Chapter 17
Preservice Teacher Professional Development in Education for Sustainable Development

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For the last four decades, education has been at the core of countless international conferences and reports related to environmental sustainability. Since *Agenda 21* (United Nations Division for Sustainable Development 1992), Education for Sustainable Development (ESD) has gained increasing recognition, highlighting the role of education as a catalyst for building a sustainable future for all. The premise of ESD is that enhancing citizens' understanding and awareness of the world's environmental and social challenges (e.g. climate change, renewable natural resources, and rural development) will be instrumental in mitigating these critical problems.

Such discourse of ESD has spread internationally in a number of ways, one of the most significant influences being the work of international agencies such as the United Nations (UN) and its subsidiaries. In particular, the UN declared 2005–2014 as the Decade of Education for Sustainable Development and called on all countries to reorient K–12 and teacher education towards an ESD framework (UNESCO 2018). As a follow-up to the UN Decade of Education for Sustainable Development, UNESCO (2014) endorsed the *Global Action Programme* to implement ESD at local levels. As a result, educators in UN member states now carry an important responsibility for facilitating the local implementation of environmental and/or sustainability education policies based on UNESCO's ESD framework.

According to UNESCO (2018), ESD incorporates environmental, social, and economic sustainability issues (such as climate change, biodiversity, poverty reduction, and sustainable consumption) into teaching and learning. The goal is to train future generations in systematic thinking and to empower them with the requisite analytical skills to understand and critically examine the world's environmental and social challenges (UNESCO 2005). More importantly, ESD encourages learners to reflect on the impact of their everyday choices in terms of sustainable development.

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It also seeks to cultivate students' sense of environmental responsibility, so they can challenge unsustainable practices and participate in changing them (e.g. avoiding overconsumption, engaging in political discussions that could produce legislation promoting environmentally sustainable living). To this end, a transformative pedagogical approach to teaching and learning is widely recommended at the international level: that is, educators and teachers are now expected to use "participatory teaching and learning methods that motivate and empower learners to change their behaviour and take action for sustainable development" (Learning for a Sustainable Future n.d. para. 2).

Canada was an active contributor to the UN Decade of Education for Sustainable Development. In particular, the Council of Ministers of Education, Canada (CMEC), played a leading role in facilitating Canadian ESD activities and aligning them with international efforts. In the last decade, the CMEC has promulgated several official documents in collaboration with Environment Canada, the Canadian Commission for UNESCO, and the United Nations Economic Commission for Europe (UNECE). Notable examples include *Report to UNECE and UNESCO on Indicators of Education for Sustainable Development* (CMEC 2007); *Developing a Pan-Canadian ESD Framework for Collaboration and Action* (CMEC 2010); and *Canada's Response to UNESCO Questionnaires on the UN Decade of Education for Sustainable Development, 2005–2014: Education for Sustainable Development after 2014 and UN Decade of ESD Final Report* (CMEC 2014).

Across Canada, most provincial and territorial departments and ministries of education have also developed strategies and supporting programmes to foster the implementation of ESD at local educational institutions, including elementary and secondary education, higher education, and teacher education (CMEC 2014). To extend these efforts further, the Government of Québec (2013) proposed the official *Government Sustainable Development Strategy* to evaluate Québec's educational programmes (K–12). The goal was to ensure that the learning outcomes for K–12 levels are centred on key sustainable development concepts, such as cultural diversity, responsible citizenship, and environmentally sound and sustainable technology. As a result, Québec teachers are now tasked with an important responsibility to develop their students' understanding and appreciation of sustainable development. They are also expected to extend the existing curriculum and integrate the principles, values, and practices of sustainable development into all areas of education (CMEC 2010, 2012).

Recognising the challenges that in-service teachers may encounter when adapting ESD for the existing curricular programmes, many teacher associations and non-profit organisations have been providing various in-service training and professional development opportunities for schoolteachers in Québec. For example, the Centrale des syndicats du Québec (CSQ), which is a union organisation, has brought more than 1000 Québec schools into its Brundtland Green School (BGS) movement. The BGS movement aims to engage teachers and students in caring about the environment and to encourage action to create a "peaceful, united, and democratic world" (CSQ 2006, p. 2). In addition, the Québec Association for the Promotion of Environmental Education (Association québécoise pour la promotion de l'éducation

relative à l'environnement), also known as AQPERE, works closely with K–12 schools and local museums to develop teaching and learning activities related to sustainable development. Members of AQPERE are also encouraged to share their ideas and training materials with schoolteachers to help them involve their young children in sustainable actions.

