

Cultivating Sustainability Literacy in the Classroom

Literature Review

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Abstract

This literature review explores themes and methods in sustainability literacy at the postsecondary level and identifies interventions that foster sustainability-based learning in the classroom. A definition of sustainability is captured by the Seventh Generation Principle: “In our every deliberation, we must consider the impact of our decisions on the next seven generations”. These include economic, social, and environmental impacts. Learners may initially grasp the definition of sustainability and intergenerational commitment but require a variety of contexts in which to apply this knowledge.

Not surprisingly, examples abound of sustainability education embedded in programs of environmental science/studies. To move away from restricting sustainability learning to a certain program (and therefore to certain learners), many institutions have embedded sustainability more broadly across disciplines. Through our research, we identified four ways institutions do this:

- By embedding sustainability into existing programs (such as business or nursing classes)
- By offering co-curricular or extra-curricular sustainability certificates (for example, the University of Calgary’s Embedded Sustainability Certificate)
- Through extra-curricular projects (such as student-driven community projects)
- Through holistic, cross-institutional application (for example, identifying sustainability as a priority at the Executive level).

A primary indicator of the adoption of pro-environmental behaviour (such as composting, using public transit, reduced meat consumption, etc.) is self-efficacy: the belief that the actions taken are effective and within the ability of the person performing them. These findings suggest focusing on the self-efficacy and prior knowledge of our learners is beneficial in fostering sustainable behaviour in our culturally diverse campus population. From our

findings, we suggest **five recommendations** for Bow Valley College:

1. Conduct a sustainability literacy assessment of learners and instructors to better understand how sustainability is currently understood, taught and practiced.
2. Facilitate peer-to-peer learning between instructors and share successes from other institutions.
3. Promote the use of the Association for the Advancement of Sustainability in Higher Education (AASHE) resource database.
4. Invest in professional development for instructors related to sustainability; specifically, the Sustainable Development Goals and climate change.
5. Identify at least one champion for sustainability in each academic department.

In support of recommendations 2-4, a sustainability resource page has been developed for instructors and shared through D2L. The research team applied for a grant through Employment and Social Development Canada in July 2019 to support work coming from recommendations 1, 4, and 5. The results of the grant are pending.

Cultivating Sustainability Literacy in the Classroom

In Defence of Sustainability

According to a 2013 public opinion poll, 76% of Scottish citizens would prefer to see most of their electricity come from low carbon sources, with 62% supporting large scale wind turbine projects in their local area (YouGov UK, 2013). However, policy makers, wind turbine manufacturers and researchers noticed many local wind energy projects were receiving major pushback from communities – including one that had 62% support for wind power. What was going on? Why was the aspiration for cleaner electricity derailed in practice?

A common explanation has been ‘NIMBY-ism’, or ‘not-in-my-backyard’ phenomenon; the circumstance that homeowners and community residents are unwilling to see new projects develop in their neighbourhood despite support for the project in theory. This conclusion seemed incomplete to a human geographer at the University of Edinburgh who decided to investigate why residents were against the wind power projects and what was going on behind the pushback. She discovered a common belief that wind turbines ruin the view of the Scottish Highlands. However, this belief was superseded by the value of the project when the turbines were co-operatively owned by community members (van Veelen, 2015; van Veelen & Haggett, 2017). When the electricity generators were owned by external companies, and the profits of the generation were leaving the community, wind turbines were described as a scar on the landscape. However, when electricity was being generated by the community for the community, aesthetics of the turbines changed – they now represented self-reliance, rather than power (literal and social) leaving the community.

The co-op model of electricity generation is flourishing in Scotland. Under a community energy model, citizens have higher engagement in the energy discussion, have

control over where their energy comes from, and profits can be re-invested into community infrastructure and the local economy (Creamer et al., 2018; Walker & Devine-Wright, 2008). It has allowed renewable energy generation to skyrocket in Scotland, resulting in lower greenhouse gas emissions. Since electricity generated in the area is used in the area, it has improved efficiency by reducing electricity losses when transported down hundreds of kilometres of powerlines.

This story demonstrates the complex relationships between community well-being, environmental stewardship, economic development, and emotional responses to landscape changes; the crux of ‘sustainability’. The transition to a cleaner energy industry would have been stalled by labelling residents as adhering to NIMBYism – instead, by applying an cooperative and creative lens, a truly sustainable approach was discovered. A solution that improves efficiencies, supports local economy, empowers citizens, and improves environmental conditions.

