Sustainability 101: Guiding Students on a Sustainability Journey

by

Apryl Bergstrom

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Science

in

Rural Sociology

Department of Resource Economics and Environmental Sociology
University of Alberta

Abstract

There have been many rigorous discussions about the purpose of sustainability education and the sets of learning objectives, learning outcomes or competencies that will best serve this purpose. Some scholars contend that sustainability education should raise awareness and disseminate knowledge to encourage students to change their attitudes and behaviours, which reflects instrumental goals and a behaviourist learning approach. Contending that education is not about filling empty minds, however, critics of this approach call for emancipatory goals and a more constructivist learning approach that emphasizes capacity development. In common with education in other disciplines, this includes the development of critical thinking. Pointing to the distinct nature of sustainability, many scholars also contend that sustainability education should develop special competencies, such as systems thinking, values and strategic thinking.

As a result of these and other discussions, many different learning objectives have been proposed for sustainability education. Since a single program or course cannot include all of these learning objectives, curriculum planners and educators need to choose them carefully. This choice is important because it influences what is taught, how it is taught, and what kinds of knowledge, capacities and dispositions students may develop as a result of their education. In turn, this can impact how well-prepared students will be for sustainability challenges.

The purpose of this research was to look at the selection of learning objectives in a sample of introductory sustainability undergraduate courses in higher education institutions in the United States and Canada. Qualitative research methods were used to explore what this choice indicates about the broader educational goals of these courses. Data collection involved semi-structured interviews with 20 instructors of introductory sustainability undergraduate

courses. Interview transcripts and course syllabi were iteratively coded and thematically analyzed to develop categories of learning objectives and identify themes.

Key findings indicate that these courses aimed to do more than raise awareness or disseminate information about sustainability. They were also concerned with developing students' capacities and dispositions to think, to understand the nature and root causes of sustainability problems, to reflect on their roles in addressing problems, and to apply their knowledge in their own lives. Common learning objectives included the development of critical thinking, systems thinking, values thinking, strategic thinking and interpersonal competence. Student engagement and empowerment were also important objectives. Three themes emerged in the analysis of learning objectives: fostering a different way of thinking, fostering the vision and drive to engage in sustainability, and putting theory into practice. Some interview comments suggested that transformative learning could also be an aspirational goal in some courses. Overall, these results suggest that introductory sustainability courses have the potential to provide an initial orientation on sustainability that may help guide students on a personal sustainability journey.

Preface

This thesis is an original work by Apryl Bergstrom. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name "Teaching Sustainability 101: The goals and practices of introductory sustainability courses", No. Pro00070721, May 2017 to May 2018.

Acknowledgements

This thesis is the result of the combined efforts of many people. Without their support and encouragement, this thesis would not have been possible.

I am deeply grateful to my supervisor, Dr. Naomi Krogman, who patiently and enthusiastically supported me throughout the entire process. She encouraged me to explore my own interests, provided advice and encouragement when I began to flag, and kept me focused when the scope of the thesis grew too large. I would also like to sincerely thank my committee members, Dr. Lynette Shultz and Dr. Robert Summers, for their encouragement and for challenging me to think more clearly and deeply about the research.

I am indebted to the participants who generously took the time to share their knowledge and experience with me. It was a privilege to speak with them and I learned a great deal from the wisdom and insights that they graciously shared with me.

I am also very grateful for the support and encouragement of my friends and family. I would like to express my appreciation to Yichuan for all the times she listened to me talk about my research and offered her ideas and encouragement. I am thankful for my daughter, Natasha, who nudged me onto my own sustainability journey when she was born and who patiently put up with the time that I spent working on this thesis. Finally, words cannot adequately express my gratitude for my husband, Anton, who reminded me about the most important things in life and believed in me when I doubted myself. I could not have done this without his unflagging love, support, patience and encouragement.

Table of Contents

List of Tables

Chapter 1: Introduction

There have been many rigorous discussions in the literature about what sustainability education should strive for and what learning objectives are needed to serve this overall purpose. In this discussion, there have been debates about whether education should be used as an instrument to promote sustainability or whether it should focus on capacity building and fostering learner autonomy. Similarly, there are related debates over whether to present students with knowledge to encourage specific attitudes, values and behaviours or help them build the capacities to construct their own understanding and meaning. As a result of these discussions and debates, many different learning objectives, learning outcomes and competencies have been proposed for sustainability programs and courses. This research looks in particular at learning objectives in a sample of introductory sustainability undergraduate courses in higher education institutions in Canada and the United States, as well as what these learning objectives indicate about the broader educational goals of these courses.

This chapter begins with background information on the perceived role of education in addressing sustainability challenges, followed by a discussion of debates over what sustainability education should strive for. In particular, it highlights debates about instrumental versus emancipatory goals and behaviourist versus constructivist learning approaches. Following this, it outlines the purpose of the research and research questions. Finally, it highlights the significance of the research, defines terms, and outlines the remaining chapters in the thesis.

Background

There has been a growing recognition in the last few decades that humanity faces many urgent, complex and interconnected social-ecological problems, such as climate change,

biodiversity loss, poverty and the degradation of land and water. If humanity fails to address these crises, there will be large detrimental consequences for people and planet (Rockström et al. 2009; van der Leeuw et al. 2012). These problems are challenging to solve. They are considered "wicked" or "messy" because they are ambiguous, multidimensional and value-laden (Klein 2004, 4). They have multiple causes, no clear solutions, and no clear end (Dobson and Tomkinson 2012, 266). As a result, they are resistant to classic approaches to problem-solving (Klein 2004, 4). Wicked problems therefore require different approaches in how we think, value the world, and interact with other people and with nature (Evans 2015b; Redman and Wiek 2013; Sterling 2009a).

Recognizing the urgency of the problems facing society, many organizations, policy makers, educators and academics over the past few decades have called for education to help address these problems (Rowe 2002; Sterling 2010; UNESCO 2002; Wright 2004). For example, one of the first international conferences to highlight education's role in addressing environmental issues was the United Nations (UN) Stockholm Conference on the Human Environment in 1972 (Sterling 2010, 513), which recommended recognizing and promoting environmental education in all countries (UNESCO 2002, 9). This role was affirmed in Chapter 36 of Agenda 21, which came out of the Earth Summit in 1992 (UNCED 1992). It was also affirmed in many subsequent conferences, declarations and reports. These sources contend that education has an important role to play in the movement toward a more sustainable future. In fact, the United Nations Educational, Scientific and Cultural Organization (UNESCO) attests that education "…is humanity's best hope and most effective means in the quest to achieve sustainable development" (UNESCO 1997).

Higher education institutions (HEIs) are seen as having an important role to play in the movement toward a more sustainable future (Cortese 2003; Escrigas 2016; Mulkey 2015; Vaughter, Wright, and Herbert 2015; Wright 2004). Scholars contend, for example, that HEIs can accumulate and mobilize information needed to address problems, as well as model sustainable practices in campus operations (Vaughter, Wright, and Herbert 2015, 83). Moreover, since HEIs educate future leaders, some argue that they have responsibility to help their graduates develop the knowledge, skills and values required to become engaged citizens and contribute to a sustainable and just future (Cortese 2003; Escrigas 2016; Learning for a Sustainable Future; University Leaders for a Sustainable Future 1990).

Many HEIs have responded to this call by incorporating sustainability into multiple components of their systems, including education, research, outreach and campus operations (Lozano et al. 2013; Lozano et al. 2015; Vaughter, Wright, and Herbert 2015). In a literature review and survey of 70 HEIs worldwide, Lozano et al. (2015, 14) found that most of the HEIs surveyed engage in some efforts to contribute to sustainable development, particularly in campus operations, outreach and education. In education, many universities around the world have begun addressing sustainability in their learning and teaching (Barth and Rieckmann 2015, 100). This often involves integrating sustainable development (SD) into the curriculum by offering SD programs, offering SD as a specialization within faculties, adding environmental material to existing courses or creating new SD courses (Lozano, Ceulemans, and Seatter 2015, 206).

What to Strive for in Sustainability Education

There has been much discussion and debate about what to strive for in sustainability education. On the one side of the debate, an instrumental view of education for sustainability (ESD) tends to focus on increasing people's knowledge and awareness to encourage them to

adopt more sustainable attitudes, values and behaviours. There is often an assumption that social change will result if this is scaled up over sufficient numbers of people (Sterling 2010, 513). On the other side of the debate, other academics and educators contend that education should not be used as an instrument to push people toward predetermined attitudes, values or behaviours (Jickling and Spork 1998; Vare and Scott 2007). They also contend that this approach will not help learners deal with a dynamic and uncertain future. Instead, advocates of an emancipatory view contend that education should help students build the capacity to think autonomously and make their own decisions (Sterling 2010; Wals 2011). In the middle ground between the instrumental and emancipatory camps, other people ask how education can promote sustainability goals while respecting people's autonomy and enabling them to explore their own roles and interests (Barth 2015).

There is a similar debate over using behaviourist or constructivist learning approaches (Sterling 2004a, 47). Aligning with instrumental goals, a behaviourist approach seeks to change the learner's behaviour through education (Sterling 2010, 513). They often aim to transfer a predetermined set of knowledge or rules to students (Wals 2012, 27). A constructivist approach, on the other hand, maintains that education is not about teaching fixed knowledge (Jickling and Wals 2008, 7). It is based on the theory that learners construct knowledge and personal meaning through their own experiences (Cranton 2016; Sterling [2001] 2004, 35). It endorses a participatory methodology and an active role for the learner (Sterling 2004a, 47), such as encouraging learners to critically reflect on their values and assumptions (Sterling 2010, 518).

The answer to the question about what to strive for is important to consider carefully because it plays an important role in the choice of broader educational goals in programs and courses, as well as the selection of learning objectives, learning outcomes, competencies,

pedagogies and content (Barth 2015). For example, education that is intended to raise awareness about sustainability tends to have a more content-based approach that focuses on disseminating information about problems (Sterling 2010, 513). If the goal is to develop student autonomy, there will be more of a focus on building capacity through critical thinking (Brookfield 1987; Wals 2011). If the goal is to understand and address sustainability problems, then this will require key sustainability competencies (Wiek, Withycombe, and Redman 2011). The choice of learning objectives, learning outcomes and competencies also affects the extent to which sustainability education can help students make autonomous decisions or build the capacity to understand and address sustainability problems. Thus, they can influence how prepared students will be for present and future sustainability challenges (Barth 2015).

Research Purpose and Questions

There are many different recommendations in the ESD literature about which learning objectives, learning outcomes and competencies should be prioritized in sustainability education. This wide range of recommendations can present a challenge to educators and curriculum planners who are presented with the task of developing sustainability courses. This raises the question of which learning objectives they choose in practice.

The purpose of this research is to explore the selection of learning objectives in a sample of introductory sustainability undergraduate courses in higher education institutions in the United States and Canada. This research also explores what the choice of learning objectives indicates about the broader educational goals of these courses.

The research focuses on introductory sustainability courses because they have the potential to impact a greater number of students than sustainability programs. Introductory courses that are open to multiple majors have the potential to expose students from a broad range

of disciplinary backgrounds to sustainability (Aktas et al. 2015). Additionally, given the introductory nature of these courses and the lack of prerequisites (Hegarty et al. 2011), more students will likely take introductory courses than sustainability programs or higher-level courses. Introductory courses have the potential to infuse sustainability principles early in students' programs (Aktas et al. 2015, 220), which would enable them to apply these principles to later courses. Individual courses can be more quickly developed and implemented than sustainability programs (Hegarty et al. 2011). Finally, research suggests that even a single environmental course has the potential to impact students (Fisher and McAdams 2015). It is therefore important to look at the learning objectives of these courses and consider their overall purpose and potential impacts on students.

This study asked the following research questions:

- What are the educational goals of a sample of introductory sustainability undergraduate courses in Canadian and U.S. four-year, degree-granting colleges and universities?
- What are the learning objectives of these courses?

To answer these research questions, semi-structured phone interviews were conducted with instructors of a sample of introductory sustainability undergraduate courses in U.S. and Canadian higher education institutions. These courses were selected using purposive sampling. The content of interview transcripts and course syllabi were iteratively coded and thematically analyzed using NVivo 12 software. The research approach, instrument and procedures for analyzing the data are described in detail in Chapter 3.

Significance of the Research

This research can contribute to the current body of literature on what institutions and educators are striving for in sustainability education. A scan of the literature reveals that there is

relatively little research that looks at learning objectives in multiple introductory sustainability courses in the United States or Canada. Several articles include in-depth explorations of the learning objectives and pedagogies for a single introductory or stand-alone sustainability course (Aktas et al. 2015; Coops et al. 2015; Hegarty et al. 2011; Hilchey and Drumm 2013; Howlett, Ferreira, and Blomfield 2016; Remington-Doucette et al. 2013; Van Meter et al. 2012; Vann, Pacheco, and Motloch 2006). Many of these articles focus on the development, implementation and assessment of these courses. One study (Zhan et al. 2015) performed a content analysis of sustainability MOOC's, which included several introductory-level courses. However, little research has looked at the learning objectives across a range of introductory sustainability courses. Thus, this research will add to an area of sustainability education that has been little researched to date. It will contribute to a better understanding of what educators strive for in these courses.

Definition of Terms

This study uses a number of terms related to sustainability and goals in sustainability education and educational. These terms are defined below.

Sustainability and Sustainability Education Terms

- *Sustainable development:* There are hundreds of definitions of sustainable development (Dale and Newman 2005, 352). One of the most common definitions of sustainable development comes from the 1987 Brundtland Report:

    "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland 1987)

- *Sustainability:* Similar to sustainable development, there are numerous definitions of sustainability. According to Evans (2015b, 72-73), these definitions typically share similar attributes. They focus on intergenerational fairness and the long-term integrity and health of the natural world and human societies. They recognize that humans are part of nature and therefore cannot thrive long-term at nature's expense. Finally, they

often acknowledge that sustainability is a dynamic praxis that needs to be continuously evaluated.

- *Education about sustainable development:* Education that conveys facts about sustainability processes and concepts (Barth 2015, 61).

- *Education for sustainable development (ESD):* Education that encourages, but does not prescribe, the adoption of sustainability values, principles and ethics (Barth 2015, 61).

- *Sustainability education:* Sterling (2004a, 40) uses this is a "catch-all" term that includes environmental education, education for sustainability, education for sustainable development and education for a sustainable future.

Educational Goals

There are many different kinds of educational goals, ranging from specific to general and including different learning domains:

- *Educational goal:* A broad goal that describes the general orientation and broader intentions of a course or program (Barth 2015).

- *Learning objective:* "[A] specific statement about what students are expected to learn or to be able to do as a result of studying a programme" (Harvey 2019). While sometimes used interchangeably with learning outcomes, learning objectives are concerned with what the educator intends for students to learn, while learning outcomes are concerned with what the student learns or achieves (Harvey 2019).

- *Learning outcome*: "[T]he specification of what a student should learn as the result of a period of specified and supported study" (Harvey 2019). More specifically, the Council for Higher Education Accreditation (2019) defines student learning outcomes as "the knowledge, skills and abilities that a student has attained as a result of engagement in a particular set of higher education experiences."

- *Cognitive learning objectives:* These objectives involve recalling or recognizing knowledge and developing intellectual abilities (Bloom et al. 1956, 7), such as solving intellectual tasks or synthesizing new ideas (Krathwohl, Bloom, and Masia 1964, 6).

- *Affective learning objectives:* These objectives involve attitudes, interests, emotions and values (Krathwohl, Bloom, and Masia 1964, 7).

- *Psychomotor learning objectives:* Objectives that emphasize motor skills, the manipulation of objects and material, or activities that require neuromuscular co-ordination (Krathwohl et al. 1964: 7).

- *Aspirational goal:* This term is used in this thesis to indicate a goal that participants hope to accomplish in their courses but that is not an explicit learning objective or learning outcome.

- *Competence:* "[A] functionally linked complex of knowledge, skills, and attitudes that enable successful task performance and problem solving" (Wiek, Withycombe, and Redman 2011, 204).

- *Sustainability competencies:* Functionally-linked sets of knowledge, attitudes and skills that enable people to perform tasks and solve problems related to sustainability challenges (Wiek, Withycombe, and Redman 2011, 204).

Thesis Outline

This research study is presented in six chapters. Chapter 2 includes a review of the literature, beginning with the conceptual framework that informs the research. Following this, it describes the learning objectives, learning outcomes, competencies and broader educational goals that are commonly advocated in the sustainability education literature.

Chapter 3 describes the methods used in this research study, including the research approach, instrument for data collection, and procedures for selecting the sample, conducting the interviews and analyzing the data.

Chapter 4 presents the findings of this research. These findings highlight the learning objectives that were emphasized in these courses, as well as why participants considered them to be important.

Chapter 5 focuses in particular on three themes that arose from the findings. It discusses how the research findings compare with recommendations in the sustainability education literature. It also discusses how they relate to the debates on instrumental versus emancipatory goals and behaviourist versus constructivist learning approaches.

Finally, Chapter 6 summarizes the findings, discusses implications of the research, offers recommendations and suggests future areas for research.