Despite the growing involvement of education communities, this top-down approach adopted by the government to implement ESD is seemingly not practical for most preservice teacher education programmes at universities. The challenge mainly lies in the autonomous nature of the academic environment in which faculty members have the option to decide whether or not they will integrate ESD into their courses. Such concern has also been raised in a number of CMEC reports in which experts have called on university leaders and administrators to establish ESD as part of the teacher education curricula; as stated in the CMEC's (2012) ESD Report for Canada,

> Universities are largely autonomous; they set their own admissions standards and degree requirements and have considerable flexibility in the management of their financial affairs and program offerings. Government intervention is generally limited to funding, fee structures, and the introduction of new programs. (p. 69).

As a result, many well-intentioned faculty members are still left alone trying to understand how to effectively engage university students in thinking about real-world issues (CMEC 2012). In many faculties of education, it has largely become an individual effort, as opposed to cross-curricular integration programming, to develop preservice teachers' knowledge and teaching competencies for ESD. In response to this challenge, we argue that student teachers can play a leadership role in fostering ESD in their universities, schools, and local communities. ESD would enable them to rethink their role in relation to sustainability issues and actively participate in finding ways to address these issues through their choices and actions. That is, university students can lead us in envisioning creative options for sustainable living, and the faculty members can turn to facilitating the process and providing their expertise to support the students. It is with this vision in mind that we initiated a student-led project to promote ESD among preservice teachers at McGill University.

In this chapter, we share a student-led initiative focusing on ESD in teacher education. We present the project objectives, student-led activities, and the ways in which this experience has contributed to the development of teacher leaders.

17.1 Professional Development in ESD

Training Teachers for Sustainability was a student-led project initiated by a team of Education students between 2015 and 2016. The project sought to offer professional development opportunities for Education students (preservice and in-service teachers) interested in integrating sustainability-related knowledge and concepts into

their teaching. This initiative was guided by Education faculty members, and professional staff from the McGill Office of Sustainability, and was supported by a grant from the McGill Sustainability Projects Fund.

The origin of this project dates back to October 2013 when the McGill Sustainability Projects Fund announced a call for proposals to support sustainability initiatives at the university. The Sustainability Projects Fund (SPF)—a campus "green" fund—is funded through a "student fee of approximately $0.52 per credit (up to $15/student/year), which is matched equally by McGill University. To date, McGill SPF has received close to $3.1 million in student fees, which, when matched by the University, brings the Fund to a total value of approximately $6.3 million" (McGill Office of Sustainability 2017, p. 3). An independent parity committee—the SPF Working Group—reviews and approves all allocations. The Working Group consists of four student members, two academic members, and two nonacademic staff members. Notably, all members of the McGill community are welcome to apply for SPF grants.

Our project was approved by the SPF Working Group in 2014 and funded between 2015 and 2016. Specific objectives of our project were to (a) explore Education students' existing knowledge of sustainability issues; (b) enhance Education students' understanding of ESD; (c) develop Education students' pedagogical skills to facilitate the integration of ESD in their teaching practice; (d) develop Education students' leadership skills as teacher leaders for promoting ESD; and (e) empower Education students as teacher leaders to develop a culture of sustainability.

17.2 Education Students' Initial Understanding of ESD

At the initial phase of the project, the project team administered an online survey to Education students to explore their initial understandings of ESD. The survey was developed by Michalos et al. (2009) to examine secondary students' and adults' knowledge and attitudes related to ESD. The survey was administrated between the months of March and May 2016 and was sent to all undergraduate and graduate students (prospective and in-service teachers) in teacher education programmes at McGill University's Faculty of Education. Student participation in the survey was voluntary, and respondents completed the survey in their own time. The results of the survey (see Tables 17.1 and 17.2) were useful in gaining an initial understanding of Education students' knowledge of social, economic, and environmental sustainability issues.