As is common in burgeoning fields, there are various models and frameworks used to understand new concepts, like sustainability. For instance, within the field of ethics, utilitarianism (outcomes-based ethics) is contrasted with deontological (rules-based) ethics. Where one proves controversial in application, the other can be used to fill in the gap, so to speak. In sustainability, the relevance and weight of economics (profit) is a key differentiator between models. In some of the first models of sustainability, “people, planet, and profit” were weighted to the same degree when evaluating solutions (as in the case of the oft used triple Venn diagram with economics, environment and social wellbeing inhabiting each of the circles). The Millennium Development Goal exemplified this type of thinking, with a primary focus on economic and social wellbeing, with “environmental sustainability” as one of the

seven goals – rather than a lens through which to approach the subset of goals (United Nations, 2015).

More recently, scholars have noted the fallacy in this prioritization of economic over ecological sustainability: there are few ways to make sustainable ecological decisions within the context of a continuous-growth economic model (Doppelt, 2008). Updated models of sustainability emphasize the continuous wellbeing of communities and ecologies; since economic sustainability is dependent upon, or a subset, of ecological sustainability. Economic profitability is dependent upon a thriving community, which in turn is dependent upon a myriad of free system services (clean air, water and general habitability), provided by the environment and specific ecological systems that have evolved over millions of years.

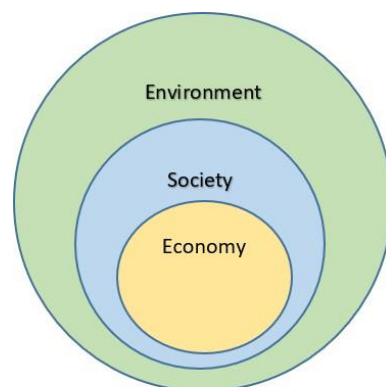


Figure 1

As in Figure 1, three nested circles indicate the dependence of social well-being. on the environment just as thriving businesses, or economics more generally, is dependent on societal well-being. In other words, a healthy environment is critical for communities. to flourish, and thriving communities are necessary for a thriving economy. The more sustainability is practiced, the easier it becomes to envisage sustainable environments and

communities in which the long- term benefits of reduced virgin material extraction, less pollution, reduced water stress, produce more stable economic outcomes. Everything becomes more expensive in a degraded environment, including the cost of doing business. With this understanding of sustainability in mind, we begin this literature review by exploring the work done by ethicists to produce moral arguments for sustainability.

The Ethics of Sustainability

Moral systems are not yet fully decisive for either personal or business ethics, and while arguments for sustainability have benefited from advances in ethics, we have not yet arrived at a single set of rules by which we can agree to resolve our disagreements about how we should act. As is typical in moral reasoning, we tend either to solicit agreement with analogies, by subjecting prospective rules to tests of reasonability or by weighing the consequences of actions within a morally significant context, or by a combination of all these methods. That said, there is agreement about the notion of sustainability insofar as it affirms intergenerational commitments about one generation's right to have as many or more opportunities as the previous. This is a substantive foundation by which the trend of sustainability in business is gaining traction, and from which a cost and benefit structure is used to identify these intergenerational social costs.

From the Report of the World Commission on Environment and Development: Our Common Future, one very common definition states "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (1987, p.41). In a recent speech to graduates of the Old Dominion University, John Kerry captures the urgency of intergenerational moral obligations about climate change: "If we don't act with greater boldness now, it could be the single most

profound betrayal by one generation of another, or others, in history. We have to prevent that... We have a moral responsibility to protect the future of our nation and our world. That is our charge. That is our duty. And ... for the generations that follow in their footsteps, we have to get this right." (Kerry, 2015, para.90-96).

Yet, how might we tie this intergenerational urgency to moral obligation? In his voluminous work, *On What Matters*, Derek Parfit has attempted to summarize the current project of an objective moral system, a set of rules for selecting moral principles, by combining consequentialist and rules-based thinking. He defines "Rule Consequentialism" in the following way: "An act is wrong if and only if, or just when, such acts are disallowed by some principle that is:

- one of the principles whose being universal laws would make things go best,
- one of the only principles whose being universal laws everyone could rationally will...
- a principle that no one could reasonably reject." (Parfit, 2011, p.413)

