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CLIL Ecology: Bioactive Terrarium and Campus Walk

Brad Barker

Rikkyo University, Japan

Abstract

This article introduces two projects that were part of a new CLIL: Ecology course at a private university in Tokyo, Japan: 1) assembling a bioactive terrarium and 2) a campus walk. For the terrarium project, each week, one step of the terrarium assembly was completed in the classroom with students. The terrarium ecosystem has contained several species of moss, a fern, ornamental plants (e.g., a jewel orchid), fungi (e.g., enoki mushrooms), springtails (decomposer hexapods), and other organisms, such as bacteria. The hands-on project added a practical element to the course. The content and language were "interwoven" [6] and emergent [7]. That is, the terrarium generated questions, comments, and language that emerged naturally, and lessons were driven by student interest and curiosity. The terrarium was started in 2024 and has been alive for more than 340 days. Students receive periodic terrarium updates via social media (Instagram). During the campus walk, the teacher and students went outdoors to study and document the plants, fungi, and animal life on the urban campus. Participants photographed and identified more than 20 species of cultivated plants (e.g., Metasequoia glyptostroboides / Dawn Redwood), wild plants (e.g., Allium macrostemon / wild garlic), fungi (e.g., Pleurotus sp. / oyster mushrooms), and animal life (e.g., cicadas). Photographs, notes, and references were added to a Google Slides document to record the findings of the campus walk and subsequent research. One positive outcome of the activity was that it reinforced classroom concepts and skills, such as scientific names, taxonomy, species interactions (e.g., mutualism, parasitism), and plant identification.

Keywords: *CLIL, ecology, terrarium, campus walk, science, taxonomy*

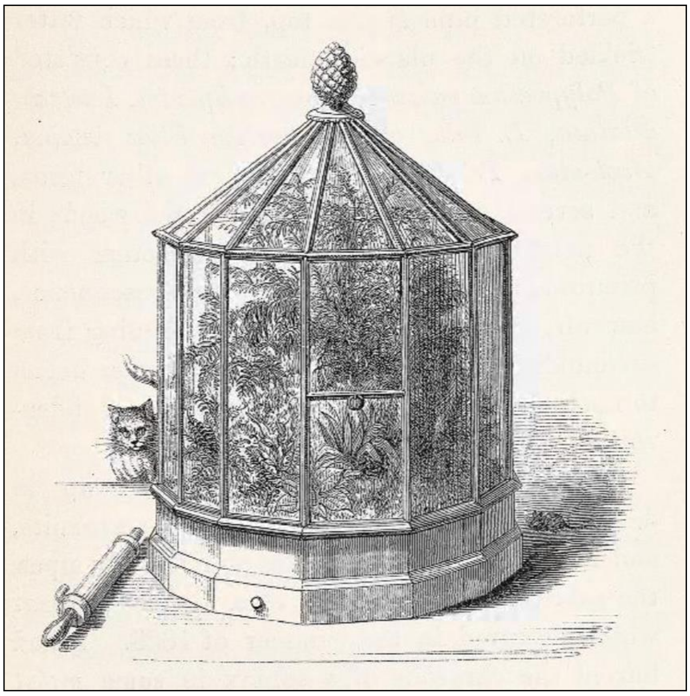

Fig. 1. Wardian case [5]

1. Introduction

This article introduces two projects that were part of a new CLIL: Ecology (Content and Language Integrated Learning) course at a private university in Tokyo, Japan: 1) assembling a bioactive terrarium and 2) a campus walk. First, I would like to highlight information about the teaching context and this paper. The university launched a series of new CLIL elective courses in 2024. The courses were new for the university, but they can be considered CLIL courses in the regular sense, and not a new kind of CLIL. The course guidelines were flexible enough to allow for teacher and student agency. Six motivated and competent students enrolled in the ecology course that I taught. Most of the course was conventional. During the 14-lesson course, there was a coursebook [1], weekly low-stakes quizzes, and final student projects.

The details outlined below were also discussed with students in the classroom and through social media (Instagram) during and after the course. These components added depth and supplemented classroom ecology concepts and skills. The two projects were trial projects, and permission to collect data from human participants was not applied for with the university. No conclusive data can be provided in this paper (e.g., questionnaire results), although the addition of the projects seemed valuable and worthy of future study. There is scant academic research about terraria and campus walks, and their learning value, although there are a few examples [2] [3].