Through the survey, we found that 84% of the Education students (44 respondents in total, 77% female and 23% male) thought that sustainable development requires "economic development, social development, and environmental protection". Furthermore, most of the students who answered the survey questions generally seemed to have a basic familiarity with and understanding of the term "sustainable development". Approximately 91% of the students were in favour of

Table 17.1 Knowledge of sustainability development,[a] percentage of student responses

Statements	Percentage of student responses (n = 44)		
	Agree	*Disagree*	*Neutral ORI don't know*
A1. Economic development, social development, and environmental protection are all necessary for sustainable development.	84	7	9
A2. Education for sustainable development emphasises education for a culture of peace.	79	7	14
A3. Sustainable development is as much about the children in the future as it is about what we need today.	91	7	2
A4. Sustainable development has nothing to do with social justice.	11	73	16
A5. Canada's overall energy is improving.	16	25	59
A6. Sustainable consumption includes using goods and services in ways that minimise the use of natural resources and toxic chemicals, and reduces waste.	91	4	5
A7. Education for sustainable development emphasises gender equality.	48	23	29
A8. Helping people out of poverty in Canada is an essential condition for Canada to become more sustainable.	71	9	20
A9. Education for sustainable development seeks to balance human and economic well-being with cultural traditions and respect for the earth's natural resources.	91	2	7
A10. We cannot slow the rate of climate change.	5	84	11
A11. Corporate social responsibility is irrelevant to sustainable development.	5	95	0
A12. Conservation of fresh water is not a priority in Canada because we have plenty.	7	91	2
A13. Maintaining biodiversity—The number and variety of living organisms—Is essential to the effective functioning of ecosystems.	96	2	2
A14. Education for sustainable development supports cultural diversity.	64	9	27
A15. Use of non-renewable resources like oil should not exceed the rate at which sustainable renewable substitutes are used.	68	7	25
A16. It is useful to estimate the monetary value of the services that the ecosystem provides to us, such as neutralising air pollutants or purifying water.	75	7	18
A17. Education for sustainable development emphasises respect for human rights.	82	4	14

This survey is retrieved from Michalos et al. (2009)

Table 17.2 Attitudes concerning sustainability development, percentage of agreeing or disagreeing with statements favourable to sustainable development

Statements	Percentage of student responses (n = 44)		
	Agree	*Disagree*	*Neutral ORI don't know*
B1. Every girl or boy should receive education that teaches the knowledge, perspectives, values, issues, and skills for sustainable living in a community.	93	2	5
B2. The present generation should ensure that the next generation inherits a community at least as healthy, diverse, and productive as it is today.	98	2	0
B3. Manufacturers should discourage the use of disposables.	79	7	14
B4. Overuse of our natural resources is a serious threat to the health and welfare of future generations.	93	7	0
B5. We need stricter laws and regulations to protect the environment.	93	2	5
B6. Poverty alleviation is an important topic in education for sustainable development.	75	9	16
B7. Sustainable development will not be possible until wealthier nations stop exploiting the labour and natural resources of poorer countries.	71	18	11
B8. Companies that are environmentally sustainable are more likely to be profitable over the long run.	68	7	25
B9. The teaching of sustainability principles should be integrated into the curriculum in all disciplines and at all levels of schooling.	89	7	4
B10. Governments should encourage greater use of fuel-efficient vehicles.	82	7	11
B11. Adopting sustainable development as a national priority is key to maintaining Canada's status as one of the most liveable countries in the world.	89	2	9
B12. Citizenship education is an important component of education for sustainable development.	79	7	14
B13. Taxes on polluters should be increased to pay for damage to communities and the environment.	79	7	14
B14. There is no point in getting involved in environmental issues, since governments and industries have all the power and can do what they like (reverse coded in attitudes index).	2	98	0
B15. Gender equality has nothing to do with sustainable development.	16	57	27

sustainable consumption, agreeing that "Sustainable consumption[1] includes using goods and services in ways that minimise the use of natural resources and toxic chemicals, and reduces waste". Similarly, 91% of the students seemed to understand that balancing "human and economic well-being with cultural traditions and respect for the earth's natural resources" is essential for ESD. However, although 71% of the students thought that poverty reduction in Canada is essentially tied to its sustainability, 29% of them either disagreed or were not sure about the relationship between poverty issues and sustainability of the society. At the same time, 75% of the Education students believed that "poverty alleviation is an important topic in education for sustainable development", while 25% were either not sure or disagreed with this statement.

