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Cooperation to Raise Learner Awareness & Encourage Community Participation

ABSTRACT

My interest in incorporating citizen science (CS) into one of my content-based English courses arose from a desire to link classroom activity with "real-world" situations and/or activities. The impetus was less a language learning goal than an inspiration to utilize a platform for bringing my second year junior college students' attention to pressing environmental issues, primarily the climate crisis, to foster both broader awareness of the issues, as well as their agency in addressing them.

Attending the LD30 Conference persuaded me that the language learning aspect can also potentially be strengthened through incorporation of techniques such as PBL (project-based learning). Based on what I learned from the PBL experiences of colleagues at the conference, I have suggested an enhanced approach to exposing students to CS that also facilitates language learning. The paper ends with some suggestions for projects that could be used with non-science majors.

Keywords: content-based instruction, citizen science (CS), project-based learning, real life research project

For over ten years, I have been teaching a content-based second-year geography course in English (L2) to my junior college English department students. It provides a useful platform for introducing topics such as the climate crisis, sustainability and sustainable development. However, the scope and depth to which the issues can be addressed is limited by time, and instruction in L2.

One avenue I am currently exploring is to encourage learners to participate in locally available "citizen science" (CS) activities. For the most part, these would not be conducted using the learners' second language, but their introduction and discussion in the classroom can potentially lead to independent learner involvement outside the classroom. I can reasonably anticipate positive effects on both their lives and their local community.

In his presentation at LD30, Robert Moreau introduced project-based learning (PBL) as being based on the pedagogical principle of "learning by doing" (Moreau, 2023), which resonated with me as my goal of raising awareness is one best reached by having learners directly engage with activities that can assist them in better grasping the implications of the concepts they are exposed to in the course. Although their engagement is not necessarily related to language learning, I think it is important from the point of view of cultivating a deeper understanding and appreciation of environmental issues.

Hokusei Gakuen Junior College, where I teach, has offered content-based courses since 1994. These may variously be referred to as content-based instruction (CBI), content-based language teaching (CBLT), or content and language integrated learning (CLIL) courses. Subjects include anthropology, life science, and geography, amongst others. Every teacher has their own approach. As the instructor for the geography course, my background in geography and environmental studies allows me

to provide knowledge of the issues and their interconnectedness, though time and the fact that students are non-majors studying in a second language limits how deeply they can be addressed.

Geography is a second-year elective course, though as students are required to take several of these electives to fulfill graduation requirements, they may not always take it out of interest in the subject. I do, however, assume that most *are* motivated out of interest and I make efforts to provide activities that they will enjoy. As they are English majors, most of the coursework is carried out in English, but using Japanese (L1) for expansion activities in the community outside of the classroom cannot be avoided. I also assume that any students participating in activities such as these, which are not mandatory, will be more motivated in general and should benefit from the further intellectual stimulation.

My participation in the LD30 Conference served to remind me of the benefits to learner development of fostering engagement and autonomy and helped me to develop a better understanding of how PBL could be applied to my situation.

CITIZEN SCIENCE (CS)

As a child growing up more or less in the middle of the forest in rural eastern Canada, observing nature was a daily routine. Watching the changes occur in our local blueberry field after drainage ditches were dug nearby and how the once bountiful wild fruit bushes gave way to scraggly spruce trees gave me an eye for observing cause and effect. Noting the changes brought on by the climate crisis to my current home in Hokkaido has inspired me to try and use my content-based geography course for second-year English majors as a vehicle for increasing their awareness of the profound changes that will impact their lives in the near future.

Getting out into nature and having firsthand experiences is one of the best ways to see the situation, and I have considered the possibility of some kind of field trip, but the logistics are challenging. As a result, I have been constantly on the lookout for *something* that could serve as an opportunity to expose my students to Hokkaido's natural environment and also be a learning experience for them.

When I eventually found a project that seemed to be a straightforward participatory activity with little barrier to entry, I decided to introduce it to my students and to estimate their level of possible interest. Researching the background of this project called Herpthon, which I detail later in this section, I came to be aware that this type of activity fell into the category of so-called citizen science (CS), defined in easy-to-understand terms by Vohland et al. (2021, p. 1):

> "Citizen science broadly refers to the active engagement of the general public in scientific research tasks. Citizen science is a growing practice in which scientists and citizens collaborate to produce new knowledge for science and society."

Although anyone with interest and curiosity can engage with science in general, my interpretation of the concept of CS is that non-specialists, such as my students, would be able to have their hands-on interaction with nature become an effective learning experience by contributing to projects run by researchers or other groups with specific scientific goals.