Chapter 2: Literature Review

Introduction

There is a debate in the literature about what educators should strive for in sustainability education. On one side of the debate, many declarations, reports and academic papers highlight the urgent nature of sustainability challenges. They have called on education to help address these challenges by raising awareness and fostering sustainable attitudes, values and behaviours. On the other side of the debate, some argue that education should not serve as an instrument to accomplish sustainability goals. Instead, they argue for a more emancipatory approach that seeks to build students' capacities and help them become autonomous learners. In between those two camps, other people look for ways for sustainability education to serve both instrumental and emancipatory goals (Barth 2015; Sterling 2010).

The answer to this question is important because it plays an important role in the choice of learning objectives, learning outcomes, pedagogies and content in programs and courses (Barth 2015). In turn, these choices may influence how prepared students will be for present and future sustainability challenges (Barth 2015).

This research asks what educators strive for in introductory sustainability courses. Specifically, it looks at the broader educational goals and learning objectives of select introductory sustainability courses in the United States and Canada. This chapter sets the context for that research by outlining the conceptual framework that informs this research, including theories about instrumental and emancipatory goals and behaviourist and constructivist learning approaches. Then it will discuss learning objectives, learning outcomes and competencies that are commonly recommended in the sustainability education literature. This includes critical thinking, the framework of key sustainability competencies proposed by Wiek, Withycombe, and

Redman (2011), and student engagement and empowerment. Finally, it will conclude with a discussion of the selection of learning objectives in introductory sustainability courses.

Conceptual Framework

This section will provide background information on the theories that help to inform this research, including those on instrumental versus emancipatory educational goals and behaviourist versus constructivist learning approaches.

Instrumental and Emancipatory Views of Sustainability Education

There is much debate within environmental and sustainability education circles about the purpose of education. Two key positions in this debate are the instrumental and the intrinsic or emancipatory approaches (Barth 2015; Sterling 2004a).

The instrumental approach recognizes the urgency of the sustainability problems facing society and views education as a means to address these problems (Sterling 2010, 513). This approach tends to focus on increasing awareness about issues and changing people's attitudes, beliefs, values and behaviours toward sustainability issues (Sterling 2004a, 46; Wals 2011, 178). For example, a common goal is to encourage people to adopt more sustainable lifestyles (Sterling 2010, 513). Advocates of this approach contend that we know much about what kinds of behaviour are needed for a sustainable future. Moreover, they argue that using education to change peoples' behaviour in a pre-determined direction is warranted because the planet's future is at stake (Wals et al. 2008, 56).

Critics of the instrumental view, however, contend that it has prescriptive tendencies and presents a deterministic view (Sterling 2010, 514). They argue that education should not try to indoctrinate students or push them toward predetermined attitudes, values (Jickling and Spork 1998, 315) or behaviours (Vare and Scott 2007, 192). They also contend that this approach will

11

not provide learners with the tools they need to deal with the complex, dynamic and uncertain conditions they will face in the future (Sterling 2010; Wals 2011). In contrast to the instrumental approach, the intrinsic or emancipatory approach calls for education to help students develop into critically reflective and autonomous learners (Barth 2015, 59; Sterling 2010). This approach focuses on empowerment, capacity-building and participation (Wals 2012, 23). An important goal is to enable learners to ask critical questions and understand what is going on (Wals 2011, 179). Advocates of this approach contend that learners need to think for themselves if they are to cope with uncertainty and divergent interests, norms, values and ways of constructing reality (Wals 2011, 179). While learning may take place in the context of sustainability, advocates argue that students should decide for themselves whether they will use this learning to help address sustainability problems (Sterling 2010, 514).

The emancipatory or intrinsic view is also not without its criticism, however. Sterling, for example, argues that this view denies the purposive dimension in education. From a sustainability viewpoint, he suggests that the intrinsic view "may be necessary but not sufficient", given the urgent nature of the issues facing society (2010, 514-515).

Given the criticisms and limitations of both the instrumental and emancipatory approaches, some scholars recommend a middle ground between the two approaches. They ask how education can help people learn to live more sustainably while respecting their autonomy and enabling them to explore their own roles and interests (Barth 2015). Barth (2015, 61) suggests that the competencies approach can reconcile means and ends. Like the instrumental approach, the competencies approach recognizes the urgency to address sustainability issues. Rather than emphasize specific outcomes or behaviours, however, it focuses on developing the abilities of the autonomous learner to make and act on informed decisions in different contexts. It

respects the autonomy of the learner while still recognizing the education's role in addressing the sustainability crisis (Barth 2015, 62-66). The framework of key sustainability competencies proposed by Wiek, Withycombe, and Redman (2011) will be summarized later in this chapter.

Behaviourist, Constructivist and Transformative Learning Approaches

Another important debate in sustainability education is over learning approaches (Sterling 2004a, 47). The behaviourist learning approach seeks to change the learner's behaviour through education, thus aligning with instrumental goals (Sterling 2010, 513). The constructivist approach reflects an intrinsic view of education that aligns with self-determination and capacity-building (Sterling 2004a, 52). The transformative learning approach, which is also based on constructivist assumptions (Cranton 2016, 18), refers to learning that transforms the way learners think, perceive and value (Burns 2011; Cranton 2016; Laininen 2019; Sterling 2004b). This section will look at the benefits and challenges of these different learning approaches, as well as how they relate to sustainability education.

Behaviourist Learning

According to Sterling, the behaviourist approach is often based on a simple and linear understanding of learning and change. It assumes that increasing awareness will foster personal behaviour change and that this will result in social change if it is scaled up over many individuals (Sterling 2010, 513). Given this understanding, behaviourist teaching approaches tend to be transmissive and content-based (Sterling 2004a, 46), with an aim to transfer a predetermined body of knowledge or set of rules to learners (Wals 2012, 27).

Some scholars observe that reports and policies on sustainability education often reflect a behaviourist and instrumental approach (Barth 2015; Dale and Newman 2005; Sterling 2010). For example, Barth (2015, 177) notes that many statements at the policy level and in Agenda 21

focus on individual behaviour. Sterling attests that a behaviourist and instrumental view was

rising for many years following the 1972 UN conference in Stockholm (2010, 513). For

example, in its review of environmental education and ESD efforts since 1972, UNESCO (2002,

10) observes that these initiatives reflect the strong belief in the international community "that

we need to foster – through education – the values, behaviour and lifestyles required for a

sustainable future." Dale and Newman note that environmental education objectives tend to

focus on awareness, acquiring knowledge about environmental problems, developing pro-

environmental values, attitudes and behaviours, and developing the skills to solve problems and

participate in solutions (2005, 356). Similarly, Wals attests that the instrumental approach

continues to have a strong presence in ESD (2012, 26). For example, the overall goal of the 2005

to 2014 UN Decade of Education for Sustainable Development was:

> "…to integrate the principles, values, and practices of sustainable development into all
> aspects of education and learning. This educational effort will encourage changes in
> behaviour that will create a more sustainable future in terms of environmental integrity,
> economic viability, and a just society for present and future generations." (UNESCO
> 2005, 6)

According to Tilbury, a recent analysis of academic publications and government and

nongovernmental organization (NGO) reports published over a 10-year period indicates that

sustainability researchers still largely focus on changing attitudes and behaviours (2015, 275).

Despite its frequency in ESD discourse, however, there are many critics of behaviourist

approaches. These critics contend that behaviour is more complex and contextual than linear

causal models portray it (Wals 2011, 179). They attest that behaviourist approaches tend to have

only a superficial effect on learners (Sterling 2004a, 47). They also criticize its abstract,

scientific view of knowledge and top-down methodology. Finally, they observe that behaviourist

approaches tend to tinker with curriculum content rather than provide a deeper reformatory response (Sterling 2004a, 48).

Constructivist Learning

The constructivist learning approach maintains that education is not about "filling empty minds" with fixed knowledge (Jickling and Wals 2008, 7). Instead, it maintains that learners construct knowledge and personal meaning through their own experiences (Cranton 2016; Sterling [2001] 2004, 35). According to constructivist theory, learning takes place when schemata – the "structures in the mind that 'hold' knowledge" – change to incorporate new information, experiences and understanding (Fry, Ketteridge, and Marshall 2009, 9-10). Learners validate meaning through interacting and communicating with others (Cranton 2016, 18).

The constructivist approach endorses a participatory methodology and an active role for the learner (Sterling 2004a, 47), such as encouraging students to critically reflect on their own assumptions and values, as well as those of others (Cranton 2016; Sterling 2010). It recognizes the importance of the learning context and the learner's disposition and prior experiences (Sterling 2004a, 46). Since students are actively engaged in their learning, this approach is thought to result in the longer retention of facts (Fry, Ketteridge, and Marshall 2009, 10) and generate a deeper understanding that can be transferred to other situations (Armstrong 2011).

Although it is strong in terms of learning process, Sterling (2010, 518) attests that the intrinsic/constructivist position is weaker on recognizing the urgency of sustainability challenges and on establishing real-world objectives. He attests that it is also weakly linked to critical sustainability discourse and social critique (2004a, 52). Noting that behaviourism and constructivism each have strengths and weaknesses, he calls for a more integrative educational paradigm that includes elements of both approaches (Sterling 2004a).

Transformative Learning

"Arguably, the root of the 'world problematique' lies in a crisis of perception of the way we see the world." (Sterling [2001] 2004, 23)

A segment of the ESD scholarship focuses on the role of transformative learning in sustainability education. Transformative learning generally refers to learning that transforms the way learners think, perceive and value (Burns 2011; Cranton 2016; Laininen 2019; Sterling 2004b). It is based on constructivist assumptions, where people are understood to construct personal meaning from their experience and validate it by interacting with others (Cranton 2016, 18). However, there are different theoretical orientations to transformative learning, which roughly fall into two theoretical frameworks (Cranton 2016; Taylor 2009). The first framework emphasizes personal transformation and growth, with relatively little focus on social change or the role of context. The second framework understands individual and social transformation as inherently linked. In this framework, critical reflection takes the form of ideology critique (Taylor 2009, 5).

This section will begin with Jack Mezirow's theory of transformative learning, which primarily emphasizes personal transformation and is an example of the first framework (Taylor 2009, 5). It will then look at Stephen Brookfield's discussion of the role of ideology critique in transformative learning, which provides an example of the second framework. Finally, it will explore one of the ways that transformative learning has been applied to sustainability education by looking at Stephen Sterling's theoretical framework.

Jack Mezirow provided the foundations for thinking about and applying transformative learning, which he refined over a period of several decades (Cranton 2016, 15). Before describing his theory, however, it is important to understand Mezirow's use of concepts. A *meaning perspective* – which Mezirow also refers to as a *frame of reference* – is the "structure of

assumptions and expectations" through which people filter their sense impressions (Mezirow 2000, 16). It provides a meaning-making context that selectively demarcates and shapes cognitions, perceptions, emotions and dispositions. It may include, for example, ideologies, stereotypes, religious doctrine, paradigms or moral-ethical norms (Mezirow 2003, 59). Frames of reference are composed of habits of mind and points of view. *Habits of mind* are sets of assumptions – broad predispositions that people use to interpret the meaning of experiences (Mezirow 2000, 17). They are expressed as *points of view*, which are clusters of meaning schemes. *Meaning schemes* are the particular beliefs, feelings, judgments and expectations that steer and shape specific interpretations. They often work outside of awareness and suggest actions that people tend to follow automatically (Mezirow 2000, 18).

According to Mezirow, learning occurs when people elaborate current meaning schemes, learn new meaning schemes, transform meaning schemes, or transform their meaning perspectives (Mezirow 2009, 22). *Transformative learning* is a special form of learning, which Mezirow defines as:

> "…learning that transforms problematic frames of reference – sets of fixed assumptions and expectations (habits of mind, meaning perspectives, mindsets) – to make them more inclusive, discriminating, open, reflective, and emotionally able to change." (2003, 58)

Frames of reference can occur in the instrumental or communicative learning domain (Mezirow 2000, 8-9). Following Habermas, Mezirow describes *instrumental learning* as learning to manipulate and control people or the environment to improve performance. It uses empirical testing to evaluate the truth of assertions. *Communicative learning* involves understanding what other people mean when they communicate. It includes becoming aware of their intentions, assumptions and qualifications (Mezirow 2000, 8-10). In communicative learning, people justify or validate contested beliefs through *discourse*, which is dialogue that involves the assessment of

beliefs, values and feelings (Mezirow 2003, 60). Habermas suggested that there is also an emancipation learning domain, but Mezirow redefines this as a transformation process that applies to instrumental and communicative learning domains (Mezirow 2000, 10). Thus, emancipatory knowledge comes from questioning instrumental and communicative knowledge (Cranton 2016, 11).

Discourse and critical reflection both play an important role in transformative learning theory (Mezirow 2000; Mezirow 2003; Mezirow 2009). Discourse is a process of communicative learning that involves "dialectical and critically reflective thinking" to arrive at tentative best judgments (Mezirow 2009, 20). When learners participate in discourse, they use other people's experiences to assess the reasons that justify assumptions and to make an action decision (Mezirow 2000, 8). Borrowing from Habermas, Mezirow noted that several conditions are required to fully and freely participate in discourse (Baumgartner 2012, 103), although he notes that they are never fully realized in practice. They include having more complete and accurate information, being open to other viewpoints, being aware of the context of ideas and assumptions, and having an equal opportunity to participate, in addition to several other conditions (Mezirow 2009, 20). Mezirow suggests that constructing knowledge in this way provides supportable tentative conclusions upon which people can act until new evidence is found and validated through discourse (2003, 61).

Critical reflection occurs when learners question the integrity of deeply-held beliefs and assumptions (Taylor 2009, 7). It involves becoming aware of the context of assumptions, including their nature, source and consequences (Mezirow 2000, 19). Transformative learning can occur through critically reflecting on one's own assumptions (subjective reframing) or on those of others (objective reframing) (Mezirow 2000, 23). This process could be prompted by a

"disorienting dilemma" – an "acute internal and personal crisis" (Taylor 2000, 298) – or other trigger, such as coming across points of view that challenge the learners' perspectives (Cranton 2016, 120).

Mezirow suggests that transformative learning can help educators achieve the broader purpose and cardinal goal of adult education. Its broader purpose is to help adults become "more liberated, socially responsible, and autonomous learners" (Mezirow 2000, 30). Its cardinal goal is to foster the liberating conditions for adults to make more informed and autonomous choices and develop a sense of self-empowerment. Quoting Siegel's 1990 book, *Educating Reason*, Mezirow suggests that a liberated person is "free from unwarranted and undesirable control of unjustified beliefs, unsupportable attitudes and paucity of ability which can prevent one from taking charge of her own life" (as cited in Mezirow 2000, 26). He attests that transformative learning helps liberate people "from reified forms of thought that are no longer dependable" (Mezirow 2000, 27). He also maintains that transformative learning helps adults learn how to think more autonomously and act on their own values, purposes and meanings rather than those uncritically taken from others. This contributes to the process of self-empowerment, which Mezirow describes as "acquiring greater control of one's life as a liberated learner" (Mezirow 2000, 27).

Finally, Mezirow maintains that people's frames of reference anchor their values and sense of self (Mezirow 2000, 18). This suggests that transforming frames of reference might lead to changes in self-perception. For example, this might include gaining confidence and coming to think of oneself as a smart and competent person (2000, 21).

Brookfield (2012b) proposes that critical theory, with its focus on ideology critique, can inform transformative learning theory. Critical social theory (CST) tries "to understand, analyze, criticize, and alter social, economic, cultural, technological, and psychological structures and

19

phenomena that have features of oppression, domination, exploitation, injustice, and misery",

seeking to change or eradicate these structures and phenomena (Bentz and Shapiro 1998, 111).

CST assumes that people who must understand their situation before they can change it will use

this knowledge in processes of social change. One of the key methods of CST is the critique of

ideology, which involves an analysis of the prevailing ideology or "self-justifying ideas" in an

institution or society to assess whether those ideas describe reality or serve to justify the power

and interests of particular groups (Bentz and Shapiro 1998, 112). Focusing specifically on

modern western societies and the dominant ideology of capitalism, Brookfield maintains that

critical theory has three core assumptions: (1) Western democracies are highly unequal; (2)

dominant ideology represents this state of affairs as "normal, natural, and inevitable", thereby

intercepting potential challenges; and (3) critical theory seeks to understand this state of affairs

with the aim to change it (2012b, 134). In terms of adult learning, he notes that critical theory

focuses on how people learn to consent to a system that opposes their interests, how they become

aware of the influence of power and hegemony over them, and what kind of learning they need

to replace capitalism with democratic socialism (Brookfield 2012b, 138-139).

Brookfield argues that ideology critique is important for transformative learning. If

transformation entails fundamentally reordering paradigmatic assumptions, he argues, and if this

is only possible when all "transformative possibilities" are open to people, then people need to

recognize how both processes are limited by dominant ideology (2012b, 133). He contends that

transformative learning is tantamount to "recognizing and challenging" tenets of dominant

ideology, such as the idea that only private enterprise can guarantee freedom (2012b, 133-134).