The majority of the Education students (98% of the respondents) agreed that "the present generation should ensure that the next generation inherits a community at least as healthy, diverse, and productive as it is today". In addition, 93% of them believed that "overuse of our natural resources is a serious threat to the health and welfare of future generations". Furthermore, 89% of the students (current and future K–12 teachers) thought that "the teaching of sustainability principles should be integrated into the curriculum in all disciplines and at all levels of schooling". However, some Education students seemed to be unfamiliar with the social aspects of sustainability, including social equity, social harmony, and cultural diversity. Although 82% of the students agreed that "ESD emphasises respect for human rights", only 48% of them thought that "ESD emphasises gender equality". In other words, approximately 50% of the students either disagreed (23%) or were not sure (29%) about the relationship between gender issues and sustainability. In the same vein, 57% of the students viewed gender equality as an important component of sustainable development, while 16% believed that "gender equality has nothing to do with sustainable development" and 27% were not sure about the relationship between gender issues and sustainable development. On the same note, 64% of the students agreed to the statement "ESD supports cultural diversity", while 27% of them were either neutral or did not agree with this statement. In addition, approximately 21% either disagreed (7%) or were not sure (14%) about the emphasis of ESD on developing a "culture of peace".

17.3 Professional Development Workshops for Education Students

In the next phase of the project, we developed a series of professional development workshops for Education students based on the survey findings presented above. In this phase, the survey findings were shared with a project team to guide our thinking

[1] A more complete definition of "sustainable consumption" is a practice that can be continued indefinitely without harmful effects. Because Michalos et al.'s (2009) entire survey was used in this study, its description of "sustainable consumption" was kept.

about the workshop content and educational materials for other Education students and faculty members. This project team, consisting of one graduate and three undergraduate students, collaboratively developed and organised three professional development workshops for Education students at McGill University to expose them to various topics and teaching activities related to ESD.

The first workshop focused on the importance of bringing scientific research on environmental sustainability issues into the classroom and engaging students in outdoor nature explorations. We also invited workshop participants to reflect on several important questions, including "How can teachers communicate complex scientific knowledge to students of all age groups?" Afterwards, we demonstrated how to use social media, such as Twitter and video blogs, to effectively engage young children with a wide range of complex socioenvironmental issues and concepts such as biodiversity, carbon footprint, and climate justice.

Our second workshop focused on engaging Education students in thinking about real-world issues, such as food security and poverty reduction. Our hope was to invite student teachers to reflect on the importance of creating a culturally and socially inclusive learning environment. We also aimed to reach out to Education students who were not yet familiar with the concept of ESD. Therefore, we initiated an awareness campaign around ESD to invite students and faculty members to share their views and concerns about infusing sustainability concepts into their teaching practices. In return, we offered a bilingual resource bank (English and French) including about 50 open-source online materials that are helpful for understanding different aspects of ESD. In this resource bank, prospective and in-service teachers can find various teaching and learning activities related to ESD to enrich their lessons.

Our final workshop, held in collaboration with McGill's Redpath Museum, was one in which Education students participated in several hands-on outdoor activities. These activities sought to connect elementary and secondary students with nature. Furthermore, these experiential activities engaged them in exploring active learning approaches to understand how changes in the environment can affect social-ecological systems.

Towards the end of the project, the project leader (Ying-Syuan (Elaine) Huang) and the faculty supervisor (Anila Asghar) noticed that Education students who were part of the project team gradually began to take on more of a leadership role in initiating new ideas and activities to promote ESD. As indicated earlier, two undergraduate students in Education took part in organising the project activities (e.g. professional development workshops). Being interested in exploring ways to empower teachers and educators to develop a culture of sustainability, we decided to carry out participatory video research with Education students. In the following section, we discuss our participatory research with the two undergraduate students who were actively involved in this initiative as members of the project team. We will then highlight their learning journeys as teacher leaders during this project.

17.4 Participatory Video Research with Education Students

As discussed earlier, this chapter seeks to highlight the contributions of three teacher leaders to this project and examine how they mutually supported each other's professional development and growth as leaders in sustainability education as they engaged in participatory video research. Ying-Syuan (first author) was a third-year doctoral student in the Faculty of Education at the time of the project. Her research focuses on sustainability policy and education in Taiwan. She is interested in comparing the ways in which Western and Confucian approaches to sustainability shape teachers' and educators' practices around environmental issues. Charlie,[2] an undergraduate student, was in the third year of the undergraduate programme in Elementary Education at the time of this project. He was interested in looking at the impact of sustainability education on public policy. He joined this project to bring together social and environmental issues, such as democracy, social cohesion, civic responsibility, climate change, and renewable energy sources. He was passionate about using problem-based learning to promote students' engagement in these issues. Jamie[2] was in the fourth year of the undergraduate programme in Secondary Science Education when she participated in this research. She was interested in promoting the development of scientific literacy skills among her students by engaging them in critical questions around the ways in which science affects our society and vice versa.

