data in context, and understanding the role of mathematics in solving real-life problems. By analysing air quality in their own community, students can see the direct relevance of mathematical tools for understanding environmental issues. Additionally,

the project naturally integrates elements of ICT, science, and civic education, aligning with cross-curricular themes such as sustainability, digital competence, and responsible citizenship.

Overall, the topic is highly suitable because it combines mathematical learning goals with real-world inquiry, promotes student engagement, and strengthens both data literacy and environmental awareness.

Participation as Citizen Scientists

My students and I will participate in the HackAir project by engaging directly in several stages of the citizen science process. Together, we will begin by discussing possible research questions related to local air quality and selecting specific locations around the school and nearby community where measurements will be taken. Students will then collect data using the HackAir mobile app, which records PM2.5 and PM10 levels along with time, weather conditions, and GPS location.

After collecting the data, students will upload the measurements to the HackAir platform, contributing valuable information to the project's wider database. In the classroom, they will take an active role in organising the raw data, entering it into spreadsheets, and performing statistical analyses, including calculating averages, medians, ranges, variances and standard deviations.

Students will also interpret their results by comparing pollution levels across locations and identifying possible factors influencing the data. Finally, they will communicate their findings through graphs, presentations or posters, sharing both their scientific observations and their contribution to the citizen science initiative. This full involvement allows them to experience what it means to act as real citizen scientists.

Method Suitability

The project methodology is very well matched to the cognitive and practical abilities of my students. First-year secondary school students (ages 14–15) are already capable of understanding basic environmental concepts and following clear instructions for data collection. The HackAir app is simple, intuitive, and requires only basic digital skills, which makes the data-gathering process accessible and manageable for all learners.

From a cognitive perspective, the mathematical tasks—such as calculating mean, median, range, variance and standard deviation—align directly with the curriculum and fall within the level of abstraction that students at this age can successfully handle. The process of transferring measurements into tables, generating graphs, and interpreting patterns helps students connect theoretical statistical concepts with real-world data in a concrete and meaningful way.

The project also suits their developmental stage because it combines outdoor activity, digital tools, collaborative work, and hands-on data analysis—all elements that help maintain motivation and engagement. Overall, the methodology is appropriately challenging but fully achievable, supporting both skill development and genuine understanding.

Special Knowledge Requirements

No specialised training is required for successful participation in the HackAir project. Students only need basic digital skills to operate the HackAir app, which is simple and user-friendly. Before data collection begins, they will receive short instructions on how to correctly hold the device, record measurements, and document environmental conditions such as weather, location, and time.

The scientific protocol is easy to follow and does not require any advanced laboratory knowledge or technical expertise. As long as students understand the importance of consistent measurement procedures and accurate data recording, they can fully and safely participate in the project.

Required Equipment

To participate in the HackAir project, students will need smartphones or tablets with the HackAir mobile application installed. This is the primary tool for measuring PM2.5 and PM10 levels. Internet access is required to upload the collected data to the HackAir platform.

For analysis in the classroom, students will use computers or tablets equipped with spreadsheet software such as Excel or Google Sheets to organise data, perform statistical calculations, and create graphs. Optional materials include notebooks for recording observations, weather information apps, and printed data sheets for backup.

All required tools are easy to access and rely on standard digital devices commonly available in schools, making the project practical and feasible for the entire class.

Data Sharing and Communication

All air quality measurements collected through the HackAir app are automatically uploaded to the HackAir online platform, where they become part of a larger citizen science database accessible to researchers and the public. This ensures that students' contributions directly support ongoing environmental monitoring and analysis.

Within the classroom, students will communicate their findings by organising the data in spreadsheets, creating graphs, and interpreting trends. They will present their results through short group presentations, posters, or digital infographics. These presentations allow them to explain both their statistical analysis and the environmental implications of their data.

Optionally, results can also be shared with the wider school community—through a class bulletin board, school website, or a brief report to school leadership—to raise awareness of local air quality issues and demonstrate the value of citizen science.

Legal and Ethical Requirements

There are no significant legal or ethical concerns associated with student participation in the HackAir project. The data collected—PM2.5 and PM10 levels, time, and general location—is environmental data, not personal data, so students' privacy is not at risk. GPS information is used only to map air quality measurements and does not include any identifiable personal details.

To ensure safety, students will conduct measurements only in safe, supervised outdoor areas near the school or their local neighbourhood, following standard school safety guidelines. They will also be instructed to avoid dangerous locations such as busy roadsides without proper supervision.

In terms of device use, students will follow the school's digital responsibility rules. With these precautions in place, participation in the project is safe, ethical, and compliant with data privacy standards.