In a sense, sharing is at the root of CS. Even non-specialists can engage with important scientific research in a variety of ways. Members of the general public can help scientists to better use their time by assisting with mundane and time-consuming, but crucial, tasks that might otherwise take scientists away from doing what they do best. By becoming involved, citizen scientists can not only help scientists perform their crucial research more efficiently, but also increase their own knowledge of the issue, or acquire new knowledge and understanding that they can then further share with their circle of acquaintances, family, etc. Learners as citizen scientists can be expected to enrich awareness within and among their current communities, and to join new communities, which will also benefit from such participation.

Figure 1 illustrates the three goals that are associated with CS (Kobori, 2022). I feel that these fit in well with my hopes for what learners will take away from my course. They will likely align with the aims of almost any course as well.

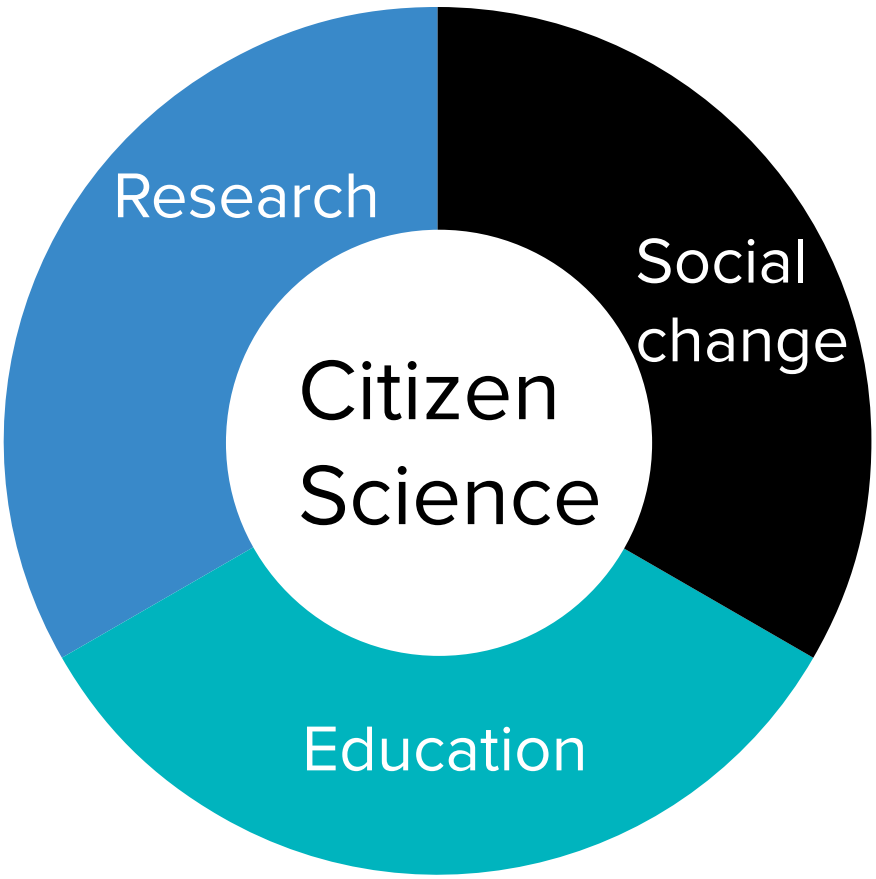

Figure 1: Three goals of CS (adapted from Kobori, 2022)

Various studies point to the benefits of participation in CS, even for those who are not initially familiar with the background of the project, or even science in general. According to Marley et al. (2022), CS is an example of "real life research projects" (RLRP) which can provide data for scientists while also increasing the confidence and engagement of students. It is most effective if related to the students' field of study (science majors) but does not have to be. A study by Mitchell et al. (2017), found that although student participants lost some confidence in the quality of data collected, the experience can encourage them to improve their data collection approach. In the context of my non-science major students, I hope for and foresee their increased awareness of scientific issues, allowing them to engage more proactively in conversations on related topics within and outside of their current communities.

Although the concept of CS appears relatively easy to embrace, the next challenge lies in identifying examples of CS that learners can participate in. Quick searches on the internet seem to suggest that CS projects are fairly common in North America and Europe. In my own teaching situation at Hokusei Gakuen, in Sapporo, Hokkaido, Japan, options are limited. My approach toward incorporating CS is to identify projects currently in progress that the students could join with a minimum amount of advance preparation. As CS projects will have started before my course and continue after it has finished, student participation will only be transient with regard to the CS project itself, but it can be hoped that some of them may be motivated to continue after the course and even after graduation.