Jamie and Charlie participated in video research projects to explore innovative ways to teach sustainability concepts and issues. Participatory video research methodology serves to empower individuals by offering them creative avenues to voice their feelings and views about critical issues in their local neighbourhoods and communities (Mitchell and de Lange 2013). Visual methodologies (including participatory video) have been used largely in the context of working with marginalised communities based on their personal experiences (Milne et al. 2012; Mitchell and de Lange 2013; Williams and Lykes 2003). Drawing on this methodology, we used "cellphilms" as a participatory research tool to explore ways to develop Education students' leadership skills for promoting ESD.

Cellphilms—short videos made using mobile phones—are often used to explore participants' perspectives on relevant issues in local communities; they tend to be short and concise with the main message elements taking priority (Dockney and Tomaselli 2009). We chose cellphilms as a participatory research tool because video production provided the prospective teachers with creative opportunities to bring people together and to help create a positive environment to engage in critical conversations around sustainability issues. Furthermore, cellphilm making is an innovative pedagogical approach to ESD because it helps to empower children and teachers to promote sustainable development through actions at the local level. In this study, Charlie and Jamie participated in the cellphilm-making process. We adapted the participatory video methodology used by Mitchell and de Lange (2011)

[2] Pseudonyms are used for confidentiality.

in their research conducted with youths on critical health issues in African communities.

Ying-Syuan worked closely with Jamie and Charlie to support their professional development. The video project involved a number of stages that prepared the students to develop their cellphilms as teaching and learning resources for ESD. Specifically, a brainstorming session was held at the beginning to encourage the students to share ideas and to collaboratively develop specific objectives for the cellphilm. As Charlie and Jamie seemed interested in enhancing other Education students' understanding of ESD through celllphilms, the project team developed a prompt question to guide their cellphilm making (Mitchell and de Lange 2011). We asked, "What are the strengths or weaknesses of education for sustainable development?". The question prompt was meant to focus their thinking to help develop a critical understanding of the concept of ESD in teachers.

Subsequently, the project team participated in a training session to develop a plan to work with the camera. Two experts in participatory research methodology were invited to conduct this training. We asked Jamie and Charlie to write field notes when they discussed their scripts for the cellphilms, drafted their storyboards, and made their cellphilms. They were also encouraged to keep track of the process in order to be aware of their developing understandings of ESD and interpretations of the question prompt from their perspective. Jamie and Charlie then filmed their cellphilms. Jamie's cellphilm brought up issues of waste management in her neighbourhood. In particular, she highlighted the impact of human activities on river pollution. In order to engage her secondary students with these issues, she developed lesson plans to use this cellphilm in her classroom. Charlie's cellphilm focused on climate change issues in relation to human choices and actions. Through this cellphilm, he intended to engage teachers in critical conversations on this important issue. Ying-Syuan facilitated this film-making process by regularly meeting with the students to discuss their evolving ideas and offering the requisite materials and resources.

After making the cellphilms, the project team had a focus group conversation to share their experiences. Charlie and Jamie were first invited to share their cellphilms with the group. The focus group discussion was facilitated by the experts who had led the initial cellphilm training session. They invited the project team to reflect on and discuss on the following questions:

- What is it that you want your cellphilm to do?
- Who you are you making your cellphilm for?
- What decisions are you making along the way to help accomplish this goal?
- What aspects are you enjoying and what are you finding challenging? Is there anything that has surprised you about this process?
- How has the process solidified, changed, or influenced your thinking about ESD?
- How does this cellphilm process compare with the other activities and resources that have been developed through this project?

Ying-Syuan documented the entire process of cellphilm making including the brainstorming and training sessions, focus group discussions and informal conversations, the video-making process, and follow-up reflections.