As such, it is at least incumbent upon businesses and individuals to consider either the consequences or rules associated with their actions and to subject them to the test of reasonability, since the social costs have become clearer in the past decade. For businesses the costs to brand reputation are significant liabilities for those that are more consumer-facing or closer to the consumer-end of the supply chain. At the personal level, this duty manifests as an epistemic duty (a duty of forming beliefs considering evidence). For a business it is more a cost associated with doing business. For example, the social costs associated with the use of coal-fired electricity drive the moral reasoning but also oblige a cost-benefit analysis, usually at the regulatory level, as awareness of these costs have become increasingly available. This can be tied directly and tangibly to the marginal social costs of a product. For

example, the social costs of carbon are estimated to be roughly \$56 per tonne (Environmental Protection Agency, 2017)¹. Importantly, once the costs become widely known, the moral reasoning (specifically the utilitarian arguments or analogies) find traction. A more recent example of this is the increasingly public discussion of concussions in sport. Once we find out about the damage caused to the brains of athletes playing a sport like hockey, re-evaluation becomes obligatory. Moreover, while smoking in a lecture hall of any Canadian university or college was at one time permissible, a professor lighting up a cigarette would now evoke a reaction of shock and distain, in addition to the disciplinary actions of the institution. Moral sensibility is sometimes slow to evolve but has teeth once the morally relevant facts become known.

In the context of these more focused examples, now consider the consequentialist reasoning with respect to climate change. Imagine that climate change causes mass migration, from uninhabitable places along the equator to northerly countries. Further, suppose wealthier countries such as Canada or the USA had demonstrably slowed the response to climate change while having the highest per capita emissions and the largest total historical contributions to climate change of any region (European Commission, 2017). The global pressure to pay for these costs, increasing over time, would burden subsequent generations of Canadians and Americans with the cost of cleanup for problems they did not create, but for which they are responsible. As Christopher Hitchens has pointed out, we have all witnessed the reluctance of generation to admit moral culpability, and the generational storytelling about the impossibility

¹The social cost of carbon is the additional cost to society of burning coal or other types of fossil fuels, and these may include hospital visits for asthma or other pollution-related diseases, or costs related to the rising temperature of the planet. The recent loss of at least one third of the Great Barrier Reef due to ocean warming is another aspect of the cost to society in the form of lost revenue from tourism or fishing (Schiermeier, 2018).

of having acted otherwise (Hitchens, 2001). Alas, getting it right, or the extension of moral reasoning, is limited by human bias.

Peter Singer would argue, by analogy, we should not be bothered about getting our expensive trousers and shoes wet to save a child from drowning in a shallow pond (Singer, 1997). Similarly, isn't avoiding excessive carbon emissions now –one less flight per year, or increased insulation in your home – like getting one's pants wet to save someone? This duty adheres all the more to affluent societies, responsible for most of the carbon emissions, insofar as increases in disposable income, coupled with economic growth, ease the burden. Indeed, economic growth increases our ability to pay for cleanup, while at the same time it increases our moral culpability for not doing so.

The weight of these arguments on principle must pass the test of reasonability – that no reasonable person would reject them. While the costs of action versus the opportunity cost of inaction are becoming clearer with respect to climate change, so too are the ways in which we both motivate and have grounds for moral action. The weight of these arguments, however clear to some, live in the arena of public opinion and rely on circumstance and the rank order of values for their traction, and ultimately force changes in government regulation. Pointedly, Andrew Nikiforuk notes that slavery was abolished at roughly the same time that steam shovels enabled the substitution of machines for labour (Nikiforuk, 2012).

Adding to the consequentialist views of the grounds and motivation for sustainability, we may also select reasonable rules and subject them to Parfit's criteria for the same end. Suppose that society is primarily for the protection and rearing of children. By extension, we should prevent our children and their children from needless risks. Most of us buy fire insurance with a much lower probability of damage or risk profile than the potential for runaway climate change,

and since we ought to avoid needless risks when it is feasible to do so we should also likewise pay to pollute. No reasonable person would dismiss our obligations to maintain a habitable planet.

Put another way, we should not needlessly risk future well-being for current happiness, satisfaction or contentedness. The generalized rule is reciprocity (or more commonly called the golden rule) that we shouldn't use people as a means to an end. The principle of double effect, for example, was used during the Vietnam War in defense of the practice of accidentally killing civilians in the attempts by American soldiers to kill enemy soldiers. These accidental civilian deaths fueled much of the resentment and protests about the war, and eventually the American military stopped the practice of justifying civilian deaths in this way. Likewise, economists have commonly discounted the effects of climate change in the future as weighed against the current benefits of increasing emissions. They also discount the effects of climate change on developing nations against developed nations, and this practice of discounting the value of one life against another while obviously distasteful, has also proved unpopular. Economists were unpleasantly surprised at the response to their attempts at discounting lives, future versus present, old versus young, or developing versus developed, in calculating the cost of climate change (Farber & Hemmersbaugh 1993; "Right-to-Discount", 2007; "Weighing the future", 2014). In opposition to this practice, we may invoke rules about human rights or similar examples of the dangers of treating people as a means to an end. Invoking a rule of reciprocity relies insofar on the suitability and long-term benefits of its application, and suffice to say becomes more difficult in application as the target audience grows in size.

