

Designing co-curriculum experiential learning practice in permaculture for studying science classics

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Abstract

General education (GE) plays a critical role in university education. It embraces a broad intellectual pursuit through the study of and reflection on liberal arts, science knowledge, and real-world situations. The inspiring yet challenging common-core GE foundation course UGFN1000 In Dialogue with Nature, which requires students to study science classics, was launched at CUHK in 2012. To enhance students' learning of the selected science classics, such as Origin of Species and Silent Spring, co-curriculum experiential learning practice in permaculture was designed and employed. This paper illustrates the design of the pre-session preparation, practice sessions, and post-session reflection. It provides a practical and insightful reference to educators interested in developing experiential learning through permaculture in GE and beyond.

Keywords: *Experiential learning; general education; in dialogue with nature; science classics; permaculture.*

1. Introduction

General education (GE) has been a key component of higher education in the 21st Century. It plays a critical role in nurturing students to meet the challenges of the ever-changing world and preparing them to be engaged citizens with global awareness (Office of University General Education, 2013). Taking the opportunity of the educational structure reform in Hong Kong in 2012 (Wang & Gano-Phillips, 2017), a common-core GE Foundation Programme was developed and integrated into the new four-year undergraduate curriculum at The Chinese University of Hong Kong (CUHK). Each year, the science classic-reading course UGFN1000 *In Dialogue with Nature* in the GE Foundation Programme requires 3,600 junior undergraduates to reflect on the intellectual pursuit of nature and science through the study and discussion of selected excerpts of science classics, such as Charles Darwin's *Origin of Species*, James Watson's *DNA: The Secret of Life*, Rachel Carson's *Silent Spring*, and Joseph Needham's *The Shorter Science and Civilization in China*.

Previous findings suggested that studying science classics as a common-core requirement is very challenging for students (Hoi, Wong & Pang, 2017; Kiang, Ng & Cheung, 2015; Lau, Li & Liao, 2018). Furthermore, without concrete experience of the contexts of the science classics and direct exposure to the related real-life situations, students may find it difficult to fully appreciate the ideas, problems, and dilemmas in the classics and, therefore, their relevance to the students' lives and contemporary situations. To enhance students' learning in this science classics-reading GE course, experiential learning has been employed to bridge the book knowledge and real-life situations and to foster reflection. (Li, 2018) Experiential learning is a transforming process whereby knowledge is created from experience (Kolb, 1984). In Kolb's experiential learning theory, an experiential-learning cycle divides the learning process into four stages, including concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, Boyatzis, & Mainemelis, 2001). Most students agreed that experiential learning through farming helped them understand the course materials and fostered reflection in the GE course (Li, 2018). The practice can foster a sense of relevance and immediacy, thereby enhancing understanding of dilemmas discussed in the classics and fostering deep reflection on the challenges and ethics of applying science in real-life situations.

While it is largely considered that farming is the foundation of sedentary civilizations, it has brought global concerns regarding food safety, environmental pollution, biotechnology ethics, and sustainability (Food and Agriculture Organization, 2017). The development of sustainable agriculture is of paramount importance to alleviate the pressing of these global challenges. Among various agriculture models, permaculture is a philosophy of living with nature and a practical design to maintain an agriculturally productive ecosystem that preserves biodiversity, stability, flexibility, and sustainability (Holmgren, 2002; Mollison & Holmgren, 1978). It has three tenets (care for the Earth, care for people, and fair share), which

can be achieved by actualizing eleven design principles (Mollison, 2013). Since the philosophy, principles, and practical designs of permaculture echoes with many core issues stressed in the science classics, permaculture is deemed suitable to become a core theme in the development of the co-curriculum experiential learning practice to enhance students' learning this science classic-reading GE course.

For instance, permaculture's tenet "care for the earth" aligns with Carson's viewpoint on the human-nature relationship, in particular, the use of pesticides. Back in the 1960s, Carson had a detailed discussion in *Silent Spring* that the "web of life" is highly complicated. There are times that we inevitably intervene in the relationship, but we should be keenly aware that our acts will bring consequences to other places in the world and in the distant future (Carson, 1962). Today, the global use of insecticides has increased nearly one-fold from 2.3 million tons in 1990 to more than 4.1 million tons in 2019 (Food and Agriculture Organization 2022). The problem of excessive use of insecticides and herbicides weakens the insect biodiversity worldwide and results in an increase of super-pests. Aligning with Carson's desire for biological control, permaculture aims at reducing or eliminating the external input for maintaining or restoring the natural systems. The permaculture principle of "using biological resources" guides farmers to adopt biological insect control instead of pesticide (Mollison, 2013). In our experiential learning practice, we did not apply any pesticides. Instead, we planned tropical milkweed (*Asclepias curassavica*) to attract ladybugs to control the population of aphids in the rooftop garden. Students can therefore have a better understanding of the ideas in *Silent Spring* and foster reflection by practicing this permaculture principle. More examples include the connection between the permaculture principle of "accelerating succession and evolution" and natural selection and man's selection described in Charles Darwin's *Origin of Specie*, as well as the permaculture principle of "relative position" and the natural pattern of yin-yang theory in Joseph Needham's *The Shorter Science and Civilization in China*.