17.5 Developing Teacher Leaders in ESD: Key Learnings

In order to track Education students' professional growth as teacher leaders, we drew on multiple sources of data to capture the richness of the learning process. Data collected included participatory video projects, focus group and informal conversations among the project team members, field notes, and researcher's journal entries (the first author, who was the project leader, wrote a journal to record her reflections on the entire process). These tools helped to document students' professional transformation through their involvement in various project activities and were used to examine Education students' emerging understandings of ESD. They also helped to explore the ways in which Education students developed the ESD knowledge and skills as teacher leaders to promote sustainability. A number of qualitative analysis tools and techniques—such as concept mapping and thematic analysis (Creswell and Poth 2017)—were used to analyse the data. This approach allowed us to identify common patterns, cluster salient themes, and explore relationships between them.

Our analysis was inspired by the *Competences in Education for Sustainable Development* (United Nations Economic Commission for Europe [UNECE] 2012) as these competencies encompass educators' knowledge of and attitudes towards ESD, professional values, and pedagogical skills to implement ESD effectively. We also believe that these competencies reflect leadership skills that we hoped to develop in teachers and educators through our project. These competencies are also important as they reflect the international vision for fostering sustainability in teacher education through empowering teachers to play a central role in ESD. Our project objectives were aligned to these competencies. Thus, we developed an interpretive framework (Fig. 17.1) drawing on these competencies (UNECE 2012) to inform our analysis of teacher development through their participation in these project activities.

17.6 Evolving Understandings of ESD

Drawing on our interpretive framework (Fig. 17.1), we first looked at project team members' developing understandings of ESD. We noticed that this experience broadened Charlie's and Jamie's conceptions of ESD as they began to make deeper connections between the natural, social, and economic components of sustainability. For example, at the beginning of the project, the students constantly referred to the challenges involved in teaching climate change issues to K–12 students. They

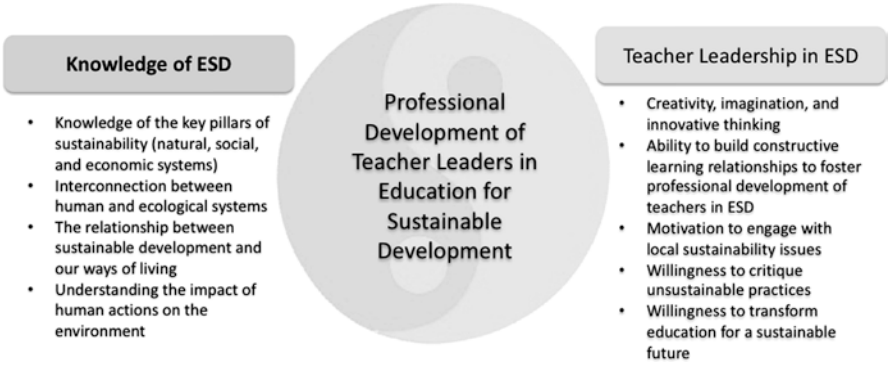

Fig. 17.1 Interpretive framework

seemed to believe that teachers needed to first understand the science of climate change themselves before teaching these issues. As they engaged with the social and economic factors that are intimately tied to climate change, we noticed a shift in their thinking as they increasingly began to emphasise the importance of teaching the interconnections between the key pillars of sustainability (natural, social, and economic systems).

For example, Jamie, a prospective secondary science teacher, noted in a focus group discussion that the purpose of ESD is to educate students about how to "develop a society that is able to sustain its economic [development] and environment considering the people in the society". Jamie believed that ESD can help us to rethink "what we need to survive" through considering the environmental, social, and economic aspects of the current sustainability issues. In the focus group discussion, these students also underlined that we, as teachers, should not just tell students to recycle and "turn off the light"; instead, teachers should take an "extra step of explaining" why these actions are important. The strength of an ESD curriculum, as the students noted, lies in providing students with opportunities to learn about interdisciplinary knowledge using real-world problems (researcher's field notes).

Moreover, the Education students stressed the impact of human activities on ecological systems. While sharing his understanding of ESD, Charlie explained in a focus group that ESD refers to "the process of educating people" that "our actions have consequences" and "learning to be able to make the link between disaster and what's causing the disaster". For Charlie, "seeing a problem", realising what is "causing the problem", and then "thinking about what are the possible solutions" are the type of thinking that is required for sustainable living. When reflecting on the process of cellphilm making, Jamie said that she made the cellphilm to remind her students to "look at things around [them], and how that impacts [their] life style" (focus group). Jamie also talked about her intention of using her cellphilm to show her students how human activities are affecting the lakeshore in the neighbourhood. As Jamie said in her focus group,

> I saw ESD as making links to direct to students, to direct to what's in your local areas, and how you can look at a second layer of that, and to look at how everything is making links in your local areas. … Up North … we can walk on the lake [sic walk along the lakeside]; we can go look at the organisms on the shore. Like algae, we actually just collect them and look at them under the microscopes. But then you can also walk on the lake [sic walk along the lakeside] and see all the wastes that people dumped off there, and how they [organisms and waste] both affect the shore.