In brief, using Derek Parfit's outline of a moral framework provides increasing clarity on grounds and motivation for sustainability as a form of intergenerational commitment. While

moral reasoning is not fully decisive and subject to the test of reasonability, which assumes society has enough rational agents to motivate action, educational institutions are obliged by mandate to apply the best available scientific and moral reasoning in order to prepare learners for the future. At the least, the ethics of sustainability obliges action in the race against climate change, the urgency of which has become more obvious in the past decade.

Sustainability in Higher Education

The future of higher education must include an ethic of sustainability in order to meet these moral obligations, and to better engage with the urgency of maintaining a thriving planet. As Dr. Paul Shrivastava, Chief Sustainability Officer at Penn State University, stated in a recent address: “Sustainable education is comprised of sustainability literacy and sustainable curriculum... Students don’t want to be passive recipients of knowledge, they want serious responsibility and holistic engagement” (Shrivastava, 2018). A twenty-first century institution not only incorporates sustainability into curriculum but prepares learners for civic engagement and the workplace by fostering sustainable mindsets.

The application of principles of sustainability is known as sustainability literacy. In practice, literacy is the “knowledge, skills and mindsets that allow individuals to become deeply committed to building a sustainable future and assisting in making informed and effective decisions to this end.” (UNDESA, 2018, para.1). Truly holistic sustainability-education is designed to help solve ‘wicked problems’; those that are difficult or impossible to solve because of “incomplete or contradictory knowledge, the number of people and opinions involved, the large economic burden, and the interconnected nature of these problems with other problems” (Kolko, 2012, para. 1; Wals, 2014). Sustainability is found at the intersection of several wicked problems: poverty, climate change, biodiversity loss, gender inequality, and

more. Knowledge about these inter-related issues is not enough. We cannot just teach about sustainability; we must develop professional skills of sustainability and motivate people – not just inform them (Brundiers and Wiek 2017).

What then, does sustainability education look like? Education that is comprehensive. Sustainability is not a siloed topic reserved for certain fields or sectors: rather, it is a theme that overlaps all considerations. Willamo et al. (2018) identify three aspects to comprehensive education: generalism (the opposite of specialization), holism (the understanding that a whole is something other than the sum of its parts) and holarchism (systems consist of both parts and whole). Furthermore, when exploring a concept in a comprehensive manner, the “ideal approach is dialectical... constant alternation between widening and narrowing, integrating and separating, etc.” (Willamo et al., 2018, p.5). Similarly, Marshall et al. (2018) encourages instructors to “probe content knowledge along both interdisciplinary and disciplinary dimensions” (p.57). In practice, many instructors use project-based studies to teach sustainability, finding it helpful when students can directly contribute to the sustainability of their city, business, or government (Wiek and Kay 2015). Comprehensive sustainability education is a balance of specific and general, case studies and theory, and disciplinary knowledge and transdisciplinary mindsets.

Perhaps the most common tool for approaching sustainability education is alignment to the Sustainable Development Goals (SDGs), adopted at the United Nations Sustainable Development Summit in 2015. These 17 goals (along with their corresponding 169 targets) fall within the intersection of all the issues of our time, including gender equality, climate action, and food security. Many businesses are now reporting in terms of the SDGs, and Statistics Canada is now reporting in alignment with these goals (Government of Canada,

2018). Post-secondary institutions are uniquely placed to work toward the SDGs “because they contribute to wider paradigm shifts, they are communities built of diverse audiences, and they train students for the wider world” (Disterheft et al., 2013, p.3). The learners at Bow Valley College come from extremely diverse communities, many of which are directly impacted by the issues that inspired the SDGs. Some of our learners are deeply bio-regional in their local food habits, their habits of mobility, reusing items through ingenious repair, or frugality, which is helpful when understanding the complex relationships between human dignity, social justice, and environmental stewardship. These are habits that should be applauded and encouraged, while at the same time adapted to local circumstances. The SDGs help connect these concepts and actions in a way that has never been done before at a global scale.

Despite the moral obligations and time-sensitive nature of responding to challenges like climate change and biodiversity loss, there are numerous barriers for embedding sustainability across curricula. McFarlane and Ogazon (2017) identify five reasons why there are lack of integration of sustainability into business programs: lack of knowledge and understanding, the influence of organizational culture and leadership, the belief that sustainability is a science (thus not relevant to business), the costs associated with changing, and the marketability of programs. Hooey et al. (2016) identify the major challenge as a lack of universal definition of the concept of ‘sustainability’, and the costs associated with implementing sustainability across all departments. Additionally, Jaquette Ray (2018) identifies the emotional barriers to teaching about sustainability: often instructors are not trained to support learners through the emotional turmoil of learning about environmental and social challenges. How, for example, should we manage the grief about species and

biodiversity loss? (Cunsolo & Ellis, 2018; Spark 2016).