2. Objective

Given that permaculture emphasizes the coherent understanding of the natural systems and values the harmonious coexistence of human society and the land community, which is highly relevant to the broad coverage of the science classics in the GE course, it was deemed an appropriate subject for the experiential learning practices in the science classics-reading GE course. Therefore, co-curriculum practices in permaculture have been designed and employed to enhance the understanding of the selected science classics. This paper aims to illustrate the designs of experiential learning sessions for educators interested in developing similar experiential learning practices.

3. Design of Practice Sessions

The purpose of the practice sessions is to enhance students' learning in the science classic-reading GE course through the experience of permaculture practice in real-life situations. Students could choose this experiential learning practice as an optional assessment component which contributed to a total of 3% of students' course grades. A rooftop garden at the Hui Yeung Shing Building at CUHK had been established as the site of practice. The experiential learning practice was designed with three parts: pre-session preparation, practical sessions, and post-session reflections (Figure 1).

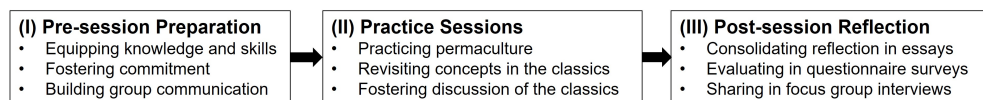


Figure 1 Schematic diagram of the design of the practice sessions.

3.1. Pre-session Preparation

Engaging students before the experiential learning sessions was essential for effective learning. The pre-session preparation aimed at equipping students with pre-requisite knowledge and skills, fostering commitment, and building communication among students in groups before the practical sessions. Blended learning was employed here using two e-learning instruments: (i) the “Experiencing Permaculture” micro-module and (ii) the tailor-designed farming companion mobile App “Growing Edibles 101” (GE101).

3.1.1. Micro-module “Experiencing Permaculture”

The permaculture micro-module was comprised of three short introductory videos about sustainable agriculture, permaculture principles, and designs (Experiencing Classics Website, 2022). The first episode “Agriculture and Sustainable Development” introduced the development of agriculture in Hong Kong and the world, the relationship between agriculture, classic texts, and social issues, and the definition of permaculture. The second episode “Permaculture Principles” and third episode “Permaculture Design” explained the permaculture principles and practice, respectively, which helped students glimpse the philosophy of permaculture. By watching these micro-module videos, students could gain pre-requisite knowledge about sustainable agriculture and permaculture before attending the practice sessions. Students were required to complete a short quiz on the micro-module before registration for the sessions.

3.1.2. Mobile App “Growing Edibles 101” (GE101)

From our experience, students generally did not understand the relationship between nature and farming. Insufficient knowledge of farming techniques also presented an obstacle to their experiential learning. A considerable amount of time had to be spent on explaining basic

knowledge and skills in each practice session. Meanwhile, inadequate attention or mere forgetfulness on the part of the students could lead to poor growth of the crops, resulting in a disappointing learning experience. Therefore, the mobile App GE101 was developed for blended learning (Figure 2). The App contained the following features which helped students learn prior to and during the practice sessions:

- connecting the knowledge, attitude, and value taught in the GE course with farming practices by asking reflective questions and displaying inspiring famous quotes;
- equipping students with essential knowledge and basic skills through tailor-made content, illustrations, and demonstration videos;
- facilitating the selection and planting of seasonal crops;
- issuing reminders and confirmations of daily farming tasks for student groups;
- serving as a platform for communication among students in groups and between teachers and students.



Figure 2 Screen captions of the mobile App GE101. The panels from left to right are the pages on farming techniques, crop information, group work reminder, and the message board for communication.

3.2. Practice Sessions

The practice sessions were a series of two-hour biweekly or triweekly hands-on practice and discussion in groups at the rooftop garden over ten weeks. The sessions aimed to provide hands-on experience in practicing permaculture, revisiting concepts, and fostering discussion of selected science classics. Each session included an introduction, demonstration of farming tasks, hands-on practices, group discussion of classics, and the learning experience (Table 1). Farming practices included soil-mixing, seeding, watering, weeding, pest control, composting, applying fertilizers, pruning, and harvesting. Apart from participating in the four practice sessions, students were responsible for taking care of their own crops between the sessions. It was crucial to carefully select the seasonal crops with appropriate growth periods (70 days in our case) so that students could harvest and enjoy their crops at the end of the sessions. If the growth was unsuccessful, it was also an excellent opportunity to reflect on the farming process and learn from the mistakes.

Table 1 Session plan of each practice session.