Mezirow disagreed with Brookfield that transformative learning theory should focus on

ideology critique, however. Wiessner and Mezirow (2000, 353) maintain that transformation

theory is concerned with challenging problematic frames of reference in *all* fields of inquiry, arguing that this offers more insights and provides a "wider range of relevance" than focusing on ideology critique alone. Brookfield remains adamant, however. Since critical theory views the self as "socially and politically created", he contends, it understands common-sense decisions and actions to be ideologically manipulated (Brookfield 2012b, 132). Transforming the self therefore requires political and social transformation. To "avoid sliding into an unproblematized focus on the self", scholars of transformative learning thus need to consider how adults learn to uncover power and challenge hegemony and dominant ideology (Brookfield 2012b, 131-132).

Stephen Sterling is interested in transformative learning in the context of sustainability education. He describes transformative learning as "a quality of learning that is deeply engaging, and touches and changes deep levels of values and belief through a process of realisation and recognition" (Sterling 2010, 512). Sterling's understanding of transformative learning draws on the concept of levels of knowing, which views knowing in terms of nested systems (Sterling 2011, 20). From shallowest to deepest, these levels include: 1) actions; 2) ideas and theories; 3) norms and assumptions; 4) beliefs and values; 5) paradigm and worldview; and 6) metaphysics and cosmology. Higher levels of knowing (e.g. actions, ideas and theories) are consciously or unconsciously influenced by the levels underneath them (e.g. assumptions, values and worldviews) (Sterling 2011, 20-21).

Sterling draws on Bateson's model of orders of learning and change for his conception of transformative learning (Sterling 2011, 22). In first-order change, meaning is given or assumed and does not challenge underlying assumptions, beliefs or values. Sterling attests that most formal education involves first-order change and is primarily concerned with the transfer of information. In second-order change, learners examine and (if necessary) change their

assumptions, beliefs and values, resulting in significant changes in thinking or doing. In consequence, this type of change is often deeper and more likely to be permanent than first-order learning. He maintains that some theorists refer to experiences that are equivalent to second order learning as "transformative learning." However, he reserves the use of this term for third-order change, which he says involves a shift of epistemology. It involves *seeing* one's worldview instead of seeing *with* one's worldview. According to Sterling, it can lead to a change in paradigm or worldview (2011, 23). By touching "deeper levels of knowing and meaning", transformative learning influences "more immediate and concrete levels of knowing, perception, and action" (Sterling 2011, 22). Thus, it results in changes in action (Sterling 2010, 524). He proposes that it also transforms who people are by changing their ability to negotiate meaning, participate and belong (Sterling [2001] 2004, 57).

Several scholars attest that transformative learning is important for sustainability education because the dominant Western worldview – which is based on atomism, mechanism, materialism, objectivism, reductionism, anthropocentrism, individualism, technological optimism and continuous economic growth – gave rise to the current unsustainable state (Laininen 2019; Leiserowitz and Fernandez 2008; Norgaard, R. B. 1994; Sterling 2011). Thus, some people contend that a change in worldview will be needed to achieve a more sustainable society (Sterling 2010, 520). For example, Sterling argues that we need a shift toward an ecological worldview that is holistic, systemic and participative and that focuses more on relationships than things (2004a, 49).

Despite recognizing the value of transformative learning for sustainability education and for adult education in general, some scholars caution that transformative learning can be challenging, unpredictable and uncomfortable. They note that it is challenging and time-

consuming for educators to facilitate or support (Blake, Sterling, and Goodson 2013; Cranton 2016; Moore 2005; Taylor 2009). Additionally, its end results cannot be easily assessed or determined in advance (Jickling 2017; Moore 2005). In fact, Cranton (2016) contends that the transformative learning process cannot be mandated because doing so would be tantamount to indoctrination. Rather than set specific transformative outcomes in advance, she recommends providing a learning environment to foster transformative learning, although she recognizes that more work is needed to identify the characteristics of this learning environment (Cranton 2016, 43). Finally, several scholars note that learners may find it difficult, uncomfortable, emotional and disorienting to engage in transformative learning (Moore 2005; Sterling 2011). Moore (2005, 88) suggests that the current model of academic teaching, with three one-hour classes per week, may not be properly structured to deal with the disturbances that can occur while trying to foster transformative learning. She questions whether it should be attempted in settings that lack experienced instructors or adequate supports (2005, 86).

Despite the challenges and risks involved with transformative learning, however, empirical studies also identified several beneficial consequences that are associated with transformative learning. These include perspective transformation, changed understanding of one's self, revised belief systems, shifts in discourse, behavioural changes, increased personal power, a "sense of liberation", courage, creativity, spirituality, compassion for others, and a "new connectedness with others" (Taylor 2000, 297).

Thus, rather than dismiss the prospect of transformative learning altogether, some scholars suggest approaching it with forethought. Taylor notes that it frequently requires intentional action and the ability to draw on several techniques to foster a learning environment that is supportive (Taylor 2009, 14). Lange (2009) proposes the creation of a "learning

sanctuary" – "a place of immunity from the full weight of social forces". This creates a safe space for a "deep encounter with self (mind, spirit, and body), social relationships, habits of thinking and living, and the conjoined individual and social myths that constrain human freedom and justice" (Lange 2009, 197). Others recognize that transformative learning involves a tension between the attempt to create safe spaces for students to express their feelings and the emotions and discomfort that come with disorienting dilemmas (Taylor and Jarecke 2009, 283). According to Gravett and Petersen (2009, 107), the educator's job is to push learners to the edge of their comfort zones or "learning edges" without pushing them so far that they will resist the new learning and withdraw.

In summary, this section outlined debates over means and ends, as well as a continuum of behaviourist, constructivist and transformative learning approaches that influence sustainability education. Given these different approaches, it is not surprising that scholars and educators have recommended many different learning objectives, learning outcomes and competencies for sustainability education, which are outlined in the following section.

Sustainability Learning Objectives, Learning Outcomes and Competencies

The education for sustainable development (ESD) literature advocates a smorgasbord of different learning objectives, learning outcomes and competencies for sustainability education (Mintz and Tal 2014; Wiek, Withycombe, and Redman 2011). As noted earlier, raising awareness, acquiring knowledge, changing attitudes and behaviours was the focus of earlier environmental education and continues to be a focus (Dale and Newman 2005; Tilbury 2015). Some literature stresses the importance of helping students develop the knowledge, attitudes and skills to envision, plan and build toward a more sustainable future (Almers 2013; de Haan 2006; Hegarty et al. 2011; Wiek, Withycombe, and Redman 2011). Some scholars argue for fostering

ethical awareness, civic engagement, a sense of responsibility, or global citizenship (Escrigas 2016; International Association of Universities 1993; Sipos, Battisti, and Grimm 2008; Svanström, Lozano-García, and Rowe 2008). Finally, some recommend fostering learner engagement or empowerment.

It is important to clarify the use of terms. A *learning objective* is "a specific statement about what students are expected to learn or to be able to do as a result of studying a programme" (Harvey 2019). A *learning outcome* is "the specification of what a student should learn as the result of a period of specified and supported study" (Harvey 2019). More specifically, the Council for Higher Education Accreditation (2019) defines student learning outcomes as "the knowledge, skills and abilities that a student has attained as a result of engagement in a particular set of higher education experiences." While the terms learning outcomes and learning objectives are sometimes used interchangeably, learning objectives are concerned with what the educator intends for students to learn, whereas learning outcomes are concerned with what the student learns or achieves (Harvey 2019). Finally, a *competence* is "a functionally linked complex of knowledge, skills, and attitudes that enable successful task performance and problem solving" (Wiek, Withycombe, and Redman 2011, 204).

Although there is no single, agreed-upon set of learning objectives, learning outcomes or competencies for sustainability education, several of these are frequently recommended in ESD reports and articles. These will be summarized in the following sections. Although the acquisition of content knowledge is also a recommended learning objective, it will not be focused on in this thesis. Instead, the following sections will focus on the development of critical thinking, key sustainability competencies, student engagement and empowerment. Following this will be an exploration of the broader educational goal of putting theory into practice.

Critical Thinking

> "The path actually taken will rest with the reflexivity of human consciousness: our capacity to think critically about why we think what we do – and then to think and act differently." (Raskin 2008, 69)

The development of critical thinking is frequently identified as being central to sustainability education (Rieckmann 2012; Svanström, Lozano-García, and Rowe 2008; Thomas 2009; Tilbury 2011; Wals 2012), as well as to education in general (Howlett, Ferreira, and Blomfield 2016, 311). The section below will outline some of the elements of critical thinking that are proposed in the literature. Following this, it will sketch three general perspectives on critical thinking. It will focus in particular on the socially active perspective, which is informed by critical pedagogy. It will also highlight some of the reasons that critical thinking is thought to be important for sustainability education. Finally, it will summarize the critical thinking VALUES rubric, which provides criteria for educators to assess the attainment of critical thinking skills (AAC&U 2009).

Perspectives of Critical Thinking

There are multiple perspectives of critical thinking (Davies, M. and Barnett 2015; Howlett, Ferreira, and Blomfield 2016). Most perspectives include a composite view that encompasses cognitive and propensity elements, and some include ethical and action dimensions (Davies and Barnett 2015). Cognitive elements include argumentation, reflective judgment and making inferences. Propensity elements include skills, attitudes and dispositions. Dispositions include fair-mindedness, a respect for different viewpoints, and the willingness to seek or be led by reason, among others (Davies, M. and Barnett 2015, 10-14). Howlett, Ferreira, and Blomfield (2016, 312), for example, write that critical thinking encourages "an open-mindedness about beliefs" and a skepticism of one's own thoughts and those of others. Some theorists prefer to use

the concept *criticality*, which is a composite of thinking, acting and being (Davies and Barnett 2015, 15-16). Criticality involves the development of critical thinking, critical self-reflection, critical action and critical being. A critical person displays a critical orientation and has the trait to act accordingly.

According to Davies and Barnett (2015, 6-7), these different views of critical thinking fit within three general perspectives: philosophical, educational and socially active. The *philosophical perspective* is interested in clear and rigorous thinking, emphasizing the development of skills in identifying and evaluating logical arguments. The *educational perspective* has a broader agenda. It is concerned with the student's development as a person, as well as how the development of critical thinking can contribute to the wider society by fostering a critico-social attitude. In addition to argumentation, it emphasizes the relation of critical thinking to things such as attitudes, intuition and creativity (Davies, M. and Barnett 2015, 9).

The *socially active perspective* views critical thinking as a means to transform society. It is informed in part by critical pedagogy, which is "the use of higher education to overcome and unlearn the social conditions that restrict and limit human freedom" (Davies, M. and Barnett 2015, 18). Based in part on critical theory, critical pedagogy focuses on inequities, forms of oppression and ideologies in society. According to critical pedagogues, truth claims are part of systems of action and belief that affect power structures. To mask underlying conditions, dimensions of meaning are hidden behind claims or beliefs. An important task of critical thinking is thus to identify and challenge these concealed dimensions. This involves identifying, critiquing and opposing discourses and other societal formations that support the capitalist status quo. Thus, critical pedagogy is concerned with changing people's habits of thought, as well as challenging and transforming the ideologies and institutions that contribute to distorted ways of

27

thinking. In this view, freedom of thought requires liberation from an oppressive system (Davies, M. and Barnett 2015, 19-20).

Brookfield (2015) proposes a perspective of critical thinking based on critical theory, sharing the concern of the socially active perspective with transforming society. He states that the process of critical thinking involves identifying and checking assumptions about how the world is or ought to be (Brookfield 2012a). As noted in the transformative learning section, assumptions and beliefs comprise the frames of reference through which people filter their perceptions, interpret the world, and make decisions (Mezirow 2000). It is therefore important to identify those assumptions and check whether they provide reliable and valid guides for action (Brookfield 2012a, 12). Moreover, as previously mentioned, Brookfield contends that the dominant ideology of capitalism serves the interests of particular groups by portraying the inequality in society as normal and natural. When people unquestioningly accept this assumption, he believes that they consent to a system that opposes their interests (Brookfield 2012b, 138-139). When critical thinking is informed by critical theory, it therefore involves "ideological detoxification", in which ideologies like individualism are revealed to be hegemonic tools to make people accept inequality as normal (Brookfield 2015, 531). Identifying and challenging assumptions also fosters contextual awareness, or the appreciation of the importance of context (Brookfield 1987, 16). This helps people understand how context influences thinking and how assumptions may be more or less appropriate depending on the cultural or historical context. According to Brookfield, this frees people to explore how assumptions and norms in other contexts can provide alternative ways of thinking and living (1987, 8). Finally, in agreement with proponents of criticality, Brookfield contends that critical thinking should result

in taking informed action, which is action based on evidence that people find convincing and that has the desired effects (Brookfield 2012a, 13-14).

Some theorists maintain that critical thinking fosters autonomous thinking and contributes to emancipatory learning (Brookfield 1987; Wals 2011). Tilbury and Wortman (2004, 37) attest that critical thinking can help people identify bias and recognize when others are trying to manipulate them. Thus, it frees people to form their own conclusions about sustainability or other issues. Brookfield attests that this knowledge is emancipatory – once people become aware of the assumptions that contributed to their present situation, he believes that they can act to change some aspects of their situation (Brookfield 1987, 12).

Critical thinking, as conceptualized by Brookfield and the socially active perspective, also seems to overlap with transformative learning theory. The processes of critical thinking and transformative learning both include identifying and challenging deeply-held assumptions, especially – according to Brookfield – those of dominant ideology. By questioning these assumptions, critical thinking and transformative learning are also believed to foster autonomous thinking and emancipatory learning. Despite this overlap, critical thinking and transformative learning do not appear to be synonymous. If transformative learning involves transforming the problematic frames of reference (Mezirow 2003) or paradigmatic assumptions (Brookfield 2012b, 133) upon which people base their actions, then this suggests that critical thinking results in transformative learning only if questioning deeply-held assumptions leads to their transformation. As Sterling suggests, critical and reflective thinking may be necessary but not sufficient for transformative learning. To be transformative, he maintains that critical thinking should result in sustainable and transformative action (Sterling 2011, 24).

Importance of Critical Thinking for Sustainability Education

Many scholars emphasize the importance of critical thinking for sustainability education. They point out that the concept of sustainability is ambiguous and contested and that knowledge about sustainability issues is frequently uncertain and provisional (Huckle 2004, 35). Additionally, there are no pre-determined solutions (Thomas 2009) and no single vision of a good lifestyle (Wals and Jickling 2002, 124). Thus, the ability to question, reflect, research and analyze are needed for people to engage in the discussions that will help guide the journey to sustainability (Thomas 2009, 248). Some note that critical thinkers need the ability and disposition to question commonly-accepted assumptions that might contribute to unsustainable decisions and actions, such as the assumption that unlimited consumption and economic growth is desirable (Nolet 2016, 77) or the shared mental model that "a good citizen is a good consumer" (Laininen 2019, 166).

Assessing Critical Thinking

Scholars note that critical thinking is a complex skill that is challenging to learn, teach, assess and reduce to a set of definable learning outcomes (Jones, A. 2009). To make it easier for educators to assess, the Association of American Colleges and Universities, in collaboration with faculty experts across the United States, developed a critical thinking VALUES rubric with a set of fundamental criteria with different levels of attainment, from benchmark to capstone (AAC&U 2009). The following summarizes these criteria:

- Explanation of issues: the issue or problem is stated, described and clarified
- Evidence: information is taken from sources with some interpretation or evaluation and expert viewpoints are questioned
- Influence of context and assumptions: identifies relevant contexts and identifies the assumptions of oneself and others when presenting a position

- Student's position (perspective, thesis/hypothesis): the specific position takes the issue's complexities into account, acknowledges the limits of position, and acknowledges or synthesizes other viewpoints

- Conclusions and related outcomes (implications and consequences): conclusions are logically tied to information, including opposing viewpoints; implications and consequences are clearly identified and logical

These criteria will be used in Chapter 4 to summarize learning objectives related to critical thinking.

Framework of Key Sustainability Competencies

This section outlines an overarching framework of key sustainability competencies proposed by Wiek, Withycombe, and Redman (2011). Sustainability competencies are functionally-linked sets of knowledge, attitudes and skills that enable people to perform tasks and solve problems related to sustainability challenges (Wiek, Withycombe, and Redman 2011, 204). Learners require a special set of linked competencies to successfully understand and address sustainability issues because these issues have special characteristics that make them distinct from problems in other fields (Barth 2015, 66). Wiek and colleagues also distinguish "regular" competencies that are in common with other programs and professions – such as communication skills and critical thinking – from "key sustainability competencies", which are "critically important for sustainability efforts". Although they acknowledge the importance of regular competencies, they focus on key sustainability competencies because they have received little attention in traditional education (Wiek, Withycombe, and Redman 2011, 204).

According to Wiek et al. (2011), much of the literature on sustainability education provides "laundry-lists" of competencies that do not prioritize them for sustainability courses or programs. After systematically reviewing the literature, they organized and synthesized sustainability competencies into a framework of key sustainability competencies for academic

sustainability programs. These include systems thinking, values thinking, futures thinking, strategic thinking and interpersonal competence. A sixth, implicit competence is the ability to integrate and use the other key competencies to solve sustainability problems (Wiek et al. 2015). Wiek et al. (2011) attest that the development of these key sustainability competencies can help students develop the knowledge and skills they need to be problem solvers or change agents.