However, these challenges to incorporating sustainability into higher education does not excuse the failure to do so. Indeed, as global challenges continue to become more complex, most occupations will be required to possess a basic understanding of sustainability in order to thrive. A collaborative report developed by the Insurance Bureau of Canada, University of Waterloo, Intact Centre on Climate Adaptation, and International Institute for Sustainable Development asserts “a new skill set – one that combines financial acumen with broader environmental and social impact assessment – is required to curtail the possible debilitating loss of natural infrastructure assets in the country” (2018, p.6). Insurance companies are beginning to imagine what ‘true cost’ accounting looks like when examining projects. For example, by investing in a natural culvert at Gibson’s Landing, this provides about four million dollars in flood mitigation services, while the maintenance costs sit at \$30 000 per year. It is a relatively cheap financial investment for a 40% reduction in flooding costs (Ibid., p.17-18) especially when social costs of natural disasters are taken into account, such as the increased rate of domestic violence after disasters (World Health Organization, 2005). Yet, it is the capacity to identify and articulate the costs and benefits of preserving ecological services that would enable learners in their prospective roles. In this sense, we are asking learners to engage in the opportunity to build sustainable wealth, at least wealth that includes externalized costs.

Financial acumen and social impact assessment fall firmly within the realm of business, and we argue – nursing, design, and early child care fields as well. In the broadest sense, sustainability literacy connects one’s individual well-being and work to the well-being of the communities in which we work, and to the health of the planet. The next section of this

paper identifies specific examples of how higher education institutions have incorporated sustainability into their academic streams.

Case studies

Not surprisingly, there are hundreds of examples of sustainability education being embedded into environmental science and studies programs. Additionally, there are many examples of sustainability education offered as minors or as additional specialized courses alongside or in conjunction with traditional educational frameworks. For example, four institutions partnered in the northeastern States to offer an “Ecovation” course – combining sustainability with innovation education (Keene State College, 2018). Georgia Tech (2019) offers a minor in Sustainable Cities as part of their urban design program. Both South Dakota State University (2017) and the University of North Carolina (2018) offer Sustainability Minors, while the University of Calgary offers a Certificate in Sustainability for undergraduate students (2019a). There are countless more Sustainability programs like this.

To move away from restricting sustainability learning to a certain program, many institutions have embedded sustainability more broadly across disciplines. Generally, institutions have done this in one of four ways: a) by embedding sustainability into existing programs, b) by offering co-curricular or extra-curricular sustainability certificates, c) through extra-curricular projects, and d) through holistic, cross-institutional application.

To reach a wider demographic of students, several institutions have begun to incorporate sustainability as a lens for learning into programs such as design, business, and nursing. Emblen-Perry (2018) enhanced student engagement in sustainability through games in their business curricula, while Ueda (2018) tasked their design students with an ‘eco-design’ activity. A psychology course at Oberlin College tasks students with implementing

and evaluating the promotion of sustainable behaviour on their campus to learn social-based marketing (Oberlin College, 2017). The University of Plymouth and several partners developed the NurSusTOOLKIT to “enhance the availability and relevance of a sound learning offer in sustainability literacy and competency in nurse education by developing innovative teaching and learning approaches and materials” (NurSuS Project, 2019, para. 1). This free toolkit is available in six languages and could easily be used to begin to embed sustainability learning into nursing programs at Bow Valley College. These are all specific examples of programs and courses that have taken the initiative to incorporate a lens of sustainability in a way that makes sense for that discipline and topic.

Another approach institutions use to enhance sustainability learning is through the introduction of extra-curricular or co-curricular programs. These may be for all employees, such as the Sustainability Certificate at the University of Waterloo (2019), or faculty-specific, such as the Sustainability Faculty Fellowship at the University of Oregon (2019). It is also common for institutions to introduce a Sustainability Certificate for students, such as the Eco-Badge program at Central Community College in Nebraska (2019). A sustainability program could correspond to Bow Valley College’s existing LEAD program and be represented on their co-curricular records.