Session 1 (Day 0)	
Introduction	<ul style="list-style-type: none"> • Introducing the aims of the practice sessions, the rationale behind experiential learning, and the connection between studying science classics and permaculture • Introducing the management and safety issues at the rooftop garden
Practice	<ul style="list-style-type: none"> • Demonstrating and practicing soil-mixing, seeding, irrigation
Discussion	<ul style="list-style-type: none"> • Discussing the hands-on experience and the value of good farming soil • Reminding students to bring food leftover for composting in the next session
Session 2 (Day 21)	
Introduction	<ul style="list-style-type: none"> • Reading the excerpt from the classics <i>Silent Spring</i> • Briefing the relationship of the practice to <i>Silent Spring</i>
Practice	<ul style="list-style-type: none"> • Demonstrating and practicing weeding and composting
Discussion	<ul style="list-style-type: none"> • Sharing thoughts or questions on the value of weed
Session 3 (Day 49)	
Introduction	<ul style="list-style-type: none"> • Reading excerpts of the classics <i>Silent Spring</i> and <i>Origin of Species</i> • Briefing the relationship of the practice to <i>Silent Spring</i> and <i>Origin of Species</i>
Practice	<ul style="list-style-type: none"> • Demonstrating and practicing weeding, pest controlling, pruning, and fertilizing
Discussion	<ul style="list-style-type: none"> • Sharing thoughts or questions on the meaning of pest and their relationships with other plants and animals in the rooftop garden
Session 4 (Day 70)	
Introduction	<ul style="list-style-type: none"> • Reading excerpts of the classics <i>DNA: The Secret of Life</i> and <i>The Shorter Science and Civilization in China</i>. • Accessing the yield and quality of students' crops
Practice	<ul style="list-style-type: none"> • Demonstrating and practicing harvesting and seed saving
Discussion	<ul style="list-style-type: none"> • Sharing thoughts or questions on the meaning of seeds and farming cycles according to patterns in nature. • Reviewing the whole process of permaculture farming over the ten weeks, such as the lessons learned, the most impressive moments, and their feelings at different stages. • Encouraging students to continue rooftop farming after the practice sessions

3.3. Post-session reflection

Students were required to submit a short post-session reflection essay to consolidate their reflection after the practice sessions. Shortlisted students' reflections can be viewed on the Experiencing Classic Website (2022). A year one medical student has agreed to share her experience and reflection in this paper:

“The activity was truly one full of insights, in terms of inducing philosophical reflection on the science classics and our daily lives, especially when the world is in such an abnormal state. To start with, the activity not only granted me the opportunity to have hands-on experience in farming but included some sort of reflecting sessions. This linkage between theory and practice allowed me to have a more in-depth understanding of the view that Carson had: nature had her way of maintaining a balanced ecology, and it is more sophisticated that may be beneficial even for humans. Examples would be weeds, which happen to be ideal indicators for the soil's condition. Moreover, seeing bees while

watering plants was really something special for me as it shows that humans must rely on nature to yield fruits. Apart from the aforementioned, planting also brought me some insights into my daily life. Participating in the production of fertilizer from food waste, eating a freshly harvested leave, putting my fingers deep in the soil, and hugging bushes are all not part of my daily life, especially the latter ones when the environment is somehow considered contaminated that from childhood I have been taught not to touch things when it is not necessary because they are 'dirty'. It was quite an experience that now I feel like having broken through a bit compared to myself in the first planting session – it feels good to be in direct contact with nature, and things that seem dirty, like soil, may sometimes be even cleaner than ourselves, who are contaminated with artifacts like plastic as so on. Additionally, eating the juicy radish I harvested really gave me satisfaction: the love of freshness felt like something I genetically possessed, and the effort of planting really paid off. My dream to do farming in my old years has been reassured!"

Students were invited to fill in a simple questionnaire and join focus group interviews to give feedback on the practice sessions. From the questionnaire, about 95% of the students agreed at different degrees that the practice sessions were helpful in learning the science classics in various aspects (Table 2).

Table 2 Students' feedback on the practice sessions of experiential learning through permaculture (n=44). The figure represents the percentage of each score.

Score	1	2	3	4	5	6
a) Deepen understanding of the science classics	0.0	2.3	2.3	31.8	43.2	20.5
b) Extend the learning beyond the courses	0.0	2.3	0.0	15.9	61.4	20.5
c) Relate science classics with daily lives	0.0	2.3	2.3	20.5	56.8	18.2
d) Enhance motivation for learning	0.0	0.0	0.0	22.7	54.5	22.7

(Six-point Likert scale: 1 strongly disagreed, 6 strongly agreed).

4. Conclusion

Experiential learning through co-curriculum practice sessions in permaculture was designed and employed to enhance the understanding of science classics in a common-core university GE course. This paper has illustrated the design of the experiential learning practice, which consisted of pre-session preparation, practice sessions, and post-session reflection. The design and practice shared in this paper are helpful for educators interested in developing similar experiential learning practices in GE and beyond.

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