Since competencies are broad and abstract, they need to be operationalized into specific learning objectives before they can be used to design and implement courses and programs (Wiek, Withycombe, and Redman 2011). Thus, Wiek et al. (2015) propose sets of learning objectives at novice, intermediate and advanced educational levels for each of the key competencies.

The sections below summarize the key competencies, along with their associated learning objectives. They also outline some of the insights and discussions in the ESD literature about the importance and challenges of these competencies and learning objectives.

Systems Thinking

The literature frequently identifies systems thinking as an important competence in sustainability education (Dale and Newman 2005; Glasser and Hirsh 2016; Rieckmann 2012; Rowe and Johnston 2013; Sandri 2013; Sipos, Battisti, and Grimm 2008; Wals 2012; Wiek, Withycombe, and Redman 2011). In a Delphi study carried out from 2008 to 2009, for example, 70 education for sustainable development (ESD) experts from Europe and Latin America selected and defined 19 key competencies that are critical for sustainable development. Of those key competencies, systemic thinking and the handling of complexity were given the highest ranking (Rieckmann 2012, 132).

Systems thinking is the capacity to "collectively analyze complex systems" across different domains and scales (Wiek, Withycombe, and Redman 2011, 207). A system is understood to have a recognizable function, coherent organization, and interconnected parts (Meadows 2008, 11). These interconnected components function together to create new behaviours and characteristics (Goekler 2003, 12). Complex systems have emergent properties and are self-organized and adaptive (Holling 2001, 391). This means that they cannot be fully understood using monocausal thinking (Barth 2015, 48), reductionist methods (Sterling 2004b, 50) or by analyzing component parts in isolation (Cilliers 1998, under "Preface"). To understand complex systems, learners must develop a new way of thinking about and seeing the world that involves thinking in terms of context, connectedness and relationships (Capra 1999, 2).

People who develop systems thinking have a special set of knowledge and skills (Wiek et al. 2015). They can analyze sustainability problems that cut across different domains and scales. They recognize the interconnectedness of nested and overlapping systems (Nolet 2016, 182). They develop an understanding of the interdependent nature of the environmental, social and economic dimensions of sustainability, as well as linkages between local actions and the global context (Nolet 2016, 78). They develop the abilities to understand the diverse perspectives that comprise the dimensions of sustainability and to discern and critically reflect on their underlying values (Remington-Doucette et al. 2013, 409). Systems thinkers can also understand and articulate the concepts, components and dynamics of complex social-ecological systems, including systems ontologies, stocks, feedback loops, cause-effect chains, tipping points, cascading effects and unintended consequences (Dale and Newman 2005; Nolet 2016; Wiek et al. 2015). They appreciate the importance of context and understand that each complex problem has its own unique set of contributing factors. As a result, they understand the importance of

looking beyond "cookie cutter" approaches to solutions (Dale and Newman 2005, 353). Finally, they can generate or interpret results using many different methods, such as quantitative modelling and qualitative analysis (Wiek et al. 2015, 244).

Many scholars of sustainability education maintain that systems thinking is vital for sustainability (Dale and Newman 2005; Laininen 2019; Sterling 2004b; Wiek, Withycombe, and Redman 2011). Since many sustainability challenges arise from complex systems, systems thinking helps people understand and solve them (Remington-Doucette et al. 2013). Systems thinkers can recognize patterns of change, grasp complex processes, and understand how systems behave over time (Nolet 2016, 169). These abilities are needed to create more effective transition strategies toward a sustainable future (Wiek, Withycombe, and Redman 2011, 217).

Some scholars relate systems thinking to a different worldview. They contend that the current Western worldview is atomistic, mechanistic, reductionist and views human and natural systems as separate (Laininen 2019; Sterling 2004b). According to Sterling (2004b, 53), this worldview has created an unsustainable relationship with the ecosphere. If we are to have a chance for a sustainable future, he urges that we must think relationally (2009b, 77). Thus, he argues that we need a new cultural worldview that is based on ecological or systems thinking (Sterling 2004b, 50). Systems thinking helps people understand that they are interrelated with natural systems and that they depend on them for their survival (Sterling 2004, 53). It also helps people become more conscious of the consequences of their actions and those of others, which can foster a sense of responsibility. As Sayal et al. (2016, 197) report, students who learned about the impacts of climate change on people in other parts of the world reported feeling an increased sense of responsibility for their actions toward the environment.

Finally, systems thinking is closely related to the other key competencies. As will be discussed later, knowledge of the structure, components and dynamics of the current system is needed to create plausible future scenarios (futures thinking) and build transition strategies (strategic thinking). An understanding of human systems also requires the ability to understand the role and impacts of values (values thinking), which is explored in the next section.

Values Thinking

Wiek and colleagues (2011) propose that values thinking (also called normative competence) is one of the five key sustainability competencies required for education for sustainable development (ESD). Values thinking is "the ability to collectively map, specify, apply, reconcile, and negotiate sustainability values, principles, goals, and targets" (Wiek, Withycombe, and Redman 2011, 209). Those who are adept in values thinking can state, compare, employ and reconcile sustainability values and goals while engaging in processes such as visioning or assessment (Wiek et al. 2015). They can describe and apply concepts like sustainability, viability, equity, justice, risk, trade-offs, social-ecological systems integrity and ethical and moral claims. They are able to use select methods, such as sustainability assessment, impact assessment, risk analysis and participatory normative methods (Wiek et al. 2015).

The ability to specify, understand, reflect on and negotiate values and ethics is often advocated in the education for sustainable development (ESD) declarations, reports and literature (Evans 2015b; McKeown 2006; Mintz and Tal 2016; Sipos, Battisti, and Grimm 2008; Wiek, Withycombe, and Redman 2011). According to many ESD scholars, this ability is important because the concept of sustainability is value-laden. It involves discussions about what should be sustained, how people want to live, and how the current system should be changed to balance or

enhance social, environmental and economic systems (Parker 2012; Remington-Doucette et al. 2013; Wiek, Withycombe, and Redman 2011).

Values are important for sustainability for several reasons. First, they influence people's perceptions, decisions and behaviours (Crompton 2010; Tilbury and Wortman 2004, 39). People base their decisions and actions on what is important to them (Laininen 2019; Remington-Doucette et al. 2013). Thus, if we want people to understand and support the need for a transition toward sustainability, O'Sullivan contends that we will need a widespread shift in the values (2004, 170). Second, for people who work on sustainability initiatives, the ability to identify, collectively negotiate, balance and prioritize values is also important (Wiek, Withycombe, and Redman 2011). Since these initiatives frequently involve people with disparate interests, beliefs and value systems, this can create conflicts and make it challenging to agree on goals and targets (Dale and Newman 2005; Remington-Doucette et al. 2013). Thus, people working on these initiatives require the ability to identify competing interests and negotiate meaningful compromises (Dale and Newman 2005, 354).

Despite the wide acknowledgement of the importance of values in sustainability, however, there is a vigorous debate in the literature about whether sustainability education should explicitly include discussions about values. On one side of the debate, the dominant educational approach seeks objective, universal and value-free knowledge (Sipos, Battisti, and Grimm 2008, 70). Thus, many instructors avoid teaching or critically assessing value judgments (Cotton and Winter 2010; Parker 2012). According to Cotton and Winter (2010, 43), many faculty members want to avoid the potential for indoctrination.

Many others contend, however, that it is not possible for education to be value neutral (Barth 2015; Mintz and Tal 2016; Sipos, Battisti, and Grimm 2008). Some research suggests that

even teachers who try to be balanced or neutral tend to unconsciously express their own viewpoints (Cotton 2006). Rather than expunge values from classroom discussions, Oulton et al. (2004, 417) recommend making them explicit so that students are aware of the potential for bias.

On the other side of the debate, many academic articles, reports, declarations and organizations call on ESD to foster specific values that will contribute to sustainability (Cotton et al. 2007; Rowe and Johnston 2013; Sipos, Battisti, and Grimm 2008; Svanström, Lozano-García, and Rowe 2008). For example, Evans (2015b, 86) contends that sustainability education is not value-neutral because its ultimate purpose is social transformation. According to Sipos and colleagues, if society's collective goal is sustainability then we must foster and impart values that contribute to this goal (2008, 70). Values that are commonly advocated for sustainability include equity, social justice, peace, intergenerational equity, responsibility, social-ecological integrity, and environmental, social and economic well-being (Nolet 2016; Mintz and Tal 2014; Remington-Doucette et al. 2013; Thomas 2009).

In the middle ground between trying to impart specific sustainability values and avoiding discussions about values altogether, some of the literature contends that sustainability education should enable students to identify, clarify, understand and think critically about personal and societal values (Barth 2015; Remington-Doucette et al. 2013; Tilbury and Wortman 2004). This includes deconstructing values that have been inherited or socially embedded (Tilbury 2011, 31). It also includes reflecting on alternative values, such as those presented in the Earth Charter (Newman 2009, 99). According to Tilbury and Wortman (2004, 32), critical thinking and values clarification help students recognize bias and understand how culture and values shape perceptions and knowledge. It also enables students to identify unconscious values that might help or hinder sustainability efforts. This fosters autonomous thinking and thus reflects an

37

emancipatory and constructivist educational approach (Brookfield 1987; Sterling 2010; Tilbury and Wortman 2004; Wals 2011).

Some positions fall between the instrumental versus behaviourist and emancipatory versus constructivist camps when it comes to values. For example, Barth attests that education for sustainable development is oriented toward encouraging – but not prescribing – the adoption of sustainability values and ethics (Barth 2015, 61).

Finally, values thinking is linked to the other key sustainability competencies (Wiek, Withycombe, and Redman 2011). Since different values and interests can foster or hinder collaboration on sustainability initiatives, understanding and negotiating values is important for strategic thinking and interpersonal competence. Values thinking is also connected with futures thinking, the subject of the next section, because it is required to identify future systems that are desirable and sustainable.

Futures Thinking

> "Holding a positive vision of the future is much like planting a tree that takes many years to bear fruit. When you plant the seedling, you are undertaking an act of faith. You are believing there will be a future. You are consciously choosing to do something, not for yourself, but for your grandchildren." (Goekler 2003, 13)

Futures thinking (or anticipatory) competence is the ability to analyze, craft and evaluate plausible future scenarios related to sustainability issues (Wiek, Withycombe, and Redman 2011, 207-209). People with this competence are able to articulate the components, structure and dynamics of "pictures" of the future. They can use evidence to anticipate the potential evolution of sustainability problems over time and have the constructive and creative skills to craft visions of a sustainable future. They understand temporal terms and concepts, such as probability, risk and intergenerational equity (Wiek, Withycombe, and Redman 2011, 209). They can employ

methods like forecasting and scenario construction or analysis. They can also sketch basic scenarios for their own lives and anticipate their career trajectories (Wiek et al. 2015, 245-246).

The ability to think about or envision the future is considered by many to be a vital component of education for sustainable development (ESD) (ACPA n.d.; Dale and Newman 2005; Hicks 2002; Rieckmann 2012; Tilbury 2011; Wiek, Withycombe, and Redman 2011). Futures thinking is important for addressing key sustainability issues, such as intergenerational equity and unintended consequences. It prompts people to consider the potential long-term consequences of actions (Thomas 2009, 252) and can encourage them to use precaution when making decisions (Wiek et al. 2015, 244). It also provides tools to assess whether the current trajectory is unsustainable and to explore visions of plausible alternative futures. This is required for developing strategies to transition to a more sustainable future (Wiek, Withycombe, and Redman 2011). At a personal level, having clear images of a sustainable future or clear personal goals is believed to inspire hope and stimulate motivation (Hicks 2002; Tilbury 2011).

Futures thinking is connected with the other key sustainability competencies. It requires critical thinking to weigh information and consider trends (Hicks 2002). It links with systems thinking because it uses an understanding of current system structures, components and dynamics to craft and evaluate future scenarios (Wiek, Withycombe, and Redman 2011, 209). It links with values thinking because crafting plausible future scenarios is an important step in the creation of visions that are desirable and sustainable. Finally, it is also connected with strategic thinking, the topic of the next section, because it informs strategies in sustainability problem solving (Wiek et al. 2015, 244) and can result in more effective actions for change (Hicks 2002).

Strategic Thinking

Strategic thinking is the ability to understand, develop, implement and evaluate interventions and practical strategies to mitigate sustainability problems and enable a transition to visions of a more sustainable future (Wiek, Withycombe, and Redman 2011, 210). People with this competence have the knowledge and skills to solve logistical problems and "get things done" (210). They can develop plans to coordinate stakeholders and use resources to overcome path dependencies and other barriers (Wiek et al. 2015, 247). They can acknowledge conflicting values and priorities and facilitate different perspectives (Wiek, Withycombe, and Redman 2011, 210). They can explain and use concepts like theories of change, systemic interventions, mitigation and adaptation strategies, stakeholder networks, and the role of power and politics in change and strategy building. They are able to use select methods, such as intervention design, program planning and evaluation, behavioural change approaches and reflexive learning (Wiek et al. 2015, 247-249). They can take the transitory and changeable nature of knowledge into account, revising strategies when conditions change or new information comes to light (de Haan 2006, 24). Finally, they can explore strategies to contribute to sustainability through their job activities (Wiek et al. 2015, 249).

Strategic thinking is important in sustainability education because it enables people to put theory into practice. It enables people to develop, implement, test and revise practical solutions to real-world sustainability problems. Although this competence is not normally emphasized in academic careers (Redman and Wiek 2013, 219), it is essential for those who work on sustainability projects and transitions (Wiek, Withycombe, and Redman 2011, 210).

Strategic thinking is closely linked to the other competencies. It relies on systems thinking, because an understanding of the structure and dynamics of social-ecological systems is

necessary to identify intervention points and plan transitions. It also depends on values thinking and futures thinking to create the plausible and sustainable visions that it tries to achieve. Finally, strategic thinking requires interpersonal competence because sustainability strategies require the ability to work with people with diverse knowledge, interests and values (Wiek, Withycombe, and Redman 2011).

Interpersonal Competence

Interpersonal (or collaboration) competence is the ability to facilitate and motivate collaborative research and problem solving in sustainability (Wiek, Withycombe, and Redman 2011, 211). People with this competence can understand and critically evaluate diverse positions and perspectives, including different cultural and disciplinary perspectives. They also have advanced skills in communication, deliberation, negotiation, collaboration and leadership. They can facilitate teamwork and stakeholder engagement by effectively using selected approaches, such as communication, trust building, empathetic understanding, negotiation, stakeholder workshops and group facilitation techniques (Wiek et al. 2015, 250).

Interpersonal competence is important for education for sustainable development (ESD) education for several reasons. Sustainability problems are complex, so no single perspective or knowledge source can provide a complete picture of them (Escrigas 2016). Escrigas (2016) thus attests that people need to develop an "ecology of knowledges." Similarly, others argue for the importance of understanding and integrating multiple perspectives (Miller et al. 2008, 218), preferences, experiences and disciplines (Wiek, Withycombe, and Redman 2011, 211). Sustainability problems also involve and affect groups of people who come from diverse regions, cultures and occupations and have diverse beliefs and priorities. Professionals who work with

these groups to address problems thus require skills in communication, pluralistic and empathetic

understanding, collaboration, negotiation and conflict resolution (Wiek et al. 2015, 250).

The following sections discuss dimensions of interpersonal competence, which include

epistemological pluralism, multidisciplinarity, interdisciplinarity, transdisciplinarity, and skills in

communication, collaboration and leadership.

<u>Epistemological Pluralism</u>

This thesis uses the term "epistemological pluralism" to describe the ability and

disposition to respect, seek and develop an understanding of different perspectives. Following

Sterling (2011, 23), epistemology is taken to mean an "operative way of knowing and thinking

that frames people's perception of, and interaction with, the world." The concept of

epistemological pluralism comes from the observation by pluralists that no single investigative or

theoretical approach can fully represent the complexity of the natural world (Longino 2002, 93).

A plurality of approaches is therefore required.

According to Wiek, Withycombe, and Redman (2011, 211), the ability to welcome,

understand, and facilitate diversity across individuals, groups and cultures is a key dimension of

interpersonal competence. Other scholars also attest to the importance of this ability for

sustainability. For example, Davies (2009, 219) notes that learning diverse perspectives is

important because it exposes learners to different ways of thinking that may challenge their

assumptions and beliefs. Learning and integrating different disciplinary perspectives is important

for a more complete understanding of environmental problems (Miller et al. 2008). When people

compare different ways of approaching and solving problems, this can also result in a greater

variety of solutions (Barth 2015, 171-172). Finally, looking at different perspectives can suggest

alternative ways of living, such as when students learn from the wisdom of people who have

lived sustainably in their local environments for hundreds or thousands of years (Davies, K. 2009, 219).