Building on this concept, many schools are now encouraging leadership from students; not to participate in an existing program, but to develop and implement a project of their own. At Southern Illinois University at Carbondale, students can submit a proposal for a project as part of a capstone course to the University’s ‘Green fund’ (2019). This fund comes from a Green Fee which is paid by students each semester. Staff and faculty are also eligible to submit a project. At Bow Valley College, perhaps this funding could come from the

Students' Association or Faculty Association. Macalester College has an interdisciplinary Sustainability and the Campus course, which tasks students to solve challenges of the University (2018). This move toward project-based education is more broadly known as a 'living laboratory' approach, using the campus as a microcosm of a system, to test ideas and concepts in-situ. The University of Calgary implemented this concept of a learning lab campus in 2016, asking students to apply for funding for a project that aligns with their Institutional Sustainability Strategy (2019b). In 2017, the Association for the Advancement of Sustainability in Higher Education (AASHE) released a guide outlining the theory, steps, and barriers for implementing project-based learning at postsecondary institutions. Notably, they provide suggestions for fostering connections across departments and "overcoming bureaucracy" (2017, p.15). This guide will be extremely helpful if Bow Valley College decides to take this project-based approach to sustainability.

The final approach schools are taking to incorporate sustainability is through an institutional-wide approach. Identifying sustainability as a priority at the Executive level empowers instructors and staff to incorporate sustainability into their own realms of work. Hill and Wang (2018) explain that strategic approval of a university-wide sustainability requirement at the University of Vermont was helpful for embedding sustainability across curricula. Gough and Longhurst (2018) outline the systematic way that all faculties at the University of the West England were reviewed for their alignment with the Sustainable Development Goals. The long-term vision at the University of British Columbia is to embed sustainability into all undergraduate programs and has developed four 'attributes' to guide the development of learning pathways, such as Holistic Systems Thinking and Acting for Positive Change (Marcus et al., 2018). Nottingham Trent University has embedded

sustainability across the curriculum, in conjunction with investing in staff development and an online resource library (Willats et al., 2017). In an interesting approach, Penn State is moving toward hiring a Sustainability Director in each department across the University to reduce the centralization and silo-effect of an Office of Sustainability (Shrivastava, 2018). The intent is to expand the possibilities of sustainability by building capacity from within departments.

As has briefly been outlined here, institutions are finding new and creative ways to embed sustainability knowledge, ethos, and mindsets into their work and education. This is exemplified in a review of the book *Narratives of Educating for Sustainability in Unsustainable Environments*: “Fostering sustainability in higher education means focusing on place... [it] means creating administrative structures that will maintain new approaches for the long-term, showing how teaching environmentally is at once intensely site-specific yet powerfully global, deeply personal yet visibly public.” (Michigan State University Press, 2019). As Bow Valley College is tasked with incorporating sustainability across curricula, we must do so in a way that honours our learners’ lived experiences, takes discipline contexts into account, and strengthens ties to our local and global communities.

Impacts Beyond the Classroom

Despite hundreds of examples of sustainability projects across postsecondary institutions, the measurement of sustainability literacy has been somewhat elusive. Namely because this form of literacy is particularly difficult to measure because the outcomes of this form of education may not be observed for 50 to 100 years. The actions of today will echo into future generations.

Before measuring sustainable outcomes, one needs to measure the prevalence of

sustainable content, which, as Stough et al. (2018) has demonstrated, can be difficult. Two distinct methods were used to assess the presence of sustainability in curriculum: European Credit Transfer and Accumulation System (ECTS file) and self-assessment. Each method yielded radically different results. What may be ‘sustainable education’ according to some, may not be considered as such by others. However, while numeracy and literacy outcomes are measurable from a behavioural standpoint, sustainability literacy curriculum may be indirectly measurable, akin to interpersonal communication and management skills. For example, introductory microeconomics texts now contain calculations on the rate of growth of cities and the reduction in farmland and the tradeoffs and costs we face. As these costs and tradeoffs become articulated from a variety of disciplinary perspectives, these models and methods add to the tangibility and measurability of sustainability literacy.

Within the discipline of economics, a means of measuring solutions to the so-called tragedy of the commons, the problems we face for not taking care of shared resources like the ocean and atmosphere, are also coming into view. Elinor Ostrom, who is the first woman to receive the Nobel Prize in Economics, has summarized eight core design principles for managing this intractable problem at more local levels, a strategy that relies on monitoring and graduated sanctions (Wilson, 2016). Her life’s work provides numerous case studies of how societies manage shared but unowned resources. The advancements in the measurement of systems benefits is a benefit to business and to the project of measuring sustainability more generally. Her work showcases that as our understanding of sustainability continues to evolve, measurement will continue to evolve as well.