Despite a first attempt in the spring 2023 semester, my students have not as yet actually participated in CS projects. I am planning to use CS projects in my geography classes from April this year (2024),

so I have spent time trying to find appropriate examples to present to them as options. One activity that takes place in various locations in or near Sapporo is tree planting. Tree planting may not at first appear to be an example of CS, since contribution to research is one of the stated goals of CS. However, the approach to planting trees has evolved from simply getting as many trees in the ground as possible, with little regard to what varieties were present previously, to reproducing levels of diversity that would contribute to more sustainable forests as the trees mature.

Participating in ecologically planned tree planting projects can educate the participants, interested citizens in general, and my students in particular, as to why it is important to not just plant any tree, but that the selection is part of a scientifically conceived plan to obtain the best results in terms of ecology, biodiversity and benefits to people as well. Therefore, tree planting that involves monitoring may also be an engaging type of CS (Idris et al., 2022).

By joining a project that utilizes a platform such as iNaturalist (https://www.inaturalist.org/) for posting photographs taken by both citizen scientists and expert researchers, the non-specialists can learn how to take photographs that will be of use to the research in question. For example, many species, whether animal or plant, are difficult to distinguish on the basis of a single photograph, due to similarities in appearance. Photographs that are taken from various angles allow distinguishing features of the subject organism to be identified. Although explanations of these techniques can be found on the platform in various forms, explicit instructions to students from the project coordinators and/or from the instructor can provide additional guidance and scaffolding.

The popularity of iNaturalist with educators at many levels has meant that there have been instances of mostly disinterested participants posting inappropriate or non-useful data to the site, causing some frustration to the community. As a result, a more general app called Seek (https://www.inaturalist.org/pages/seek_app) was developed and is recommended for projects where learner participation is mandatory. Unlike iNaturalist, users need not be identifiable, and the anonymity is suitable for younger learners. This platform can be useful for some educators wishing to engage their learners in CS from a young age and in situations where participation is required. However, this does not suit my approach.

My first attempt at interesting my students in participating in CS was an event called Herpthon 2023 (https://koke-koke.com/Kamui/archives/category/herpthon). The name is derived from “Herpetological Marathon”, and the concept is for ‘teams’ of participants to take photographs of (living or dead) reptiles and amphibians found in Hokkaido. Participants are also invited to make recordings, for example of frogs croaking, since photographing them may be difficult. An incentive of sorts existed in the form of a competition for the best photograph taken during the 2023 iteration of the marathon. In addition to the fact that there are a limited number of amphibian and reptile species in Hokkaido, meaning less complexity, the period of the ‘event’ corresponded quite closely to the length of the university’s first semester. I felt that this would also help me to ease into the experience of CS in general. Although a handful of students expressed some interest, in the end none actually took up the challenge. An earlier start and better explanation may have helped, but the main reaction from students was revulsion at the idea of having any interaction with ‘uncute’ animals such as frogs and snakes, whether living or dead, so a psychological hurdle to participation exists and I will need to think carefully about which projects to introduce.

Whether it is photographing amphibians and reptiles for a project such as Herpthon, planting trees in an ecologically sound manner, or any other activity that contributes to scientific research, understanding or practical outcomes, there can be various levels of complexity or depth of participation. Haklay (2013, p. 115) proposes four “Levels of participation and engagement in Citizen Science projects” as compiled in Figure 2.