I would like to next distinguish the terrarium and campus walk projects from project-based learning. The terrarium and campus walk projects cannot be considered project learning in the conventional sense. Project-based learning typically consists of groups of students working collaboratively on projects that are largely student-managed [4]. Students make decisions and complete projects while exercising student agency and decision-making [4]. In contrast, the two projects in this study were largely teacher-managed, that is, teacher projects that involved students. Students made active decisions together with classmates and the teacher, for example, on design features. However, students researching terraria, procuring specialized materials, assembling the terrarium, and storing it are beyond the scope of this 14-lesson CLIL course. Likewise, although students were involved with the campus walk, the majority of the work associated with the campus walk was completed by the teacher, mainly due to insufficient class time. This is not intended to minimize student potential for excellence. All students produced impressive and high-quality work for their final projects, which were distinct from the two projects outlined in the paper. The addition of the two projects was valuable, but the projects would not have been feasible if student-led. Additional photos and descriptions of the terrarium and campus walk can be viewed here (conference presentation):

Conference Presentation

Fig. 2. Terrarium

2. Bioactive Terrarium

The origin of modern terraria can be traced back to the Warden case, which was discovered accidentally by Ward when he placed moth cocoons in a sealed glass case and noticed spontaneous plant growing from the included soil [5]. The Warden case allowed for the transportation of live plants around the globe, and had wide-ranging impacts on agriculture, horticulture, and commerce [5].

The terrarium assembled as part of the ecology course is bioactive. In contrast, some terrarium makers seek to exclude certain organisms. For example, it is common to boil rocks, wood, and other hardscape material to keep things "clean." The intention is that mold, insect eggs, harmful bacteria, etc., would not present an issue and risk the survival of the ecosystem. Plant material is often washed and quarantined for similar reasons. The terrarium project in this course was not "anything goes," but the hope was that there would be a diversity of life and that it would reach a kind of balance. Nothing was sterilized or quarantined. In addition, purchased springtails (decomposer hexapods) and worm casting were added, which bring with them microorganisms (e.g., bacteria, fungi).

For the two projects, content and language were "interwoven" [6] and emergent [7]. There were no vocabulary lists, stated objectives, or clear ideas of what the outcome would be. For example, when the terrarium assembly began, I did not know it was possible to include mushrooms. During subsequent research, I came across a limited sale of a specialty terrarium mushroom product. The wood inoculated with fungus mycelium was sold specifically for use in terraria, although the practice is not widespread and the products seem to have emerged only in the last few years. These products are not available outside of Japan as far as I am aware, although they could be replicated somewhat easily. After adding the *enoki* mushrooms, the terrarium became a *kinocorium* (*kinoko* (Japanese) = mushroom + -arium) (see Fig. 2). Also, rather than pre-planning a language-focused task or activity, simply doing interesting things in the classroom with students seemed beneficial. The terrarium generated questions, comments, and language that emerged naturally, and lessons were driven by student interest and curiosity. I could not predict what students might comment on or ask about. Each week, I gave students instructions about building the terrarium, and they completed the steps in class. My feedback was based on their real-time responses. For example, students thought the chestnut (ornamentation) looked like *uni* (Japanese for sea urchin), which led to the emergent vocabulary "sea urchin." Questions and comments often arose naturally, such as "What's that?" "I think it's a springtail." This was also an opportunity to review and reinforce classroom vocabulary and concepts. For example, roots, leaves, spores, mycelium, and decomposers.

Although no formal data were collected (e.g., questionnaire results), students seemed to love the terrarium. They spent time before, after, and during class observing it, taking photos, and discussing it with classmates. We created an artifact that continues to live after the end of the course (currently 340 days). Students receive periodic terrarium updates via social media (Instagram). Some students continue to ask about the terrarium hundreds of days after the final lesson. Fourteen-lesson courses are so brief that it often feels hard to make a meaningful impact. The ongoing social media interaction, even if students are only liking posts or asking a question, hopefully counts for something. I hope that by continuing the interaction, students will continue learning about ecology and observing their environment, even after the end of the course. More study is needed to gather formal data about these potential opportunities.