Regardless of the challenges identified above, many scholars have attempted to quantify the baseline and post-program sustainability literacy of students. The online Sulitest

has been taken at over 700 universities in 61 countries by almost 80 000 students (UNDESA, 2018). There are at least 12 distinct sustainability literacy assessment tools available (Fischer et al., 2015). Although this number is likely much higher since institutions often develop sustainability literacy assessments for their unique student body, such as the assessment given at the University of British Columbia (Crowther, 2016).

These efforts to measure a) the extent of sustainability in curriculum and b) the outcome of this curricula on literacy, leads to a third frame of measurement: the impacts of this literacy on behaviour.

People's environmental attitudes and behaviour are influenced by childhood experience, social norms, education, felt responsibility, and more (Gifford & Nilsson, 2014). However, one of the largest indicators of the adoption of pro-environmental behaviour – composting, using public transit, reduced meat consumption – is self-efficacy: the belief that the actions taken are effective and within the ability of the person performing them (Meinhold & Malkus, 2005). Essentially, believing one can perform an action leads to internal motivation, which increases the likelihood that one will engage in positive environmental actions (Tabernerero & Hernández, 2010). This is a cross-cultural finding (Kim et al., 2012), suggesting focusing on self- efficacy to promote positive environmental behaviour is beneficial for culturally diverse audiences.

In this context, self-efficacy is a combination of a) access to infrastructure that promotes sustainable behaviour (ex: a compost bin and composting program available), b) believing one can complete an action competently, and c) an understanding and belief that the actions taken make a positive difference. Most Canadians want to make decisions and take actions that have a positive impact on the environment, with 76% agreeing that they are

morally obligated to act in their daily lives to reduce carbon pollution (Climate Action Network, 2015). A major barrier is understanding which actions to take (ex: what items are compostable), and psychological fatigue: remembering to make sustainable decisions (Heath & Heath, 2010). For this reason, many sustainability professionals recommend implementing solutions that reduce psychological fatigue (Theotokis & Manganari, 2014). For example, setting the default on printers to double-sided printing, and putting recycling and compost receptacles beside landfill bins. This simultaneously helps people understand which decision is more sustainable, while reducing the amount of brain power required to remember to make that decision.

With these insights in mind, the best way educators can increase pro-environmental behaviour is through the development of self-efficacy in their students. Access to sustainable infrastructure and tangible case studies and examples of sustainability in their field, combined with education that facilitates confidence in the learner, inspires long-lasting behaviour change. As observed by Demirci & Teksöz (2017), “students who attended [a] sustainability course have relatively high personal self-efficacy beliefs toward integrating sustainability into their daily life” (p.116). By extension, this self-efficacy should lead to more sustainable behaviour (Meinhold & Malkus, 2005), but more research is needed to understand this relationship at the post-secondary level. This relationship between learning and behaviour is echoed in a recommendation by UNESCO: “The need to move beyond teaching about the concept of sustainable development in some subjects to reorienting the whole learning institution so that everyone within the community develops the knowledge, skills, and values that will help them to lead and maintain sustainable lifestyles” (as cited in UNEVOC, 2017, p.28). Since each person leads a different lifestyle, De Young highlights the

need to foster ‘behavioural entrepreneurship’: discovering ways to change their own behaviour (2019). It is not an expert-driven process, or a one-size-fits-all. Like all comprehensive education, successful sustainability education encourages the learner to incorporate the tenants of sustainability into their daily lives in a way that makes sense for them.

Raymond De Young advocates for a move beyond green consumerism, to green citizenship. Smaller experiments in pursuit of frugality, competence, and community participation may be grounds for more satisfying and durable motivators of environmental action. These in turn, within the context of an increasingly constrained and perhaps chaotic set of environmental circumstances might help communities adjust to their changing environments. These “behavioural innovations” have the advantage of local relevance and rapid dissemination of findings. The added benefit to a community college of being driven by “citizen-developed interventions” is obvious to a facilitator-led classroom environment. As De Young states, the move is away from “delivery-based interventions toward the facilitation of citizen- developed interventions occurring in a partially unknowable future context.” (2019, p.8). In other words, we need to prepare learners/citizens for an increasingly ambiguous future; business schools in particular should be doing more to develop entrepreneurs with a higher tolerance for ambiguity and capacity for change.

Some good news for sustainability is the plateau of happiness, or the Easterlin paradox, the tendency for money to provide no measurable contribution to well-being beyond roughly \$100,000 of household income (Jebb et al., 2018). Happiness does increase with increasing salary, but plateaus after \$100 000. Perhaps the tendency to make purchases that signal a higher social status may be substituted for recognition that rarely do purchases

increase our happiness long-term. While money has a variety of uses, it seems that we wouldn't be giving up on well-being if it were necessary from the standpoint of the limitations of the earth's carrying capacity to consume less. At least for the behavioural aspect of sustainability literacy, we are beginning to map lifestyle plans that may allow us to maintain a habitable planet and happy lives.