Healy (2003) maintains that epistemological pluralism can help democratize knowledge and decision-making processes. He argues that it counters epistemic sovereignty, the recognition of a single (often scientific) knowledge authority. In addition to recognizing the validity of scientific insights, epistemological pluralism legitimizes and employs other forms of knowledge in processes of knowledge construction and decision-making (2003, 693). According to Healy (2003, 689), these processes are characterized by transparency, openness and participation. Thus, it includes voices that are marginalized when only scientific knowledge is considered. This is important to consider in policy decision making, for example. As Miller and Erickson (2006, 299) observe, environmental problems often cross political boundaries and impact people who do not normally have a voice in policy decisions. Including and integrating these unheard voices in policy choices would have the potential to foster a more democratic and inclusive approach to decision-making. It also counters the idea, prevalent in a strain of environmental education, that the environment is a complex domain that lies outside the grasp of ordinary citizens and must be managed by trained experts (Luke 2001, 189).

Of interest, some scholarship suggests that the willingness and ability to consider other perspectives is related to empathy. According to Wals, the ability to mirror one's ideas, feelings and experiences against those of others requires empathy, the "willingness to open up to and sympathise with 'otherness' and/or the other" (2011, 182). Empathy, in turn, can be fostered by taking the perspectives of others and considering their points of view (Goodman 2001, 144). Since empathy is thought to be a strong motivator for action (Evans 2015a; Hickman, Riemer,

and the YLEC Collaborative 2016), this provides another reason for why different perspectives are important for sustainability education.

<u>Multidisciplinarity, Interdisciplinarity and Transdisciplinarity</u>

Similar to epistemological pluralism, multidisciplinarity, interdisciplinarity and transdisciplinarity entail exploring and understanding different perspectives or ways of knowing. However, multidisciplinarity and interdisciplinarity explicitly focus on *disciplinary* perspectives. Disciplinary content and methods are valuable because they have withstood the rigorous scrutiny of experts in those disciplinary fields (Boix Mansilla 2005, 17). Multiple disciplines are necessary in sustainability because social-ecological issues cross disciplinary boundaries (Dale and Newman 2005, 353) and lie beyond the scope of any single discipline (Barth 2015, 184).

Some academics observe that there is some confusion in the way the terms "multidisciplinary", "interdisciplinary" and "transdisciplinary" are used. Dyer attests that these terms are sometimes used interchangeably, noting that this can cause confusion for educators who develop courses (2003, 186). Likewise, Clark et al. (2011, 719) indicate that some definitions fail to note the differences between these three terms. Thus, multidisciplinarity is often inaccurately referred to as "interdisciplinarity". It is therefore important to differentiate these terms.

Many scholars differentiate these terms by the degree to which they integrate disciplinary knowledge (Remington-Doucette et al. 2013, 405). Multidisciplinary learning involves learning about topics through the lenses of different disciplines (Park and Son 2010, 83). In multidisciplinary research, practitioners use the theories and methods of two or more disciplines. Disciplinary experts work to solve problems using their own distinct disciplinary approaches but the different disciplinary theories, epistemologies and methods are not integrated (Remington-

Doucette et al. 2013, 406). Some scholars argue that multidisciplinarity is limited in its ability to help people understand or address complex environmental problems (Clark and Wallace 2015, 240). Miller et al. (2008, 4) attest that when researchers look at issues through these narrow "epistemological silos", they focus on a sub-system of interest but do not fully recognize how it interacts with other subsystems or with the "larger, integrated system".

Although there is little agreement on what interdisciplinarity means (Clark and Wallace 2015, 242), it is generally thought to be more integrative than multidisciplinarity. It integrates multiple disciplinary theories, approaches and methods to analyze and address complex problems (Clark et al. 2011). It is frequently viewed in the literature as being critical for sustainability because social-environmental problems cannot be understood or addressed in isolation (Barth 2015; Boix Mansilla 2005; Clark and Wallace 2015; Dale and Newman 2005). Interdisciplinary approaches are thought to be important for recognizing interrelationship, which is critical for understanding and addressing sustainability issues (Jones, Selby, and Sterling 2010, 20-21). According to Boix Mansilla (2005), epistemic exchanges between disciplines result in an interdisciplinary "whole" that is greater than the sum of its "parts." This can produce cognitive advancements that would be unlikely when using a single discipline (Boix Mansilla 2005, 16).

Given the important role interdisciplinarity can play in helping people understand and address challenging problems, many scholars and educators recommend interdisciplinary learning objectives or learning outcomes for ESD (Barth 2015; Remington-Doucette et al. 2013; Rieckmann 2012; Svanström, Lozano-García, and Rowe 2008; Wiek, Withycombe, and Redman 2011). However, interdisciplinary approaches are challenging to teach and learn. It is difficult for educators to be experts in multiple disciplines (Domask 2007, 61). It is also challenging to judge which disciplines to include, how to include them, and how to integrate them (Boix Mansilla

2005, 19-20). Moreover, explicit methods that would enable people to integrate diverse kinds of knowledge are often lacking (Clark and Wallace 2015, 234). The fragmented and uni-disciplinary nature of most higher education institutions is also commonly cited as an obstacle to interdisciplinary teaching and learning (Max-Neef 2005, 5). Thus, even though interdisciplinary approaches are often called for in the ESD literature, it remains on the fringes of mainstream higher education (Jones, Selby, and Sterling 2010, 34).

Similar to interdisciplinarity, transdisciplinarity also integrates different disciplinary perspectives. However, transdisciplinarity is distinguished from interdisciplinarity by going beyond disciplinary knowledge to integrate knowledge from outside of academia (Remington-Doucette et al. 2013, 407). This could include traditional knowledge or the knowledge of practitioners who work on sustainability initiatives, for example. Transdisciplinary work is also distinguished from interdisciplinary work by engaging with values within problem-solving contexts (Evans 2015b, 74). According to Remington-Doucette et al. (2013, 407), the push for transdisciplinary education is based on the idea that academic knowledge has failed to solve sustainability problems.

In a commentary on the foundations of transdisciplinarity, Max-Neef (2005, 7-9) differentiates between weak and strong transdisciplinarity. According to Max-Neef, *weak transdisciplinarity* is practical and involves the coordination among four hierarchical levels of organization. The base level is the empirical level. It includes disciplines that are concerned with asking and answering questions about what exists, such as such as physics, biology and sociology. Above that is the pragmatic level, which is concerned with what we are capable of doing. It includes technical disciplines, such as medicine and agriculture. Next is the normative level, which includes disciplines like planning and politics and asks and answers questions about

what we want to do. Finally, the value level is at the top. It asks "What should we do?" or "How should we do what we want to do?" According to Max-Neef (2005, 9), a transdisciplinary action includes all four hierarchical levels, yet most of actions leave out the highest level. To successfully orient society toward the common good and confront the challenges of this century, people need to make their values and ethics explicit in the lower levels (e.g., in policies).

Max-Neef attests that weak transdisciplinarity, while practical, is not sufficient. He therefore proposes *strong transdisciplinarity*, which counters the linear logic of the traditional disciplines with a kind of quantum logic (Max-Neef 2005, 10). The traditional disciplines assume that there is a single reality that can be fully understood using pure reason or a unified theory. However, Max-Neef contends that our simple, uni-dimensional, binary, fragmented and reductionist way of thinking has led to a state where "we know very much but understand very little" (2005, 14). Moreover, he attests that this way of thinking has been responsible in large part for the crises currently facing society. In contrast, strong transdisciplinarity offers a different way of seeing the world that is more systemic, holistic and complex. It breaks with the assumption that there is a single reality, thus recognizing that the world is complex and our knowledge of it is ever-evolving. Max-Neef suggests that transdisciplinarity can facilitate our understanding of complexity – a requirement for relating to a complex world (2005, 14-15).

Communication Skills

According to Wiek, Withycombe, and Redman (2011, 211-212), communication is a basic competence that provides the foundation for sustainability education. Communication skills are also widely recommended in the ESD literature. Common learning objectives include the development of skills in reading, listening, oral communication, persuasive writing, technical writing, and the use of electronic communication tools (Crofton 2000; Learning for a Sustainable

47

Future; Rieckmann 2012; Svanström, Lozano-García, and Rowe 2008; Thomas and Day 2014; Tilbury 2011; Wiek, Withycombe, and Redman 2011; Wiek et al. 2015).

According to the ESD literature, communication skills are important to develop in sustainability education for several reasons. They are important to acquire information (de Haan 2006), convey complex ideas (Brundiers and Wiek 2017), communicate with stakeholders (Willard et al. 2010), develop multi-scalar and integrated solutions (Osman et al. 2017), and empower students to become agents of change (Tarrant and Thiele 2016) and lifelong learners (Barth et al. 2007; Brundiers and Wiek 2017; Tarrant and Thiele 2016; Thomas and Day 2014).

According to some scholars, the ability to communicate with empathy, caring and compassion is an important skill for triggering positive change (Brundiers and Wiek 2017, 5). Among other skills, this involves listening to divergent opinions, explaining situations that are complex, providing feedback, resolving conflicts, and persuading policymakers. The ability to communicate with empathy is important for sustainability professionals who work on issues that are contested and potentially polarizing (Brundiers and Wiek 2017). According to sociologist Robb Willer, the ability to listen carefully, understand the values of people with different moral and political commitments, and think creatively about how to come to an agreement can help build bridges with people (Shashkevich 2017). This is valuable in a time of increasing political polarization. When people on opposing sides fail to do this, they tend to "speak past one another" without convincing the other side (Feinberg and Willer 2015, 1667).

Collaboration Skills

Collaboration skills are an important component of interpersonal competence. They include the ability to initiate and facilitate collaborations in sustainability efforts with diverse teams and stakeholders from business, government or civil society (Wiek et al. 2015, 250).

People with skills in collaboration are able to use select techniques, including project management, group facilitation and stakeholder engagement. They also have the ability to work constructively with team members, use inclusive approaches, negotiate among groups, resolve conflicts, and find meaningful compromises when goals are not compatible (Dale and Newman 2005; Frisk and Larson 2011; Kearins and Springett 2003; Wiek et al. 2015).

Skills in cooperation and collaboration are very important for people who work on sustainability initiatives (Crofton 2000; Dale and Newman 2005; de Haan 2006; Frisk and Larson 2011; Rieckmann 2012; Sipos, Battisti, and Grimm 2008; Wiek, Withycombe, and Redman 2011). As previously mentioned, sustainability problems are caused by and affect people from many different fields, disciplines, organizations, communities, businesses, institutions, sectors and regions. Collaborative teamwork and impactful engagement with diverse stakeholders is therefore needed to address them (Brundiers and Wiek 2017, 5-6). To create more effective solutions, it is important to know how to tap into the knowledge and skills of team members to accomplish a task (Brundiers and Wiek 2017, 5-6). Effective and equitable solutions also require the ability to understand and consider the different knowledge, values, cultures and perspectives of diverse stakeholders (Wiek, Withycombe, and Redman 2011, 211). It is important to consider the perspectives of local actors with practical experience, for example, because they can contribute local knowledge (Dale and Newman 2005; Frisk and Larson 2011) and help identify relevant problems (Steiner and Posch 2006). Equitably including stakeholder interests is also important for developing collaborative decision-making processes that are democratic (Frisk and Larson 2011). Finally, the ability to collaborate is also required for the collaborative approaches used in the other key sustainability competencies (Wiek, Withycombe, and Redman 2011, 211).

<u>Leadership Skills</u>

Finally, leadership is an important component of interpersonal competence (Wiek, Withycombe, and Redman 2011, 211), as well as a key attribute of change agents (Laininen 2019, 183). According to Quinn and Matkin, effective leadership entails "creating and sustaining positive change" (2012, 207). They attest that the complex problems society faces will require leaders in both formal positions and in communities. They also note that being a sustainability leader is challenging, since leaders need to develop many abilities, such as the ability to understand interconnectedness and collaborate with others to create and implement solutions. In particular, an important skill of leaders is to provide compelling and positive visions of "where we have been and where we need to go" to motivate people to embark on a journey toward a more sustainable future (Quinn and Matkin 2012, 212).

Engagement and Empowerment

> "For the mind does not require filling like a bottle, but rather, like wood, it only requires kindling to create in it an impulse to think independently and an ardent desire for the truth." (Plutarch 1927, 257)

Student engagement is acknowledged to be important in discourses on education for sustainable development (ESD) (Tilbury 2015, 274) and in higher education in general (Coates 2006, 15). However, despite the popularity of the concept, there is no single, widely-accepted definition or framework for student engagement (Fredricks, Blumenfeld, and Paris 2004; Tilbury 2015). Additionally, there is a lack of clarity about what is included in the concept or about the best way to measure it (Fredricks, Blumenfeld, and Paris 2004). This section will briefly describe the constructivist underpinnings of student engagement and some of the proposed definitions of this concept. It will discuss the importance of engagement and then conclude by looking at two forms of engagement: engagement for sustainability and civic engagement.

Most of the research on student engagement is premised on the constructivist assumption that learning is "a process of individual knowledge construction" (Coates 2006, 25). This assumes that students and staff are both responsible for student learning. Staff and institutions provide opportunities to get involved, but learning is also influenced by the way individuals participate in educational activities (Coates 2006, 25). Tilbury similarly links constructivism with engagement, asserting that the tendency to view students as "empty vessels" to be filled with ideas from experts is an obstacle to deeper student engagement (2015, 276).

According to Tilbury (2015, 281), much of the research defines student engagement in terms of student satisfaction. Contending that this is a narrow definition, however, Tilbury describes alternative conceptions of student engagement that involve student participation and link "active involvement in the educational experience" with a more enduring and meaningful form of learning (Tilbury 2015, 274). She views student engagement through the lens of sustainable development, looking at the threads of power in educational or research activities and opportunities for authentic participation where students are able to influence activities. Similarly, Coates (2006, 2) also proposes that student engagement focuses on enhancing student learning and development. According to Coates, student engagement is "the involvement of individuals with phenomena that are relevant to and instrumental for their learning" (2006, 17).

Fredricks, Blumenfeld, and Paris (2004, 60), looking at concepts of engagement for the elementary, middle and high school years, propose that engagement is a multifaceted concept that encompasses cognitive, emotional and behavioural engagement. According to Fredricks and colleagues, *cognitive engagement* involves thoughtfulness, as well as the willingness to put in the necessary effort to master difficult skills and understand complex ideas. Coates (2006, 26) similarly links student engagement with high-quality learning processes that lead to high-quality

learning objectives, such as developing intellectual or interpersonal skills. Students' engagement with topics is also important for deep learning, an internally-motivated form of learning where students extract understanding and meaning from course experiences and materials (Warburton 2003, 45). According to Warburton (2003, 46), deep learning is important for environmental education because it involves "comparative and synthetic thinking" at different levels to develop a critical awareness of key concepts.

Emotional engagement involves affective outcomes, including interests, emotions and values, and it is believed to influence students' willingness to do their work (Fredricks, Blumenfeld, and Paris 2004, 61). This aligns with the scholarship on emotions and values, which recognizes that human motivations and actions are not based on reason alone (Crompton 2010; Laininen 2019; Norgaard, K. M. 2011). Theorists contend, for example, that values have a motivational dimension and can influence behaviour if they are activated (Schwartz 2012; Verplanken and Holland 2002). Crompton (2010, 18-19) suggests that feelings are *more* important than facts when it comes to judgments on emotionally-charged issues.

The concept of *behavioural engagement* incorporates the idea of participation, including involvement in academic, extracurricular and social activities (Fredricks, Blumenfeld, and Paris 2004, 60). Different scholars have referred to this concept as being involved in learning tasks (e.g. putting in effort and paying attention), positive conduct (e.g. following the rules), and participating in school-related activities (e.g. school governance). Finally, behavioural engagement is considered critical for attaining positive academic outcomes (2004, 62).

In summary, student engagement is thought to be important for education in general because it results in learning that is higher-quality, deeper, more meaningful, and more enduring (Coates 2006; Tilbury 2015; Warburton 2003). It influences students' willingness to do their

work and can contribute to positive academic outcomes (Fredricks, Blumenfeld, and Paris 2004). In addition to these instrumental reasons, Coates (2006, 32-33) suggests that student engagement is also intrinsically valuable because engaged students will see their interactions with learning activities as being more satisfying, motivating and exciting. The next section considers why engagement is important for sustainability education, looking in particular at two forms of engagement: engagement with sustainability and civic engagement.

Engagement with Sustainability and Civic Engagement

Some ESD scholars and practitioners advocate fostering engagement with sustainability (Murray, Goodhew, and Murray 2014) or environmental civic engagement for youth (Hickman, Riemer, and the YLEC Collaborative 2016; Riemer, Lynes, and Hickman 2014). According to these scholars, fostering engagement requires more than just increasing awareness. They advocate for including both cognitive and affective outcomes in education, including awareness, values, emotions, a sense of compassion and empathy, and a sense of self-efficacy.

Murray, Goodhew and Murray (2014, 718) maintain that ESD aims to engage students with the concept of sustainability. Their research is informed by the idea that affective/emotional learning can motivate students to act more sustainably (Murray, Goodhew, and Murray 2014, 719). Their research is supported by Schwartz's (2012) theory of values, which maintains that that the relative importance of values guides people's motivations. In turn, their motivations potentially guide their actions. Re-prioritizing values can therefore potentially lead to shifts in motivation and behaviour. This could involve, for instance, a shift from self-enhancement values – or values concerning their own interests, achievement and power – toward those of self-transcendence, which concern the welfare and interests of others (Schwartz 2012, 8).