Fig. 3. Terrarium during assembly

3. Campus Walk

When I was an undergraduate horticulture student at Colorado State University in the United States, campus walks were common for courses such as Arboriculture and Plant Identification; however, they do not seem to be common for language courses in Japan. There is potential for natural science CLIL courses to use university campuses, public parks, and botanical gardens to reinforce and deepen classroom learning.

Studying the campus ecosystem added a sense of discovery. We found incredibly interesting things living right on campus. Like the terrarium, a campus walk was an opportunity to reinforce classroom concepts and skills (e.g., plant identification, taxonomy, vocabulary). As an example, we “discovered” a species of *Amanita* mushroom growing in a symbiotic relationship with the university’s iconic trees (Himalayan Cedars / *Cedrus deodara*). The cedars are at least one hundred years old, and the fungus has probably been there as long. So “noticed” is the correct word, but it felt like discovering something new at the time. Most people walking on campus do not notice them at all. With the help of iNaturalist.org, we were able to identify the fungus to species [8] (see Fig. 8 & 9). *Amanita ibotengutake* was only described as a new species in 2002 when a team of Japanese scientists published a paper showing it was distinct from *A. pantherina* [9]. These mushrooms only appear twice a year (Spring and Fall), and they disappear quickly. Students discovered that the maintenance staff were “cleaning” the mushrooms with their brooms! This became a game of finding and photographing the mushrooms before they were gone. As with the terrarium project, more study is needed to gain insight into the potential of campus walks for natural science language courses. A Google Slides document with photographs, notes, species IDs, and references was created and can be found here:
Campus Walk

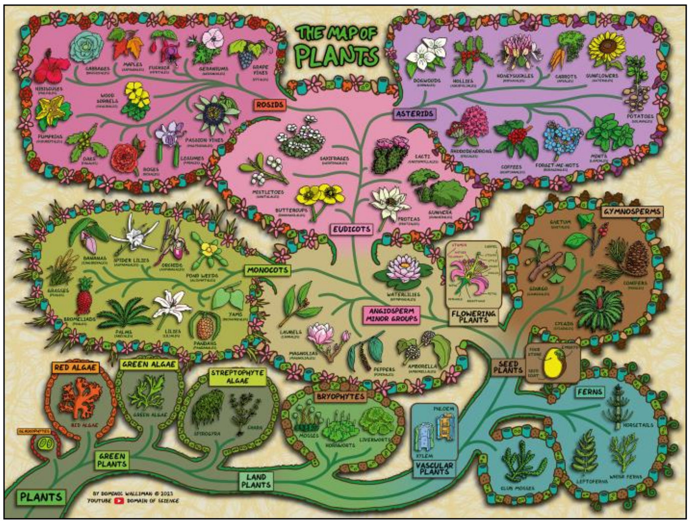

Fig. 4. Map of plants [10]