Recommendations for Bow Valley College

In order to understand how Bow Valley College compares to other postsecondary institutions, a meta-analysis of 319 institutional reports was conducted. Through the Association for the Advancement of Sustainability in Higher Education (AASHE) database, we discovered institutions incorporate sustainability into 11.65% of courses. For comparison, Bow Valley College incorporates sustainability into only 7.77% of courses. Additionally, 39% of higher education institutions have completed Sustainability Literacy Assessments, while Bow Valley College has not. However, we are slightly above average when it comes to the number of students who graduate from programs that have adopted at least one sustainability learning outcome (48.16% at Bow Valley College, compared to 38.84% at other institutions). This is due to the work done by the Chiu School of Business, which is the only department that currently adopts sustainability as a learning outcome.

The work started by the Chiu School of Business is just the beginning of a larger transformation of curriculum that needs to take place at Bow Valley College. According to the 2018 report by the Intergovernmental Panel on Climate Change (IPCC), limiting temperature rises to 1.5 degrees Celsius is essential in order to avoid catastrophic effects of climate change by 2030 (IPCC, 2018a). As IPCC Chair Hoesung Lee states, "Limiting warming to 1.5 degrees is not impossible but would require unprecedented transformations in

all areas of society.” (Lee, 2018). This transformation includes postsecondary education.

Postsecondary institutions in Alberta are in a particularly unique position when it comes to action. While it seems obvious to argue that we should maintain a habitable planet, we may also apply an ability-to-pay principle – those that can afford to reduce their footprints should do so, to avoid the worst consequences of climate change, ocean acidification, and pollution. Further, we may also apply ethics more broadly about the fairness of the consequences of western lifestyles most harshly visited upon those with the least responsibility in creating these problems. Alberta emits approximately 62 tonnes of greenhouse gas per year, per person, and we have an idea now of those costs imposed by the lifestyle of Albertans on other, between \$2800-4500 (Leach, 2016). The cost of keeping the world within the safe operating space of 1.5°C increase is approximately 3 trillion dollars per year (IPCC, 2018b). Moreover, the Global Footprint Network has refined their estimates of the average global footprint at 2.8 global hectares per person, as compared to the availability of biocapacity at 1.7 global hectares per person, and Calgary at 9.8 gha (2018). Postsecondary institutions in Alberta, in light of these footprints, have a significant role to play in the transformation of all areas of society, in order to meet our global and ethical obligations.

It is not just intergovernmental panels, networks, and journalists that are calling for action. According to a National Union of Students study of 3000 students from around the world, 91% of students have an “expectation to see action on sustainability from their place of study, and also of a similarly high demand to learn more about sustainable development” (2018, para.3). Institutions that do not take this lens to all levels of their operations and academia risk being left behind.

With these calls-to-action in mind, we recommend these next steps for Bow Valley College:

1. Conduct a sustainability literacy assessment of learners and instructors to better understand how sustainability is currently understood, taught and practiced.
2. Facilitate peer-to-peer learning between instructors and share successes from other institutions, fostering the sharing of sustainability curriculum (rather than reinventing the wheel). Facilitate conversations between curriculum developers and instructors, to ensure both are incorporating a lens of sustainability.
3. Promote the use of the Association for the Advancement of Sustainability in Higher Education (AASHE) resource database, which is accessible to all Bow Valley College employees under our membership fee.
4. Invest in Professional Development for instructors related to sustainability; specifically, the Sustainable Development Goals and climate change.
5. Identify at least one champion for sustainability in each academic department.

All these recommendations align with the new strategic plan for the college; specifically, to Challenge our Thinking and Shape the Future of College Education. The future of college education relies on a sustainable future and Bow Valley College is well positioned to be an active leader in that transition. We are an institution composed of diverse students, many of whom already espouse values of conservation (such as saving money and not wasting food). These existing values can be re-directed into sustainable mindsets for their future careers. Additionally, we are an institution filled with empathetic instructors, willing to build the self- confidence and self-efficacy of our learners to promote pro-environmental behaviour.

Lastly, monocultures lack the fecundity of more diverse environments, and Bow Valley College may be one of the most diverse institutions in the city, an advantage from which we could develop the most innovative solutions to the challenges of sustainability. Bow Valley College's diversity, empathetic staff, and international students are our greatest strengths as we tackle the wicked problems of our time.

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