Murray and colleagues (2014, 723) suggest that if the above theory of values is correct, then promoting sustainability may be more about strengthening existing values (e.g. self-transcendence values) than about adopting new values. Based on this, they developed and evaluated training to deepen students' awareness and understanding of issues and to encourage them to reflect on their values, aspirations and perspectives. The training also sought to promote self-motivation and a sense of self-empowerment. They found that the training led to some degree of values clarification and shift in mindsets (Murray, Goodhew, and Murray 2014, 719).

Another form of engagement, civic engagement, is also often advocated in the ESD literature (Fagan 2009; Habron 2012; Hickman, Riemer, and the YLEC Collaborative 2016; Mintz and Tal 2014; Riemer, Lynes, and Hickman 2014; Van Meter et al. 2012). Scholars who call for civic engagement contend that we need engaged and competent citizens to push for the cultural shifts or social-environmental systems change that is required to move toward a more sustainable future. According to Riemer and colleagues, engaged citizens are "aware of their rights and responsibilities in society and actively participate in shaping the system norms, resources, regulations and operations that comprise the foundation of their respective society" (2014, 554). Engaged citizens take part in civic behaviours, such as participatory actions (e.g. attending events) and leadership actions (e.g. organizing protests) (Hickman, Riemer, and the YLEC Collaborative 2016, 167).

According to Hickman et al. (2016), citizen engagement requires several facilitating factors. They propose that people need to develop systems thinking so that they are aware of how system components interact with people and with each other. They need to be largely motivated by a sense of compassion and empathy. They require the skills and knowledge to effectively take action to create change in their communities and systems. They require a sense of self-efficacy,

the belief that they have the skills and knowledge to act effectively and that their actions will make a difference. Finally, in order to sustain long-term engagement, they need the opportunity to engage in environmental action (Hickman, Riemer, and the YLEC Collaborative 2016).

Student Empowerment

Despite the wide use of the word "empowerment", there is no agreed-upon definition of the concept in the literature (Thomas and Velthouse 1990, 666). Empower means "to give power to", but as Thomas and Velthouse (1990, 667) note, the concept of "power" has several meanings and can refer to authorization, capacity or energy. Using the latter meaning, the authors use the term empowerment to mean "to energize", and they link it to intrinsic motivation.

Thomas and Velthouse (1990, 667) argue that intrinsic motivation regarding specific tasks depends on individuals' assessments of those tasks in terms of impact, competence, meaningfulness and choice. First, they judge *impact*, or whether their actions will "make a difference" in achieving the purpose of the task. Feelings of helplessness will decrease their motivation. This includes personal helplessness – the belief that they lack the ability to accomplish the desired outcome – as well as universal helplessness – the belief that *nobody's* responses would lead to the desired outcome (Abramson, Seligman, and Teasdale 1978, 54). Second, individuals assess their *competence* or ability to skillfully perform the task, which is related to self-efficacy (Thomas and Velthouse 1990, 672). When students believe in their ability to perform actions, students are more motivated to act (Bandura 1991), put in greater levels of effort, and persist in tasks when facing obstacles (Bandura 1977, 194). Third, individuals assess the *meaningfulness* or value of the task. According to Thomas and Velthouse (1990, 672-673), people will have an increased sense of commitment and involvement if they believe tasks are

meaningful. Finally, individuals also assess whether they had a *choice* in the task or activity. According to Deci and Ryan (1985, 49), self-determination is essential for intrinsic motivation.

Some of the education for sustainable development (ESD) literature calls on educators and institutions to help empower students (Burns 2011; Domask 2007; Kagawa 2007; Osman et al. 2017; Riemer, Lynes, and Hickman 2014; Tilbury 2011; Tilbury 2015; Wals 2012). Those calling for empowerment often implicitly refer to the importance of impact, competence, meaningfulness and choice.

Impact: Several ESD scholars stress impact and the importance of encouraging students to believe that their actions, as well as those of others, will make a difference. This is particularly important in sustainability education, where students often learn about the devastating impacts that human beings are having on the planet. When students learn about the urgency and severity of sustainability problems without learning sufficiently about solutions to these problems, they might conclude that these challenges are too big and complex to solve (Rowe 2002, 2). This can engender a sense of universal helplessness, as well as feelings of despair, grief (Hicks 2002), cynicism, apathy (Rowe 2002), pessimism and hopelessness (Ojala 2012). Rather than engage and empower students to work for a more sustainable future, students might give up and focus instead on their own individual interests (Rowe 2002).

To counter feelings of helplessness and despair, several scholars recommend bringing hopeful examples and stories of sustainability solutions into classes (Burns 2013; Evans 2015a; Hicks 2002). This is empowering because it can provide positive examples of what they and others can accomplish (Burns 2013, 174). Participating in place-based projects is also empowering because students can see the impacts of their efforts. As a result, they gain confidence in their ability to take action (Frisk and Larson 2011).

Competence: The ESD literature also emphasizes the importance of helping students gain the competence or capacities to take action. The purpose of Wiek and colleagues' framework of key competencies, for example, is to help students develop the knowledge and skills to become problem solvers (Wiek, Withycombe, and Redman 2011, 204). Several articles or reports call for education to empower students to become change agents (Kagawa 2007; Laininen 2019; Tilbury and Wortman 2004) or ecological citizens (Burns 2013; Huckle 2004; Wals 2012; Warburton 2003). They also call for empowering students with the knowledge, skills or dispositions to take action (Godemann and Michelsen 2011; Osman et al. 2017; Rieckmann 2012), contribute to sustainability efforts (Burns 2011; Hegarty et al. 2011; Huckle 2004; Mintz and Tal 2014; Sterling et al. 2017; Tilbury and Wortman 2004; UNESCO 2014), participate in decision-making (John et al. 2017; Osman et al. 2017; Sipos, Battisti, and Grimm 2008; Wals 2011), and make decisions that are responsible (Burns 2013) and informed (Marcus et al. 2015; Sterling 2011; UNESCO 2014).

Meaningfulness: Some ESD scholars focus on making learning meaningful for students. They attest that learning is meaningful when it is relevant to students (Frisk and Larson 2011) and it connects with their personal experiences, interests, values and lives (de Haan 2006; Gruenewald 2003; Kearins and Springett 2003). According to Kearins and Springett (2003, 197-198), empowerment and emancipation are fostered when students are invited to set their own learning goals and bring their personal knowledge, experiences and interests into the classroom. Some scholars also suggest that learning is meaningful when it helps students compare and connect different kinds of knowledge (John et al. 2017, 70) and develop a more holistic understanding of phenomena (Sterling 2004b, 49-50). Nolet (2016, 65) proposes that the "big ideas" in sustainability – such as equity and justice, universal responsibility, interconnectedness,

and local to global – help students bring disparate concepts and perspectives together into patterns that are meaningful and coherent. Several scholars also note that learning is meaningful and memorable when it can be applied to practice (de Haan 2006; DuPuis and Ball 2013; John et al. 2017). This might take place, for example, when students get opportunities to practice making meaningful decisions that have consequences beyond the assignment (Nolet 2016, 164).

Choice: Finally, many ESD scholars allude to the importance of choice. They advocate for fostering autonomous thinking, self-determination, the ability to participate in societal decision-making processes, and self-directed learning. These scholars note that fostering autonomous thinking, the ability to think and choose for oneself, is an important function of education (Brookfield 1987; John et al. 2017; Wals 2011; Wals and Jickling 2002). Wals and Jickling (2002), for example, attest that independent thinking is important because we do not have all the answers to important environmental issues. Since environmental thought and ethics are evolving processes, it is important to enable students to engage in these processes (Wals and Jickling 2002, 122). As previously discussed, some of the literature links critical or autonomous thinking to emancipatory learning (Brookfield 1987; Wals 2011).

Related to autonomous thinking, another goal in some of the ESD literature is to foster self-determination. This includes building people's capacity to assert their rights and needs (John et al. 2017) and shape the conditions of their own lives (Brookfield 1987; Godemann and Michelsen 2011). It also involves acquiring the knowledge and competencies to actively take part in shaping society (Godemann and Michelsen 2011; John et al. 2017).

Finally, some of the literature calls for ESD to focus on self-directed learning (de Haan 2006; John et al. 2017). This type of learning focuses on individual autonomy and responsibility for the learning process (John et al. 2017, 86). Self-directed learners diagnose their learning

needs and create their own learning goals (Mezirow 1985, 26). They are empowered to decide how they learn best (Cranton 2016, 102) and are able to seek resources to gain the knowledge and skills they need to accomplish tasks (John et al. 2017, 71). An aim of self-directed learning is to enable students to engage in meaningful learning outside of the educational setting (John et al. 2017, 86). As noted earlier, students are more intrinsically motivated when they believe tasks to be meaningful (Thomas and Velthouse 1990, 672-673).

The next section looks at how empowerment – along with engagement, knowledge, critical thinking and the key sustainability competencies – contributes to themes and broader goals in sustainability education.

Themes and Broader Goals in Sustainability Education

Several themes are evident in the preceding sections on learning objectives, learning outcomes and competencies in the education for sustainable development (ESD) literature. The first theme is that sustainability education involves more than just the accumulation of information and knowledge about sustainability. Instead, there has been a move in ESD from traditional, knowledge-focused education to learning that is more learner-centred and process-based (Thomas 2009, 254). As discussed previously, this focus challenges students to go beyond memorization to foster their ability to think (Thomas 2009). This includes developing the capacity to question assumptions, integrate different ideas and forms of knowledge, reflect on values and envision possible futures. It helps students cultivate skills in communicating and collaborating with others to develop and implement initiatives. It aims to foster engagement and empowerment and develop the learner's motivation and capacity to enact change. As will be discussed below, it also involves enabling students to put theory into practice.

A related theme is the integration of cognitive, affective and psycho-motor learning objectives. As noted in previous sections, competencies combine knowledge, attitudes and skills to perform tasks (Wiek, Withycombe, and Redman 2011, 204). According to some, student engagement involves cognitive, emotional and behavioural components (Fredricks, Blumenfeld, and Paris 2004). The combination of all three components is believed to result in higher levels of overall engagement (Riemer, Lynes, and Hickman 2014). Empowerment involves knowledge, skills, values and emotions. To be empowered to take action, people need to feel confident that they are capable of making a difference (Thomas and Velthouse 1990). Finally, values and emotions influence motivation (Crompton 2010; Schwartz 2012), which is believed to be important for both empowerment (Thomas and Velthouse 1990) and engagement (Hickman, Riemer, and the YLEC Collaborative 2016; Murray, Goodhew, and Murray 2014).

In addition to its importance for developing competencies, engagement and empowerment, some ESD scholars attest that integrating cognitive, affective and psycho-motor learning objectives supports "whole person learning". This involves "the development of whole human beings, who are able to think critically, respond compassionately and act ethically" (Davies 2009, 219). Davies attests that this is important for learners to develop as "authentic human beings". Similarly, Sterling contends that the educational paradigm needs to support "a remedial movement" in three interconnected areas:

> "…a broadening of perception (the affective dimension), a shift towards relational thinking or conception (the cognitive dimension), and manifestation of integrative practice (the intentional dimension) towards well-being." (2017, 41)

Sterling argues that these shifts in epistemology, ontology and praxis could "nurture a deep ecological sense of what it is to be human at this most challenging of times" (2017, 41).

According to some of the ESD literature, integrating the three learning domains is important for transformative learning. For example, the head, hands and heart framework by Sipos and colleagues proposes that balancing sustainability learning objectives and pedagogies in the cognitive, psycho-motor and affective learning domains can lead to transformative sustainability learning (Sipos, Battisti, and Grimm 2008). The topic of transformative learning will be discussed later in this chapter.

Putting Theory into Practice

According to many ESD scholars, sustainability education is about putting knowledge, concepts, theories and skills into practice (Almers 2013; Boix Mansilla 2005; de Haan 2006; MacDonald and Shriberg 2016; Wiek, Withycombe, and Redman 2011). As Wiek and colleagues note, for example, the combined sustainability competencies enable students "to plan, conduct, and engage in sustainability research and problem solving" (2011, 207).

Several ESD scholars advocate shifting from theory-dominated to praxis-oriented learning (Evans 2015a; Huckle 2004; Sterling 2004a). Praxis can be understood as "the unity of theory, practice, and reflection that generates conscious, purposeful action" aimed at resolving pressing societal challenges (Evans 2015a, 4). Huckle attests that education should be a process-based form of praxis, where theory guides practice and practice becomes a test of theory (2004, 37). He suggests that sustainability efforts on campus and in the community provide opportunities for praxis and for evaluating both lay knowledge and academic ideas.

The ESD literature recommends several ways to help learners put theory into practice. This includes helping students develop the capacity to: take action in their own lives (Mintz and Tal 2014; Svanström, Lozano-García, and Rowe 2008), become change agents who initiate or act for positive change (ACPA n.d.; Barth 2015; Laininen 2019; Rowe 2002; Svanström, Lozano-

García, and Rowe 2008), and develop or implement initiatives and transition strategies (ACPA n.d.; Wiek, Withycombe, and Redman 2011).

The ability to develop and implement initiatives was previously discussed in the strategic thinking section. The sections below will therefore focus on the goals of encouraging individual action and fostering change agency.

Encouraging Individual Action

Many articles and reports call for ESD to help students develop the knowledge, skills and motivation to enable them to take action on sustainability in their own lives. Some of the literature focuses more on instrumental goals, such as promoting the adoption of individual, pro-environmental behaviours in the private sphere (Mintz and Tal 2014), while other literature focuses more on emancipatory goals.

As noted earlier, an instrumental and behaviourist view of environmental education arose after the 1972 conference in Stockholm (Sterling 2010, 513) and continues to have a strong presence in educational programs and ESD discourse (Frisk and Larson 2011; Wals 2012). This approach aims to promote the attitudes, values, beliefs, behaviours and lifestyle changes needed to move to a more sustainable future (see for example UNESCO 2002, 10). This includes private sphere environmental behaviours, such as "green consumerism" and recycling (Stern 2000).

Proponents of an emancipatory approach criticize the instrumental view, arguing that education should not push students toward predetermined attitudes and behaviours (Vare and Scott 2007, 192). They argue that since much is not known about what sustainability is or how to attain it, behaviours currently believed to be sustainable could turn out to be unsustainable in the future (Wals 2011, 179) or in a different context (Huckle 2004, 43). They argue that sustainability education should foster critical, empowered and self-determined citizens who can

deal with changing and uncertain conditions (Sterling 2010; Wals 2011) and participate in co-designing a more sustainable world (Wals et al 2008, 62). They focus on helping students develop the capacity to critically reflect on their assumptions, beliefs, and values (Tilbury and Wortman 2004, 32) and decide for themselves how (or whether) to use their knowledge to address sustainability issues (Sterling 2010, 514).

Some ESD scholars critique the models of personal and social change that underlie the instrumental approach. They attest that these models reflect a simple and linear understanding of behaviour that assumes increasing environmental awareness will change attitudes and thus lead to more environmentally-conscious behaviours (Frisk and Larson 2011; Sterling 2010; Wals 2011). Then, once enough people change their behaviour, social change is believed to follow (Sterling 2010, 513). Some scholars call this an "aggregation" (Fuchs et al. 2016, 300) or "ripple effect" model of change (Miller 2016, 52).

Research indicates, however, that increasing awareness and knowledge is insufficient to engage people in sustainability or change their behaviour (Kollmuss and Agyeman 2002; Sterling 2004a; Wals 2011). Critics argue that this is because behaviour is more complex and contextual than described in the knowledge-attitude-behaviour model (Frisk and Larson 2011; Kollmuss and Agyeman 2002; Wals 2011, 179). Additionally, critics of the ripple model of social change contend that it ignores the physical and institutional structures that constrain individual behaviours (Miller 2016). Individuals might want to take public transportation to work, for example, but they cannot do this if it is not available. Critics therefore argue that encouraging individuals to change their behaviours will be insufficient on its own to attain a sustainable future (Laininen 2019, 182). Moreover, an over-emphasis on individual actions can

be counterproductive if people are satiated by engaging in individual actions and fail to identify how they can contribute to structural transformation (Miller 2016, 63).

Instead of looking to solutions based on changing individual attitudes and behaviours, a number of ESD scholars contend that we need to foster the development of individuals who can generate change. This is the subject of the next section.

<u>Fostering Change Agency</u>

Numerous articles and declarations of education for sustainable development advocate for the broader goal of fostering change agent knowledge, skills and dispositions (Barth 2015; Laininen 2019; Marcus et al. 2015; Rowe 2002; Svanström, Lozano-García, and Rowe 2008). They attest that these skills and knowledge can help learners contribute to the emergence of healthy social, ecological and economic systems (Marcus et al. 2015, 10).

Change agency is an elusive concept (Svanström 2016, 304). There is no clear description of what change agency means in practice and no single definition of a "change agent" (John et al. 2017, 19). In general, however, change agents commonly refer to people or groups who are motivated and able to engage others and identify, initiate, develop and implement initiatives to bring about positive change (Marcus et al. 2015; Rowe 2002; Svanström, Lozano-García, and Rowe 2008). For example, John and colleagues propose that change agents are "citizens who can combine critical and transformative mindsets, knowledge, and skills in order to address the sustainability problems of the 21st century" (2017, 19). Similarly, Rowe (2002) attests that change agents can envision positive future scenarios, are willing to help create those scenarios, and understand how to effectively bring about change.