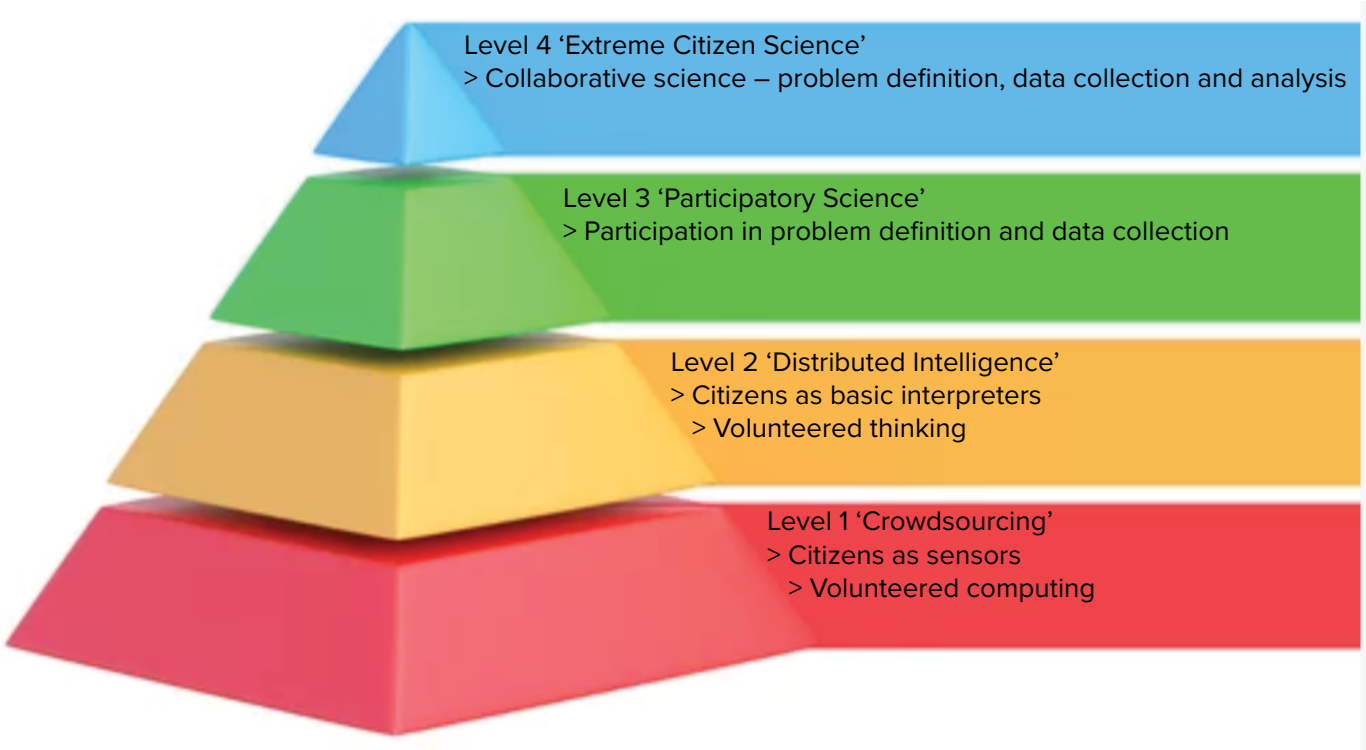

Figure 2: Levels of participation and engagement in citizen science projects (from Haklay, 2013)

As they involve less of a deep understanding and expertise on the part of participating students, Level 1 and Level 2 are of most interest and relevance to my situation. Level 3, involving data collection, may also be possible as the students gain more confidence in their ability to participate. However, it seems reasonable to assume that basic data collection of the kind that my students might engage in, such as photographing animals and recording other relevant information about them and when or where they were spotted, would be included in Level 1 participation.

Another CS project that may interest my students is the "Hanamaru Maruhana (Bumblebee National Census) Project". This project is introduced on Fukuoka University's Faculty of Commerce, Citizen Science Research Centre website and may attract more student interest than the "Herpthon" project. The center identifies it as a good example of a citizen science project that fits into the Level 1 'Crowdsourcing' category (Haklay, 2013), since participants from around the country provide photographs they take of bees, and which are used to create a census for bumblebees. As this appears to be an ongoing project, it may be a good addition to the choices of project for students, given its relevance to geography topics such as ecosystems and farming/resources. In Hokkaido, *Bombus terrestris*, the buff-tailed bumblebee, common in Europe, is classified as a 'designated invasive alien species' and there is concern that it will displace the native bumblebees, so participation in the project can raise learner awareness of the situation, its effect on Hokkaido ecosystems, and also encourage them to think about the consequences for and impacts on agriculture in Hokkaido. That may also motivate them to create connections between participation in the activity and their choice of foods to use in a second semester in-class activity where, in groups, they research locally produced foods to create a 'Hokkaido Breakfast' and locate the production regions on a map of the prefecture.

ENVIRONMENTAL EDUCATION AND PBL

Although incorporating CS into my course is not a formal example of environmental education, a model outlining the progression in environmental education from an initial focus on information proceeding through to action, introduced by Henderson and cited in Jacobson (1999), is a good summary of my expectations for the path that learners would follow (Figure 3).

