

Teaching a sustainability mindset: The need for holistic and multidisciplinary learning

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BIOL510: The Biology of Sustainability

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November 30th, 2022

Introduction

The youth of today have been tasked with handling the climate crisis and are intended to grow into adults with the skills to overcome social and environmental issues (Karsgaard and Davidson 2021). Multiple studies support the claim that the education system is a necessary arena to promote sustainability due to its ability to influence students and create more profound social change (Dobson 2007). Additional studies also support the statement that “knowing” about global issues doesn’t always translate into a shift in behaviours (Pfeffer and Sutton 2000, Schein 2014, Rimanoczy 2020). Regardless of this reality, the Biology Department does not prioritize teaching its students the way biology must fit into the complex network of other disciplines that will create the future. When viewing biology through the Western lens of strictly biochemistry or strictly limnology, you miss out on the vital interactions of people and nature. BIOL510 2022, titled “The Biology of Sustainability”, is a discussion-based and student-led course centered around a deep understanding of interconnectedness and impermanence, taught through a focus on Indigenous Ways of Knowing (IWOK). The principle question that the course addresses is “Interconnectedness and impermanence: Is enhanced deep awareness of these fundamental biological principles the ultimate key to significantly advancing our species toward more sustainable living?” (BIOL510 2022). Its content and delivery encourage reflection and teach students that knowing more is not always synonymous with doing better. A good scientist understands their biases as well as their position in complex factors, and BIOL510 builds critical and worldview-oriented scientists. In this essay, I will argue that the course content of BIOL510 2022 should be mandatory for all undergraduates in the Department of Biology because the holistic and multidisciplinary learning it provides is critical to significantly improve the sustainability mindset within the next generation.

Holistic and Multi-disciplinary Learning

First, I will cover the ways BIOL510 represents holistic and multi-disciplinary learning in a way that is different from other courses offered in the Biology Department. I will focus on the course

learning outcomes, the discussion-based structure, and classroom dynamic. The course learning outcomes highlight the ways that BIOL510 students learn about biology in relation to real-world factors. The two that best demonstrate this are “Explain and contrast the term ‘ways of knowing’ from Indigenous, Western Science and Arts perspectives, and outline their historical roots and interconnections” and “Formulate clear, original, challenging, and concise thematic questions from course reading materials that are likely to lead to focussed and intellectually-probing seminar group discussions, student-led seminar topics, and short essays” (BIOL510 2022).

The first outcome uses the term “ways of knowing” which typically refers to a set of 8 ways of knowing we use to understand the world (Gurm 2013). These are language, reason, sense perception, memory, faith, intuition, imagination, and emotion. Western education and typical STEM (Science, technology, engineering, and math) curriculum does not teach or follow some of the ways of knowing such as emotion and faith. In BIOL510 we learn the necessity of engaging with IWOK through our course textbook, *Braiding Sweetgrass* by Robin Kimmerer. Student-led seminars reflect on using IWOK in our own lives and connect it with Western ways of knowing. This outcome shows holistic learning for multiple reasons, one being the content, which focuses on mind, body, and spirit, in equal parts. The second is the nature of the learning, it requires each student to centre themselves in the context of what they are learning. Finally, the outcome supports multidisciplinary learning by demonstrating that students learn from Indigenous, Western Science, and Arts perspectives.

The second outcome is highlighting how the course’s discussion-based structure allows it to branch into other disciplines. Our discussions connect biology with religion, global health, human psychology, and many other topics. This is a direct result of effective communication and student-led nature, as we can discuss connections that relate to our lives and see differences in experience from person to person. The second outcome also relates to the overall classroom dynamic, which involves sitting in a circle. Sitting in a circle is the best way to promote individuals to feel engaged, valued, and supported, creating a deeper engagement and understanding of the content (Supratman 2015). BIOL510

is the only course I have taken at Queen's with this classroom dynamic and invites students to learn biology in a global context through our peers rather than an instructor lecturing from the podium. The second outcome represents multi-disciplinary learning because of the freedom in discussion topics as well as the shared understanding that environmental issues are directly linked to social issues. As a student in the Biology Department, I get to firsthand contrast my experiences in 30 + courses to BIOL510 2022 to say that it promotes self-growth and self-actualization that is absent in other courses.