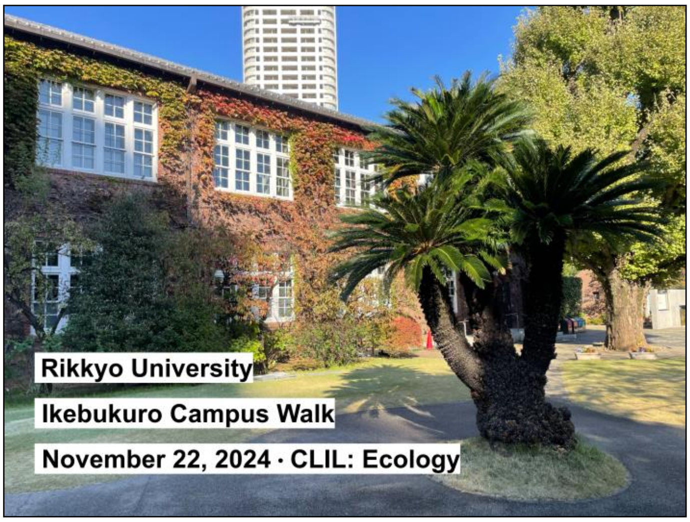

Fig. 5. Campus walk slide

Fig. 6. Campus walk slide

Fig. 7. Campus walk slide

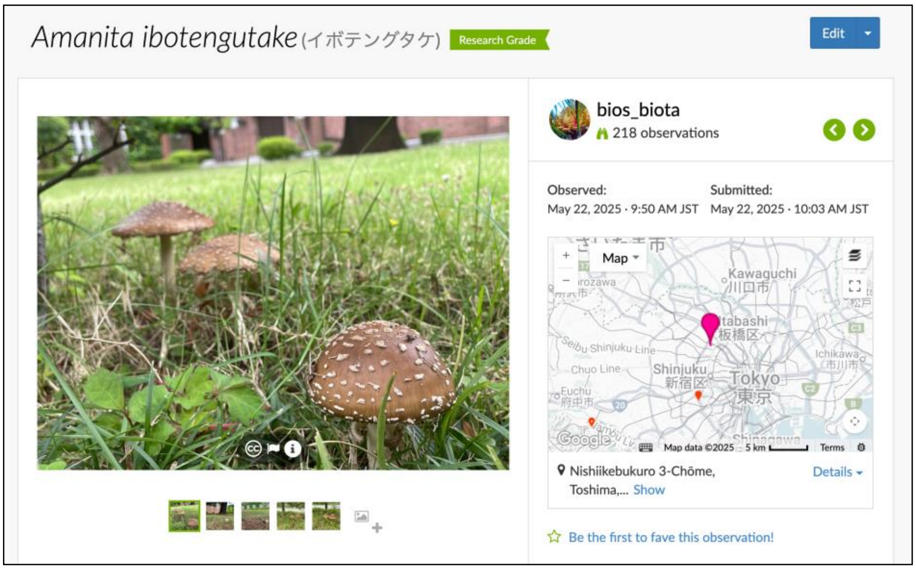

Fig. 8. iNaturalist.org [8]

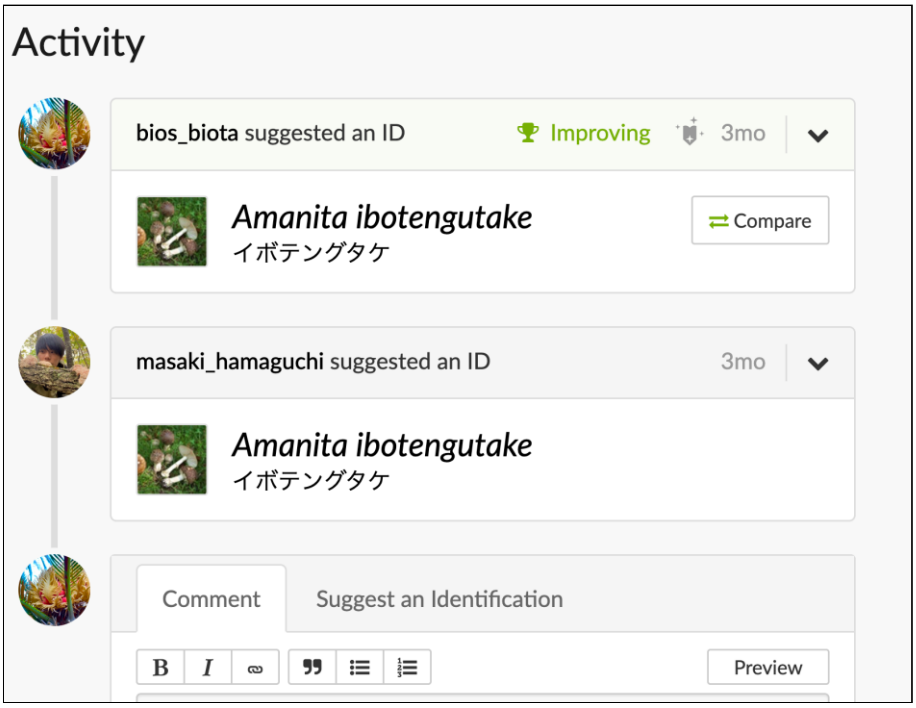

Fig. 9. iNaturalist.org [8]

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