

Bringing citizen science to the classroom

A unique participatory science project involves lower secondary students across Europe in research to understand the effects of climate change on trees. Digital technology is allowing innovative collaboration such as this to enrich both science and education, but it requires careful organization and oversight.



“Look, you can see the trace of the bird’s beak really well.” At the base of a shady oak in the courtyard of the Gaston Flament lower secondary school, Émilie Goyran examines evidence of how a bird was fooled by a fake caterpillar made of green modelling clay.

Two weeks earlier, at this school 30 km from Bordeaux, this earth sciences teacher and her class had made these 3-cm-long lures and placed them on the branches of the tree. Clearly, the birds had fallen for the trick, leaving beak marks in the clay: an exciting discovery for the participants in this open-air natural science course. Back in the classroom, they will observe their fake caterpillars under the microscope to determine which have been confused for prey. Then they will scrupulously record the results of the experiment.

Learning science by doing

A fun approach to learning science? Yes, but more than that. These students are also providing key data for a research programme called Tree Bodyguards. The aim of the project is to understand tree resistance to herbivores and identify possible biocontrol solutions to promote tree health in a context of climate change. In this particular case, students are observing how the tree (a pedunculate oak) is defended by other organisms (birds) against herbivorous insects (caterpillars). The scientists directing the project hope to use this data to predict how these natural defences may change due to global warming with the objective of helping trees adapt.

Launched in 2020, this project is coordinated by the French National Research Institute for Agriculture, Food and the Environment (INRAE) research site in Cestas, some 15 km from the school. Supported by the BNP Paribas Foundation's Climate & Biodiversity Initiative, the project is led by Bastien Castagneyrol, a research fellow at INRAE specialising in ecology.

A participatory project that involves students across Europe

"To get a large sample size, we need to deploy these fake caterpillars as widely as possible," explains the scientist. "As this is a relatively inexpensive and fun method, as well as being effective, the idea of working with schools came up very quickly." The students at Gaston Flament were pioneers in this approach, but today they are part of a network providing essential data. "There has been a ripple effect," continues the researcher. "We now have 40 scientific collaborators and between 80 and 100 earth science classes from 23 countries around Europe that have participated in the project, from Spain to Scandinavia."

This collaborative international study focuses on a crucial issue: the future of our forests. The pedunculate oak, which owes its name to the long peduncle (stalk) that attaches the acorns to the twigs, is native to most of Europe. It can reach 40 m in height and live for hundreds of years. The oldest are thought to be two oaks in Bulgaria that are more than 1500 years old. Yet its longevity depends on its environment – global warming threatens forest ecosystems, and it is uncertain how oaks will adapt.

Protecting the pedunculate oak

Beyond all the reasons why conserving trees is vital for the environment – forests are home to the majority of biodiversity on land and also store carbon dioxide – the pedunculate oak has economic importance. Along with the sessile oak, it is one of the main types of timber in Western European forests. Oak is a major part of the French forestry and wood industry. Nearly 40% of the oak growing in Europe is in France, which is the world's second largest producer of this species (the United States is the first).

Translation of the article: <https://www.wedemain.fr/articlesponso/grace-aux-sciences-participatives-la-recherche-sinvite-a-lecole/>

There are a growing number of participatory science projects like Tree Bodyguards that involve citizens in research. This is particularly the case in ecology, Bastien Castagneyrol observes in an article for *The Conversation*. The researcher sees the approach as “an amazing tool for fostering dialogue between science and society. It’s also a learning tool that remains underexploited in science education.” The message he wants to get across to young people? “Why they should trust scientific results rather than a post quickly scanned on a website or social network.”

Science centres that bring together research and education

But there are challenges in developing these types of projects, warns the scientist. One is “aligning the objectives of scientific research and those of science teaching in all its facets”. This is not easy, as “participatory science approaches are still little known to teachers, although school programmes invite them to be used”. And they can be difficult for researchers to adopt, as scientists do not always have an educational background. A solution is a “third party” that can serve as an intermediary. In France, this role is played by science centres known as *Maisons pour la Science*: university-based hubs that “provide a link between the worlds of research and education”.

Mauricette Mesguich, earth sciences teacher, teacher trainer and director of the *Maison pour la Science* in Aquitaine, the region where Bordeaux is located, is involved in the Tree Bodyguards programme. “The project allows [the students] to see science in the making by participating in setting up the protocol and collecting the data, (...) then to understand what information can be drawn from it,” she explains. Emilie Goyran, the earth sciences teacher, sees another advantage: “This project develops a real curiosity about the environment around them.” For their part, the students are enthusiastic about the approach. “We have lessons, but we’re not in a room watching the teacher write on a blackboard and taking notes. It’s freer,” one comments.

These benefits weigh in favour of overcoming the challenges in this approach. In a survey Bastien Castagneyrol conducted with 13 teachers involved in the Tree Bodyguards project, while they stated the project was an opportunity for students “to participate in a genuine scientific research project”, it did not allow them to “acquire knowledge of ecology or contextualize learning”. The researcher’s recommendation to address this concern is “to adapt protocols to students’ skills at a given level, aligned with the school calendar and curriculum.”

Citizen science, an approach taking root

Meanwhile, participatory science is also making inroads outside schools. Last March, INRAE organized its first Participatory Research Prize, which was awarded to a project involving researchers and citizens with the aim of gaining a better understanding of the

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ecology of ticks and the diseases they transmit. During the project, 70,000 tick bites were reported via smartphone app, and 50,000 insects were frozen to form a “tick library” that is unique in France.

Other projects for aspiring citizen scientists include:

- * Annotating images acquired by seafloor observation systems for the oceanic institute Ifremer
- * Monitoring pollinating insects by photographing them using the Natural History Museum’s Spipoll app
- * Classifying images of the cosmos with the Galaxy Zoo tool.

Everyone can now participate in science with their smartphone, inside the classroom or out!

Arthur Hily