Building a Sustainability Mindset

Next, I will discuss the ways that the course content strengthens the sustainability mindset of its students. A sustainability mindset is defined as a perspective that comes from expansive comprehension of biological systems and an introspective focus on one's personal values and higher self (Rimanoczy 2020). A paper from the University of Oulu titled "Deep learning for a sustainability mindset", outlines a conceptual model for building a sustainable mindset and provides an example of how it was applied in an undergraduate course. The course had three different sections, Developing Awareness, Exploring Paradigms, and Getting into Action (Hermes and Rimanoczy 2018). BIOL510 parallels this structure, as our student-led seminars explored multiple paradigms. Additionally, the final course learning outcome is "Use the learning achieved in this course to develop lasting personal solutions for coping with, and constructively responding to, the major environmental and social sustainability issues of the 21st century" (BIOL510 2022). An essential part of the sustainability mindset is the reflective focus which is the part lost in content-based undergraduate courses. In BIOL510, our final classes are entirely focused on how to actively shift to a sustainability mindset and tools are provided for students looking to make the shift. BIOL510 mimics a course structure that is proven to aid in the development of a personal connection to biological systems.

A second key characteristic of a sustainability mindset is its requirement for ethical sensitivity (Gentile 2022). In BIOL510, our course textbook teaches Indigenous principles and explores the reciprocal relationship between humans and the land (Kimmerer 2013). It is a great resource for

teaching ethical sensitivity and an understanding of Indigenous culture and beliefs. As people living in Canada, understanding Indigenous culture is important to our sustainability mindset (De-Abreu et al. 2022). A multicultural education is a component of mindset building, meaning that students learn historical, social and literary events from different ethnic and cultural perspectives (Ngai 2004). Kimmerer's book helps students to place themselves within Canada's colonial history as well as teaching about botany through story.

Thirdly, in BIOL510 we follow learning-based teaching, as an alternative to content-based teaching. The main differences are that in learning-based teaching a mutual relationship is created between student and teacher, and needs are flexible and based on the goal of advancing the students' development (Postareff et al. 2007, Hermes and Rimanoczy 2018). Before each assignment in BIOL510 the students have the chance to get feedback from the instructor and share a mutual understanding of the task in front of them. This learning-based teaching lets students have a larger role in their learning, leading to increased engagement and ultimately changes in behaviors (Postareff et al. 2007). A large component of the sustainability mindset is deep reflective thought, and to teach this mindset there must be an open and reflective dialogue between students and their instructors. The learning-based teaching allows for open dialogue and has the ability to create permanent and impactful change in student lives.

Toolkit for Social Change

I believe that BIOL510 should be added to the fourth-year core courses of the Biology Program. The Biology Department does an exceptional job building well-informed scientists, however, it lacks in building students who are reflective. Some people argue that this type of training isn't required or appropriate for biologists, but I disagree for multiple reasons.

First of all, the University is actively working to incorporate more sustainable initiatives on campus. In 2021, Queen's released an impact statement titled "Queen's Contributions to the UN

Sustainable Development Goals” which states that Queen’s supports sustainable strategic program enhancement initiatives and encourages novel approaches to teaching (Queen’s University 2020). Implementing BIOL510 as a core course would mean that not only do students gain a well-rounded education, but Queen’s achieves some of its proposed sustainability goals.

Second, it’s proven that traditional Western learning methods don’t adequately provide the character building that allows students to understand the world, make decisions and solve complex problems (Stanley and Brickhouse 2001, Bang and Medin 2010). Research from the University of Washington Seattle states that the intentional design of improved multicultural frameworks for environmental science education is needed in the pursuit of social and environmental justice (De-Abreu et al. 2022). We need this framework to create prepared graduates and we need young adults with sustainability mindsets to address the growing issues of the future. The Biology Department shouldn’t stop short of building well-rounded, emotionally intelligent scientists. Creating social and environmental change will be a priority of our generation and we need the full tool kit to be able to achieve it.

Conclusion

In conclusion, the Biology Department would greatly improve the reflective focus and multicultural understanding of its students through the inclusion of BIOL510 to the core course list. Undergraduates spend the first three years of their education gaining a comprehensive understanding of biological systems. With the connection of this knowledge to deep self-understanding and awareness, students would significantly build on their sustainability mindsets. The argument has been supported by researchers around the globe, in the statement that learning-based teaching is key to building sustainable mindsets (Ngai 2004, Gurm 2013) and that a multicultural and reflective education is a key component to having a generation capable of handling the climate crisis (Bang and Medin 2010, Hermes and Rimanoczy 2018, De-Abreu et al. 2022). It’s important to note that I am bringing the importance of BIOL510 to light because of its relevance to the Biology Department, but there are likely

courses in other departments that students could take to broaden their perspectives. This essay recommends that every biology student take BIOL510, and a future step could be to incorporate some of BIOL510's learning objectives into other upper-year courses. Every biology student is on the path to a career that connects them with the natural world, whether it be tending to cells in a dish or observing patterns in larger ecosystems. As professionals who bridge knowledge from the scientific community outward, it is essential that they have sustainability mindsets. This will allow every graduate to not only connect with people of all backgrounds but also to evaluate and distribute knowledge with awareness. If we want to work with social, economic, and environmental factors to help the climate crisis and other global issues, we need young academics who can understand themselves and their position in our complex global society.

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