Svanström (2016, 297) suggests that the concept of action competence adds to the understanding of change agency. Action competence involves knowledge and the capability and

willingness to take action (Almers 2013, 117). It includes: knowledge of the root causes and consequences of problems; knowledge of and ability to develop visions and solutions; knowledge about how to change conditions; and the ability to "put this knowledge into practice". It also includes commitment and the courage and willingness to act (Almers 2013, 117).

To better define change agency, the American College Personnel Association (ACPA) listed knowledge, skills and dispositions required by change agents. Similar to the other conceptions, ACPA (n.d.) affirms that change agents need a combination of knowledge and skills. Notably, these align with Wiek and colleagues' (2011) framework of key sustainability competencies. Thus, they are thematically re-organized in Table 1 according to the key competencies, as well as critical thinking, student engagement and empowerment. Although not included in Table 1, ACPA attests that change agents also need a value system and self-concept to support change agent actions. Thus, they list several characteristics of change agents, such as being passionate, persuasive, self-aware, optimistic, empathetic, curious and ethical.

Table 1: ACPA Change Agent Abilities to Help Create a Sustainable Future

ESD Goals	ACPA Change Agent Abilities
Critical thinking	"Engage in self-assessment, self-reflection, and analysis" "Challenge the status quo effectively when appropriate" "Reflect on what is happening to make meaning, gain perspective and understanding"
Systems thinking	"Analyze power, structures of inequality, and social systems that govern individual and communal life" "See the big picture and the larger goal and understand the need for systemic change" "Tolerate ambiguity and cope effectively with change" "Recognize the global implications of their actions" - They have: "Insights into the functioning and interconnectedness of systems"
Values thinking	"Make ethical decisions which incorporate responsibility to self, community, and society"
Futures thinking	"Help envision, articulate and create positive scenarios for the future of society"
Strategic thinking	"Creatively and collaboratively solve problems using critical thinking skills "See the paths, small steps, for changes needed for a more sustainable future, convert it into a task list and timeline, and follow through effectively" "Set realistic and clearly defined goals and objectives" "Accommodate individual differences… in your decisions and actions and be able to negotiate across these differences" "Search for 'families' of solutions for complex multi-faceted issues" "Adjust to the diverse and changing needs of both individuals and society as a whole"
Interpersonal competence	"Listen to others and incorporate their ideas and perspectives" "Engage in civil discourse and debate" "Span boundaries" "Communicate ideas clearly, concisely, and precisely both orally and in writing" "Involve others, inspire and excite participants, engender support and commitment" "Collaborate, network, develop alliances and coalitions, build teams" "Be both a leader and a follower, as necessary" "Mediate and resolve conflicts" "Analyze and influence group dynamics"
Student engagement and empowerment	They have: "A commitment to finding solutions to societal problems" "Political efficacy, a belief that what they think and do civically and politically matters"

Van Poeck, Læssøe, and Block (2017) note that there are different kinds of sustainability change agents. Some change agents promote change in their professions or in private companies. Others are engaged citizens or act as change agents in their communities, nongovernmental organizations or public institutions. The key sustainability competencies might be considered competencies for change agents who are professionals. Wiek and colleagues (2011, 204) attest that the key sustainability competencies are meant to provide a reference point for developing the knowledge and skill profile of change agents and problem solvers. As Wiek et al. (2015, 241) attest, the competencies help equip *professionals* to address sustainability challenges.

Finally, change agency appears to involve both instrumental and emancipatory goals. On the one hand, it is clear from the foregoing discussion that one of the aims of fostering change agent skills is to work toward a more sustainable future. In that sense, it serves instrumental goals. On the other hand, however, change agency is also concerned with emancipatory goals. Like the key competencies, change agency does not push learners toward pre-determined attitudes and behaviours. Instead, it focuses on developing the learner's ability to make and act on informed decisions in different contexts. The related concept of action competence, for example, is concerned with strengthening the learner's capacity to critically reflect, take a standpoint, and be self-determining (Almers 2013, 118). Additionally, change agency is concerned with increasing learner competence. As noted earlier, competence is important for fostering self-efficacy (Thomas and Velthouse 1990, 672) – the belief that one can act effectively and make a difference (Hickman, Riemer, and the YLEC Collaborative 2016). In turn, self-efficacy can foster *motivation* to take action (Bandura 1991) and persist in one's efforts (Bandura 1977, 194). This suggests the intriguing possibility that developing change agent skills – like

developing sustainability competencies (Barth 2015) – could satisfy both instrumental and emancipatory ends in sustainability education.

Selecting Sustainability Learning Objectives

It is important to ask what educational goals educators are striving for in sustainability courses and programs, as well as which learning objectives will contribute to these goals. The answers to those questions will influence what is taught, how it is taught, and what students will learn as a result of their education. In turn, the knowledge, understanding and capacities that they develop can impact how well-prepared they will be for present and future sustainability challenges (Barth 2015). It can also impact their development as autonomous learners and affect whether they come out of these courses feeling engaged and empowered to make a difference.

As noted in this chapter, however, there are many different recommendations in the ESD literature about which learning objectives, learning outcomes or competencies are should be prioritized in sustainability education. Since there is a limited amount of time in sustainability programs and courses, it is not possible to include all learning objectives. This raises the question of which ones are chosen in practice.

As suggested in this chapter, the choice of learning objectives will depend in part on the broader educational goals. For example, if the educational goal is for students to develop the capacity to research and solve sustainability problems, then this may suggest an approach like that of the key sustainability competencies (Wiek, Withycombe, and Redman 2011). If the educational goal is to develop individual capacity and learner autonomy, then this suggests that it will be important to develop critical thinking, reflective thinking, and the ability to identify and question beliefs, assumptions and values (Barth 2015; Brookfield 1987; Sterling 2010; Tilbury and Wortman 2004). If the goal is to motivate students to learn more about, and take action, on

sustainability, then this suggests learning objectives to foster student engagement and empowerment.

Much of the foregoing discussion suggests that a balanced mix of learning objectives may be required to create a deeper, more meaningful and engaging learning experience for students. As noted, focusing on disseminating knowledge about sustainability is not an effective way to inspire individual behaviour change (Kollmuss and Agyeman 2002; Sterling 2004a; Wals 2011). Teaching students about the urgency and extent of problems without teaching about solutions or fostering their capacity to address problems can disempower them and lead to feelings of despair, grief, helplessness and apathy (Hicks 2002; Rowe 2002). Leaving values out of discussions about sustainability ill-equips students to understand how values shape perceptions (Tilbury and Wortman 2004) or to envision more sustainable trajectories (Wiek, Withycombe, and Redman 2011).

The Selection of Learning Objectives in Introductory Sustainability Courses

The purpose of this research is to explore which learning objectives are most commonly selected for introductory undergraduate sustainability courses in Canada and the United States. This research also looks at what the choice of learning objectives indicates about the broader educational goals of these courses.

There are several reasons for focusing on introductory sustainability courses:

- Introductory courses that are open to multiple majors have the potential to expose students from a broad range of disciplinary backgrounds to sustainability (Aktas et al. 2015).

- Given the introductory nature of these courses, more students will likely take introductory courses than sustainability programs or higher-level courses. These courses therefore have the potential to impact a larger number of students.

- Introductory courses have the potential to infuse sustainability principles early in students' programs (Aktas et al. 2015, 220). This would allow students to apply these principles to other courses as they progress through their programs.

- Stand-alone sustainability courses can be quickly developed and implemented, thus offering a more immediate way to integrate sustainability into higher education than developing a new specialization or program (Hegarty et al. 2011).

In addition to these reasons, even a single course has the potential to impact students. For example, taking a single environmental course can influence students' attitudes and behaviours towards the environment (Fisher and McAdams 2015). It is therefore important to look at the learning objectives of these courses and carefully consider their potential impacts on students and the overall purpose they serve.

Finally, this research includes courses from Canadian and U.S. higher education institutions because this would provide a reasonable number of introductory sustainability courses to select from without making the research project too large to manage for a Master's thesis. Additionally, a scan of the literature reveals that there is relatively little research on the learning objectives in introductory sustainability courses in the United States or Canada. Thus, this research contributes to a better understanding of what educators strive for in these courses.

Chapter 3: Methods

The purpose of this research is to explore the selection of learning objectives in a sample of introductory sustainability undergraduate courses in higher education institutions in the United States and Canada. This research also explores what the choice of learning objectives indicates about the broader educational goals of these courses.

This study asked the following research questions:

- What are the educational goals of a sample of introductory sustainability undergraduate courses in Canadian and U.S. four-year, degree-granting colleges and universities?
- What are the learning objectives of these courses?

The initial research questions also asked about the pedagogies used in these courses. Due to space restrictions in this thesis, however, the discussion about pedagogies will be left for a future paper.

To answer these research questions, I conducted semi-structured interviews over the phone with instructors of introductory sustainability undergraduate courses in the United States and Canada. I interviewed instructors because they have a thorough understanding of the learning objectives of these courses. Since instructors often play a role in selecting learning objectives, many of them will also be able to describe the reasons behind their selection. They will therefore be able to explain why these objectives are important for student learning and for achieving sustainability goals. They can also speak about what can reasonably be achieved in a single introductory course. Finally, they will be able to discuss the broader educational goals of these courses.

The rest of this chapter describes the research approach, instrument for data collection, sample selection, interview process and methods of data analysis.

Research Approach

This research used a qualitative approach because the aim was to develop a richer and more detailed understanding of the broader goals of the courses and the instructors' meanings and beliefs with respect to these goals. Qualitative research helps researchers understand the participants' interpretations or perspectives of phenomena and uncover the processes that led to decisions and outcomes (Maxwell 2013, 30). In this research, participant interviews were chosen over quantitative methods because this would enable a better understanding of how and why learning objectives were chosen. It also allowed participants to highlight the objectives, processes and practices that they believed to be most important for their courses. Another advantage of qualitative research is its flexible and open nature, which permits researchers to modify their research focus and design in the event of new discoveries (Maxwell 2013, 30).

Instrument for Data Collection

Research data was gathered through semi-structured interviews with 20 instructors of introductory sustainability undergraduate courses in the United States and Canada. Twenty interviews were conducted because this would provide enough data to identify main themes while remaining small enough in scope to conduct and analyze within the timeframe of a Master's program. The participants also supplied copies of their course syllabi or outlines to supplement data from the interviews. Together, these sources of data provided a more complete understanding of the learning objectives and broader educational goals of these courses.

A semi-structured interview format was chosen because it enables interviewers to follow a predetermined set of questions while allowing the flexibility to alter the form and order of questions and explore interesting new leads (Kvale 2007, 52). In consequence, they can explore unanticipated data while ensuring that key research questions are covered (Green 2013, 136).

Since sustainability is a complex concept, side conversations are quite likely and can offer valuable insights (Bullock and Hitzhusen 2015, 14070).

Since the participants were spread out over a wide geographical area, it was not feasible to conduct most interviews in person. Thus, the majority of interviews (19 out of 20) were conducted over the telephone or through Skype. One interview took place in person. A potential drawback of conducting interviews over the phone is that this could make it more difficult to establish rapport with participants and make it more challenging to obtain in-depth responses to questions (Johnson 2014). However, Johnson (2014) noted that sustainability professionals often have highly-developed interpersonal skills, an interest in the topic of sustainability, and an understanding of research processes. His research suggests that these attributes can mitigate the barriers to establishing rapport over the phone. An assumption of this research was that the instructors would also possess these attributes. Thus, the use of the phone or Skype was not seen as presenting a significant barrier to receiving rich or in-depth responses to questions.

Prior to the participant interviews, a preliminary interview guide was created. This guide included open-ended questions about primary course goals, course content and teaching methods. These questions were informed by a review of the learning objectives, learning outcomes and competencies that are commonly recommended in the sustainability education literature, as described in Chapter 2. To test and improve these questions, two pilot interviews were conducted with instructors of sustainability-focused courses. Based on their feedback, some interview questions were revised or removed. The questions were revised again after the first participant interviews to improve their clarity and flow. The final version of the interview guide is in Appendix B.

The following interview questions focused on broader course goals and learning objectives:

- Broadly speaking, what are the primary goals for your course? Why are these goals important for this course?
- Which types of skills are important for your students to develop in this course?
- Do you talk about values in this course? What do you want students to learn or understand about values?
- Do you discuss human actions or behaviour in this course? If so, how do you approach this topic?
- After students take your course, what do you hope they will do with what they have learned?

The purpose of the question about primary course goals and why they are important was to get a sense of the highest priorities and broader intentions of the courses (Barth 2015). Participants were also asked specifically about skills, values and behaviours, since these outcomes are frequently debated in the literature on sustainability education. Participants were asked what they hope students will do with what they have learned to get a sense of whether they had aspirational goals in addition to those that were explicitly stated in course syllabi.

Finally, several questions were asked during the interviews but not explicitly discussed in this thesis. For example, they were asked about pedagogies, assessments and topics. To learn some of the context for the choice of learning objectives and pedagogies, participants were also asked about class sizes, their disciplinary backgrounds and what they believed to be the purpose of sustainability education.

Sample Selection

Participants were chosen using a multi-stage selection process that involved criterion sampling. This is a form of purposive sampling that seeks participants who meet particular criteria (Palys 2008, 697). First, lists of sustainability courses from U.S. and Canadian higher

education institutions that completed a Sustainability Tracking, Assessment & Rating System™ (STARS) assessment were downloaded from the Association for the Advancement of Sustainability in Higher Education's (AASHE) STARS website (https://stars.aashe.org/). This was a convenient way to search for sustainability course offerings at higher education institutions that were members of AASHE. From these lists, first- or second-year sustainability-focused courses were selected and added to a preliminary list of potential courses. A small number of sustainability courses were also identified in research articles or Internet searches. In total, 110 sustainability courses were identified using these methods.

The second step was to gather course information from university and college calendars, course websites and course syllabi (when available). Based on this information, courses were assessed for their eligibility. Using the following criteria, 76 courses were identified as being eligible for inclusion in the research:

- It was offered by a university or college that grants Bachelor's degrees
- It was a first- or second-year undergraduate course
- The course title contained the words "sustainability" or "sustainable development" (e.g. Introduction to Sustainability/Sustainable Development)
- Sustainability was the primary focus of the course; there was sustainability content throughout the course and not just in one lecture or unit
- It covered multiple dimensions of sustainability, including environmental, social and economic dimensions
- It included multiple disciplinary perspectives

The third step was to carefully examine and prioritize all eligible courses. Some courses were given a higher priority because their institutions were well-known for their sustainability programs (e.g. Arizona State University and Dalhousie University). Other courses were assigned a higher priority because they contributed to the diversity of the sample. Efforts were made to achieve a diverse range of the following course attributes:

- Location (colleges and universities were located in multiple regions throughout Canada and the United States)
- Institution size (from fewer than 1000 students to almost 100,000 students)
- Institution type (public, private and faith-based colleges and universities)
- Class size (from 20 to more than 300 students)
- Number of instructors (single instructor, co-instructors, and team-taught)
- Teaching methods (lecture, community service-learning, project-based, etc.)

Once courses were prioritized, instructors of the highest-priority courses were identified by searching the institution's website or contacting the faculty or department administrators. Only instructors who had taught the course within the previous two years were considered for inclusion in the research project. Some courses were taught by more than one instructor over the previous two years. In those cases, preference was given to contacting instructors who either developed the course, taught it most frequently, or whose disciplinary backgrounds or other attributes were less represented in the sample.

Soon after ethics approval was granted, instructors were contacted via email and invited to participate in the research. When instructors declined to participate or failed to respond to several attempts to contact them, the next instructor on the prioritized list was contacted. Out of the 29 instructors who were contacted, 20 agreed to participate in this research.

Description of Participants

The final sample included male and female participants from Canadian and U.S. colleges and universities. They also encompassed a range of ages, disciplinary backgrounds, career stages, and duration of service at their respective institutions. Participant attributes are shown in Table 2.

Table 2: Participant Attributes

Institution location	Canada	6
	United States	14
Participant gender	Female	8
	Male	12
Participant age	25 - 34	2
	35 - 44	7
	45 - 54	4
	55 - 64	6
	65 and older	1

More participants were from the United States (14) than Canada (6) because the majority of introductory sustainability courses identified in the research were from higher education institutions in the U.S. Most participants fell into the 35 to 44 (7) and 55 to 64 (6) age ranges, followed by the 45 to 54 age range (4). The 25 to 34 (2) and 65 plus (1) age ranges were least represented. While the research aimed to balance the gender of the participants whenever possible, there were more male (12) than female (8) participants.

The participants had a wide range of educational backgrounds, with Master's or doctoral degrees in the following areas of study: Anthropology (1), Architecture (1), Astrophysics or Physics (2), Biology (1), Communications (1), Engineering (1), English/Creative Writing (1), Environmental Education (1), Environmental Studies (2), Environmental Science (1), Geography (5), Global Policy Studies (1), Indigenous Studies (1), Natural Resources (1), Planning (3), Psychology (1), Sustainable Development (1) and Zoology (1). The numbers in parentheses indicate the number of participants in each area of study.