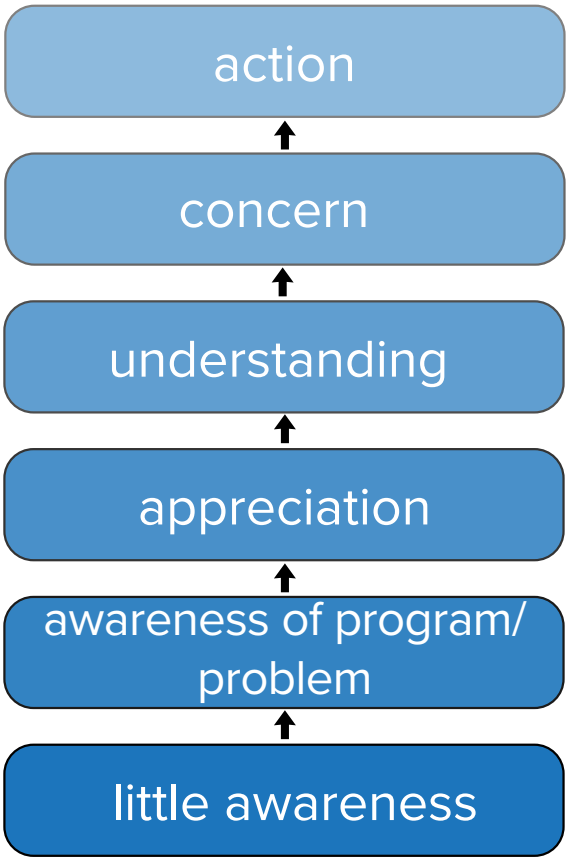

Figure 3: Awareness-to-action model (adapted from Jacobson, 1999)

Jacobson emphasizes that even as familiarity with the program/problem increases, "...the first few levels of the hierarchy always should be included in educational programs, even for adolescents and adults, because the awareness phase of learning remains important and enjoyable for mature learners," (Jacobson, 1999, p. 239). I also agree with this philosophy and approach to education on environmental issues, as it will serve to remind learners of what they should be trying to achieve. The life experiences of project participants will place them at varying levels of the model from the outset, but through continual stimulation of awareness and understanding of the environmental issues, all should be able to make progress rapidly to a stage where they can engage in meaningful action.

Despite having an understanding and image of what an approach based on environmental education principles entails, before attending the LD30 Conference, I did not have a clear image of how to integrate a CS project into my course in a structured manner. Attending a presentation on PBL at the conference given by Robert Moreau introduced me to a possible framework for introducing CS.

In his presentation, Moreau (2023) introduced Stoller and Myers' (2020) five-stage framework, consisting of preparation, information gathering, information processing, display and reflection. I felt that this was something that I could use. Given that I am in the preliminary phase of trying to incorporate citizen science activities into my course as a complement to the main (assessed) content, I will not attempt the more advanced stages of display and reflection. In my approach, preparation will involve introducing the concepts behind citizen science and the background of the projects which will be featured as options for the learners to engage with. Information gathering and processing at this point in time will not be highly structured, nor given overly strong emphasis. Instead, there will be more emphasis on the experiences directly had by students as they participate in their chosen projects, and the awareness generated as they come to realize the significance and/or utility of the information/data that they are contributing to the project.

Although the use of PBL in my course seems a good fit, this was my first exposure to it, and none of my colleagues at my school use it either. It will obviously take some time and research to obtain a clear grasp of how it is best implemented and how to approach using it effectively. As part of my investigation into PBL, I found the emphasis by McDowell (2017) on "confidence in learning attributes" (growth mindset, assessment-capable learning and collaboration) and "competence in learning levels" (surface, deep and transfer) to have strong appeal, and the idea that PBL could facilitate the cultivation of these in my learners further increased my interest in this method.

Although face-to-face work on tasks and collaboration is a very important skill for learners, it is also true that some of them find it very difficult to work with others in a face-to-face situation. I have experience with a variety of learners who have expressed misgivings about being required to operate in such contexts. The use of technology, with which many of them are more comfortable than direct human interaction, may help to alleviate this, as well as enhancing overall collaboration. I think that finding CS projects that also allow this type of more indirect participation is one way of accommodating such learners.

The times that we live in present enormous variety in how we can engage with science and with each other and as Busch (2013, p. 209) writes, it can be anticipated that introducing learners to websites or applications which involve them in CS endeavors will, "nurture a collective effort, a sense of collaboration and community that is particular to these times" independent of the original ostensible goal of learning a second language.

CONCLUSION

With all these still-expanding connections being made, I further appreciate the experience of attending LD30, and even feel excitement at the prospect of bringing all these threads together, whether in my current courses, or in a future course that I may design and teach. The exposure to PBL in particular will help with how I structure my approach. A project related to ecosystems and invasive species introduced by McDowell (2017), despite being a kindergarten project, convincingly illustrates the suitability of CS for use in a PBL environment. Activating student interest is an ongoing challenge but exposing them to examples of what their peers are capable of achieving, and also by giving them the opportunity to 'get their hands dirty' in CS projects, should engage their interest and curiosity. All these experiences hold the potential to raise their awareness of a range of issues, awareness that they will pass on to members of their communities and also engage their capacity to think critically. That to me is a very worthwhile outcome.

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