Building on Jamie's point, Charlie added that we, as teachers, needed to think creatively about the curriculum and to integrate these complex issues into our lessons. For instance, as Charlie pointed out, teachers can engage students in thinking about the long-term economic benefits of electric cars and can engage them in critical thinking required for sustainable living. According to Charlie:

> In terms of how do [teachers] integrate a discussion on economic [sustainability] back to the curriculum, it's just a different way of thinking. … Yes, on one hand, it might go cheaper if you are using gasoline cars than electric cars because electricity is not necessarily less expensive than the gas, and the [electric] is certainly more expensive [than gasoline cars]. But on the other hand, if you run out of oil, and there is no more oil on the planet, that [gasoline] car you own now then cannot be driven. So, you can calculate the economic benefit over the long term. The problem is that it is difficult to see the economic benefit for a short term. So [students will] have to think in long term. (Focus group).

As outlined in our interpretive framework (Fig. 17.1), students' emerging understandings of ESD reflected a more holistic approach to teaching the complex sustainability issues in their classrooms. That is, they intended to engage their students in learning about complex sustainability issues in their local communities and rethinking the impact of their choices and actions on the environment.

17.7 Developing Teacher Leaders in ESD

Developing leadership skills in Education students was a key objective of this project. As noted earlier, three Education students were the core members of the project team. Ying-Syuan led the entire project and also mentored the undergraduate students—Jamie and Charlie—to organise and facilitate the professional development workshops for other Education students. She also guided them during their participation in the video research project. This process immensely contributed to Ying-Syuan's professional development as a scholar, education leader, mentor, and researcher. In the following section, we focus on the undergraduate students' development as teacher leaders through their engagement in this project. As noted in our interpretive framework (Fig. 17.1), the key leadership skills for teachers in ESD that we have described include creative and innovative thinking; promoting professional development in ESD; engaging with sustainability issues in local communities; and encouraging learners to consider the consequences of their actions and to envision different ways of living for a sustainable future.

Towards the end of the project, the undergraduate students seemed highly motivated to engage with real-life local sustainability problems. For example, they decided to interview the student activists who participated in the fossil fuel divestment campaign at McGill to gain an in-depth understanding of the concept of climate justice. Jamie also talked about her recent efforts to introduce the concept of local economic sustainability when her secondary students were learning about nutrition. In particular, she explained the benefits of buying local food to her Grade 10 Science class. According to Jamie, she brought tomatoes from local farmers and tomatoes imported from Mexico and asked her students to compare them. When her students noticed that the tomatoes from local farmers were more expensive, she engaged them in thinking about the impact of consumers' decisions on local economics. As Jamie explained in a focus group,

> They are probably a few cents off. [But] it's just being aware of that consumers have to know where you are buying things from, and basically you are supporting your economy if you support [buying] locally. And you are actually helping your local neighbours and farmers.

Moreover, we also noticed that these undergraduate students became more willing to build constructive learning relationships with teachers to promote ESD. They said that there needs to be a platform for teachers and educators to exchange their experiences of successful and/or unsuccessful school-based sustainability initiatives. They believed that school-based projects such as investigating the local waste cycle could serve as a central motivation for changes in community living practices (researcher's field notes). In addition, Charlie volunteered to design and lead one of the project's professional development workshops that focused on the interrelationships among the social, economic, and natural components of sustainability. Charlie believed that we first needed to debunk the myth that ESD is related only to environmental protection. He also intended to address some common concerns about integrating ESD into the curriculum in this workshop. He asked critical, reflective questions during the workshop, such as "How can teachers get extra time to talk about sustainability issues when there is just simply not enough time and there are too many topics to cover in the regular curriculum?" (researcher's journal). In his presentation, Charlie noted that sustainability is, in fact, an integral part of the curriculum because there are a number of concepts in the Québec Education Programme (e.g. citizenship and community life, consumer rights and responsibilities) that are connected to environmental sustainability issues. As Charlie observed,

> There are implications [of ESD] for different subject areas including: Science & Technology, Ethics and Religious Culture, Geography, History and Citizenship Education. … For example, bringing in news articles for English Language Arts or calculating the fuel efficiency of a car in Math. … Students also care more when they can see direct links between what they learn in school and the real world. This also fosters students' intrinsic motivation in [learning]. (Researcher's field notes).

Furthermore, through engaging in cellphilm making, we found that these student teachers became more willing to discuss the assumptions that are embedded in the current unsustainable practices. For example, Jamie used her cellphilm to highlight

the waste management problem in the neighbouring river. Charlie also used his cellphilm to discuss his concerns about our inability to change our behaviours to address climate change problems. He was particularly concerned that "we still don't want to change anything" despite the increasing intensity of natural disasters, such as hurricanes" (Charlie, field notes, focus group). As Charlie further explained in his cellphilm,

> There are rare instances in history when a disaster sparks drastic change in human behaviour. … Is the action sparked by these disasters due to the scale of the disaster, a fear that something similar could happen, or, more likely, a combination of both and/or other factors. … While there are always calls to action regarding climate change, rarely do enough people sit up and make a change in their life to respond to disaster. (Charlie, cellphim transcription).

In addition, these student leaders shared their passion about transforming education for a sustainable future. We believe that their willingness to engage in such a complex, and difficult, task will continue to enhance their leadership skills for promoting ESD. For instance, when asked to reflect on the challenges involved in the implementation of ESD in Canada, they shared their vision for transforming education for sustainable living. Charlie believed that current strategies of integrating ESD have not yet helped students to "see the link between sustainable development and the implications for themselves" (focus group). For Charlie, students still see "[sustainability] as a separate sphere of knowledge that is inconsequential in many ways like Math, Science, or other subject areas". To overcome this challenge, Charlie believed that teachers need to spend more time in supporting their students to find "their passion and interests" and to explore potential "solutions to the problems that they are interested in investigating" (focus group).

Similarly, Jamie envisioned a learning environment in which students are engaged in project-based learning to investigate local sustainability issues. For example, Jamie discussed her next lesson plan on "where the coffee cups go in her neighbourhood". Jamie explained that she was planning to engage her students in an ethnographic project that would connect the three pillars of sustainability issues. Specifically, she would encourage her students to interview people at the local coffee shops and observe "who the consumers are, what the most popular items are, and what happens to the used coffee cups" (focus group). For Jamie, this project can stimulate learning opportunities for high school students to think about the relationship between our ways of living and critical sustainability issues, including social justice, local versus cooperative economic models, and waste management.

17.8 Implications for Teacher Education

This project was the first student-led initiative focusing on ESD in the Faculty of Education at McGill. Such initiatives have transformative potential for enriching teacher education programmes to develop teachers as ESD leaders in their universities, schools, and local communities. Providing rich opportunities for student

teachers to develop and enact creative ESD pedagogies enabled them to engage other teachers and their students in rethinking what it means to create sustainable societies. This collaborative work facilitated a deeper and holistic learning of ESD as the participants critically examined the key pillars of ESD and reflected on real-world issues that are affecting their communities. In contrast with top-down ESD policies, such ground-up experiences seem to spark and sustain participants' passion for transforming education for a sustainable future.

Teacher education programmes need to offer creative opportunities and spaces to support effective professional development of prospective teachers. Such spaces stimulate teachers' innovative thinking, encourage them to question the assumptions underpinning unsustainable actions, promote collaborative leadership work, foster interdisciplinary connections, and inspire problem-based learning approaches. This professional development approach motivates teachers to develop productive learning relationships to advance their learning and growth as ESD leaders. Through this experience, we have learned that peer-to-peer exchange to promote ESD plays an important role in stimulating students' interests in the topic. Further, university students have a distinct advantage in terms of knowing how to approach other students and encourage them to participate in constructive learning opportunities. Such a ground-up model of professional development can be sustained by providing funding to support students to initiate and lead collaborative ESD projects (e.g. setting up a campus green fund to enhance university students' engagement and participation in ESD). Teacher Education institutions need to reorient their professional programmes to place ESD at the core of the curriculum to foster a culture of sustainability.

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