Interview Procedure

Human ethics approval for this research was granted in May 2017, prior to the recruitment of participants. The process of sample selection, recruitment and interview

procedures was conducted in accordance with the requirements of the University of Alberta Research Ethics Board (REB). Participant interviews took place between June 2017 and October 2017 and ranged from 44 to 73 minutes in duration. Nineteen interviews were conducted over the phone or Skype and one took place in person.

Prior to the interviews, each of the participants received an information and consent form, which can be found in Appendix A. This informed participants about the purpose of the study, the nature of their participation, the research procedure, the potential risks and benefits of participating in the project, and their right to withdraw from the research. Interviewees were also provided with the interview guide in advance, in case they wished to review the questions and prepare in advance.

Information about consent was explained at the beginning of each interview. At this time, participants were given the choice of whether or not to consent to take part in the research. They were also asked whether or not they wished to be identified in this study. Seventeen out of twenty agreed to participate in the study with their name and identity. Three participants requested anonymity, so their names, course names and institution names have been withheld from the findings.

With the participants' consent, all interviews were recorded with a digital audio recorder. These recordings were later transcribed by the researcher. Participants were offered copies of interview transcripts and 15 participants requested these copies. When transcripts were sent to participants, they were invited to send feedback. Three participants sent small corrections or clarifications.

Since the interviews were semi-structured, the interview guide was not rigidly followed during interviews. Slightly different wording was sometimes used or questions were asked in a

different order. When there was insufficient time to cover all interview questions, optional questions were sometimes skipped. At times, participants introduced new or unforeseen ideas that prompted new follow-up questions.

Data Analysis

Interview transcripts and course syllabi were coded using NVivo 12 Pro software to identify themes. Coding involves identifying data that represent the same descriptive or theoretical idea, and then giving this idea a name (i.e., a code) (Gibbs 2007, 38). NVivo is specifically designed to help store, organize, categorize, analyze and visualize qualitative data (QSR International).

I used an iterative process of coding to develop themes. I began with descriptive coding and open coding. Using descriptive coding, I created a detailed inventory of basic topics (Saldaña 2016, 73), such as learning objectives, aspirational goals, pedagogies, assessment types, and course content. Open coding (also called initial coding) is an open-ended approach that breaks data into discrete parts and delineates concepts to represent blocks of data (Corbin and Strauss 2008, 195). Thus, segments of text were coded and grouped together into categories and sub-categories based on their similarity. In this way, for example, I identified learning objectives or pedagogies related to thinking or solving problems.

A second pass through the data included focused coding and pattern coding to help develop broader categories. Using focused coding, I searched for the most frequent codes to help develop the most important categories (Saldaña 2016, 240). Pattern coding was used to group initial codes into fewer categories, constructs or themes (Miles, Huberman, and Saldaña 2014, 86). This coding was guided by reviewing concepts in the literature, such as the key sustainability competencies proposed by Wiek et al. (2011). Comparing codes and categories

with each other and with the literature can help researchers gain insight into patterns (Charmaz 2014, 170).

To supplement and inform the coding, I also re-read and wrote summaries of the interview transcripts to strengthen my understanding of broader educational goals. Through this process, I ensured that relevant data was not missed. This process also helped in the identification of text related to concepts such as instrumental or emancipatory goals and behaviourist or constructivist learning approaches.

The findings were initially categorized using Wiek, Withycombe, and Redman's (2011) framework of key sustainability competencies. This framework was chosen because it was based on a comprehensive literature review that has been widely cited in the literature. Additionally, an initial analysis indicated that most learning objectives fit into this framework. Moreover, Wiek et al. (2015) provided useful tables of learning objectives for each competence, which clarified where to place each objective in the research. Thus, the framework provided a useful structure with which to discuss the findings. Notably, critical thinking, student engagement and student empowerment were missing from Wiek and colleague's (2011) framework. In the findings, these learning objectives were summarized in separate sections.

Using this combination of methods, I created the following organizational categories and sub-categories of learning objectives:

- Critical thinking
- Sustainability competencies (sub-categories: systems thinking, values thinking, futures thinking, strategic thinking and interpersonal competence)
- Student engagement
- Empowerment
- Transforming thinking
- Putting theory into practice

Categories were also created for other concepts, including cognitive and affective learning objectives, instrumental and emancipatory goals, and constructivist and behaviourist learning approaches.

To identify key themes in the research, I reflected on the codes and text in each category, wrote analytic memos, and consulted with the literature. Using this process, a "trinity" of key themes (Saldaña 2016, 275) began to emerge about the overall educational goals of these courses. These included: fostering a different way of thinking, fostering the vision and drive to engage in sustainability, and encouraging students to put theory into practice.

Validity Concerns

Potential validity threats that needed to be addressed in this research project included researcher bias and inconsistent coding. Researcher bias occurs when the researcher's perceptual lens, beliefs and theories influence the research results (Maxwell 2013, 124). This bias was minimized by re-examining the data several times. For example, once the first cycle of coding was completed, all interview transcripts and syllabi were carefully re-examined and summarized to develop a more holistic understanding of the educational goals of each course and to ensure that no important information was overlooked in the process of coding. Triangulation was also used to confirm findings. When three or more independent measures confirm or do not contradict a finding, this lends support to the finding (Miles, Huberman, and Saldaña 2014, 299). As a means of triangulation, I compared data in the interview transcripts with that in course syllabi and websites. I compared my analysis of the data with concepts and research in the sustainability education literature. Finally, I shared emerging themes with my supervisor, a sociology expert with a background in sustainability education. These methods helped confirm some emerging findings and also suggested alternative ways to interpret the data (Gibbs 2007, 104).

After arriving at preliminary conclusions, the data was re-examined for evidence that did not support these conclusions. Research findings were compared with the literature, and findings that differed from the literature were carefully re-analyzed to look for alternative conclusions. The researcher's graduate supervisor also reviewed and provided extensive feedback on emerging themes, as well as on the research findings as they were written. Getting another party to review results is an effective way to check for flaws in methods or logic (Maxwell 2013, 127).

Other potential validity risks included coding the data inconsistently or in ways that do not align with the way concepts are understood in the literature. To ensure that codes were employed consistently and to guard against the potential for "definitional drift", constant comparison was used to check newly-coded text against previously-coded text (Gibbs 2007, 98).

Another challenge in this research was that participants used many different terms and concepts that are understood in different ways in the literature, such as multidisciplinary, interdisciplinary, transdisciplinarity and change agent. While participants were asked to define some terms, asking them to define more of their terms would have helped guard against potential misinterpretations. Thus, there is a potential for inter-observer differences in meaning and the use of language (Clark and Wallace 2015, 235). In their interviews and syllabi, for example, some participant descriptions of "interdisciplinary" referred to its integrative nature, while other appeared to be more multidisciplinary in nature. A few participants also used these two terms interchangeably. In such cases, I based my coding on the descriptions of the terms and carefully compared these against the definitions in the literature that were described in Chapter 2.

Researcher Standpoint

It is important to acknowledge and clarify my own standpoint as a researcher. Otherwise, my own subjectivity can unconsciously dominate the way I interpret the findings (Clark and

Wallace 2015, 246). I am a student in an environmental sociology Master's program in a Canadian university. I am very concerned about the sustainability challenges facing society and feel strongly that people have a personal and collective responsibility to take action. However, I also think that it is important to respect learner autonomy. I am attracted to the ideas of fostering change agents and transformative learning in sustainability education. These personal interests and concerns helped guide the choice of conceptual framework that informs this research.

Study Limitations

There are several limitations to the proposed research project. First, the sample size is small and non-random, which means that the conclusions cannot be generalized to all introductory sustainability courses in Canadian and U.S. higher education institutions. Second, due to time constraints I interviewed only one instructor for each course. Interviewing other people who were involved with these courses – such as co-instructors or curriculum developers – would have provided different perspectives and contributed to a richer understanding of the purposes and practices of these courses. Third, the research did not look at whether or not learning objectives or aspirational goals were actually met, so it is not possible to come to firm conclusions about the impact of the selection of these learning objectives. Finally, my data depended on the shared perceptions of the participants and my ability to accurately interpret their meaning. While I took measures to carefully look at the context of statements to discern their meaning, there is still a possibility of misinterpretation. I kept these limitations in mind while analyzing and writing the findings to avoid drawing unwarranted conclusions.

Chapter 4: Findings

Introduction

This chapter will summarize the learning objectives of the introductory sustainability undergraduate courses in Canadian and U.S. colleges and universities that were included in this research. These learning objectives are organized into the following sections:

- Critical thinking
- Systems thinking
- Values thinking
- Futures thinking
- Strategic thinking
- Interpersonal competence
- Student engagement and empowerment
- Transforming thinking and putting theory into practice

This chapter begins with the objective to develop critical thinking. According to several participants, critical thinking is particularly important in sustainability because there is an abundance of knowledge claims from multiple sources about the causes and solutions of problems. Many of these claims are partial, uncertain, contested or subject to the influence of personal biases, hidden assumptions, cultural beliefs, and dominant paradigms. Students thus need to become critical, autonomous thinkers who will identify hidden assumptions and biases, seek the best available evidence, and form their own conclusions.

Wiek et al.'s (2011) proposed key sustainability competencies, which are described in Chapter 2, provide a framework to discuss the next five learning objectives, including the development of systems thinking, values thinking, futures thinking, strategic thinking and interpersonal competence.

Participants particularly stressed the importance of developing systems thinking. They reported that sustainability issues are complex, multidisciplinary and multi-dimensional. They involve interconnected systems that interact in unpredictable ways that are context-dependent and that impact human and natural systems in multiple scales and dimensions. This entails that people cannot approach problems with linear, monocausal thinking. Instead, students need to think holistically and recognize the interconnected and multi-scalar nature of problems.

Many participants attested that students needed to be able to recognize the importance of values in sustainability, envision a sustainable system, understand different values, and connect sustainability to their own lives and values. Several participants reported that this focus on values distinguishes sustainability from some of the more knowledge-focused disciplines.

Although futures thinking was emphasized less than the other competencies, several participants discussed the importance of thinking about the future. In particular, they wanted students to develop future scenarios and visions and apply futures thinking to own lives.

In this research, most courses included one or more dimensions of strategic thinking. Courses particularly emphasized the ability to understand sustainability solutions. In several courses, students also developed the knowledge and skills to create and implement sustainability initiatives.

These courses stressed several dimensions of interpersonal competence, including epistemological pluralism, multi- or interdisciplinarity, and communication. Developing collaboration skills, though considered important, was not emphasized in many courses.

Fostering student engagement and empowerment were also important learning objectives in this research. Participants wanted students to be engaged in their courses, as well as engaged and empowered to act on sustainability in their own lives. Several participants maintained that

sustainability issues affect everyone and everyone contributes to these issues in some way. Thus, it is important to engage and empower as many people as possible to help tackle these issues. Many participants observed, however, that students could become disempowered when courses focus too much on the intractable nature of problems. To counter this, they focused on solutions in their courses. They also engaged and empowered students through active, participatory and experiential learning activities.

The findings conclude with a summary of interview comments and syllabi text that were related to two themes that emerge from the research: transforming thinking and putting theory into practice.

The following sections will explore these learning objectives in more detail. It also includes aspirational goals, which are goals that participants hoped to achieve but did not necessarily include as formal learning objectives.

As will be discussed in greater detail in Chapter 5, it is evident that these courses aimed to teach students more than just facts and theories about sustainability. They also aimed to develop students' thinking processes, engage them in sustainability, and help them develop the knowledge, understanding, skills and dispositions to put theory into practice.

Critical Thinking

Developing students' abilities and dispositions to think critically was an important learning objective for most courses in this research. Several courses in this research explicitly stated that a learning objective was to develop critical thinking. Many others included learning objectives that relate to one of the dimensions of critical thinking. Additionally, some participants hoped to foster critical thinking dispositions, including the willingness to seek truth, question assumptions and be open to different perspectives. This section will summarize

information in interviews and course syllabi related to the importance of critical thinking, as well as learning objectives related to critical thinking abilities and dispositions.

Participants attested that critical thinking is essential for sustainability education in particular because our knowledge of complex sustainability issues is often incomplete, uncertain, complex and continually changing. Additionally, there is no single answer about how to understand and address problems:

> "We're trying to get our students to think critically in the age of information abundance. And there is not one right answer within the field of sustainable development, so I just want to expose them to some of the extremes and see where they land on their own. So, I think it's important for them to think critically."
>
> - Mark Orrs interview (Lehigh University)

Participants stressed that not all claims about sustainability issues are equally trustworthy. These claims might be based on incomplete information or questionable evidence. People's values, assumptions, beliefs and biases might also influence how they frame problems and solutions, but these influences often remain hidden and unquestioned. Learners therefore require the disposition and ability to identify biases and evaluate the evidence behind claims.

Finally, critical thinking encourages students to question the sustainability discourse, including taken-for-granted claims about the root causes and differential impacts of sustainability problems, or how people define and measure sustainability. This encourages students to understand that there are other ways to approach and understand these issues.

> "One is we want to get students thinking critically about environmental problems and, particularly, the human dimensions of environmental problems. Not just thinking about bad things people are doing to be unsustainable, but the sort of more fundamental social, cultural, and even conceptual ways that those problems have come to be: how we define nature, why inequity happens, and how that relates to environmental problems."
>
> - Philip Loring interview (University of Saskatchewan)

Following the framework of the Critical Thinking VALUE Rubric, learning objectives related to the dimensions of critical thinking are summarized below. As described in Chapter 2, these learning objectives include the ability to explain the key factors of issues, seek evidence, understand the influence of context and assumptions, identify their standpoint, and come to logical and informed conclusions.

Explain the Key Factors of Issues

In this research, a common learning objective was to develop the ability to describe or clarify key sustainability issues or concepts. As will be discussed in more detail in the systems thinking section, students in most courses were also expected to diagnose and explain the root causes of socio-environmental problems.

Seek Evidence

Most courses emphasized the ability to select and assess evidence. Participants observed that students are exposed to an abundance of information and that some of this information is incomplete, biased or incorrect. Students therefore need the ability to question what they hear and see in classes, the media and public discourse. They also need to identify bias and find balanced, credible sources of information.

> "I want them to know how and where to find reputable sources of information to help them understand how to draw in knowledge and make decisions about it. Using those inputs and looking at very balanced sources and inputs so you're not just adding to the echo chamber on one side. How to evaluate those sources."
>
> - Marian Brown interview (Wells College)

Understand the Influence of Context and Assumptions

Several courses emphasized the ability to analyze the influence of context and assumptions. For example, students in some courses were expected to have a sense of how

histories, institutions, policies and systems influence contemporary problems. As noted in the strategic thinking section, several participants stressed that people who plan and implement sustainability initiatives need to understand the local context, including the needs, values and goals of the people they wish to work with.

In some courses, participants asked students to consider how public discourse on sustainability affects the way people frame, understand and try to address problems. Philip Loring, for example, wanted his students to understand that discourses provide incomplete stories that privilege particular people and viewpoints:

> "One of the things that I like to spend time on is ways of seeing and ways of knowing. Recognizing that there are discourses in the world around environmental problems and their solutions – that they include some information and not others, that they privilege some people and not others, or they tell the story in different ways."

> - Philip Loring interview (University of Saskatchewan)

A learning objective in some courses was for students to develop the ability and disposition to question and unpack common assumptions in sustainability discourses, such as the assumption that sustainability is about greening consumption or changing individual behaviours. For example, Allison Goebel encouraged students to consider how solutions focused on changing individual lifestyles tend to overlook systemic barriers to change, like the lack of viable public transportation options where people live and work.

Identify Student's Position (Perspective, Thesis/Hypothesis)

Students in a number of courses identified their assumptions, beliefs, values or standpoints in relation to sustainability issues. Some participants suggested that this would help students understand the origins of their beliefs and how their standpoints influence and limit their understanding and approach to issues. This would also help students understand the importance

of looking at different perspectives. Philip Loring attested that reflecting on their standpoints on

sustainability issues is important for building students' epistemological awareness:

> "If you are not able to recognize the assumptions that you're making and how you might
> be closing off different facets of a problem or of an issue simply because of the way that
> your standpoint is influencing how you understand it… So, if you grew up on a farm and
> you have this particular approach and feeling about the natural world and man's place in
> it, if you don't recognize where that comes from you can't ever then see it in how you
> talk about a problem. It's awareness. It's epistemological awareness that we're trying to
> help them build."

> - Philip Loring interview (University of Saskatchewan)

Conclusions and Related Outcomes

An important learning objective in several courses was to develop the ability to do

assessments and make informed decisions. In one course, for example, students evaluated

corporate social responsibility initiatives. Their job was to assess whether these initiatives were

examples of sincere efforts or of greenwashing. An objective in some courses was for students to

develop their abilities to gather evidence and make informed decisions that consider multiple

dimensions, impacts and perspectives. Some participants hoped students would use this ability to

make well-informed decisions in their future personal or professional lives.

Critical Thinking Dispositions

In addition to aiming to develop students' *ability* to think critically, participants also

talked about the importance of fostering critical thinking *dispositions*. These include the

dispositions to seek truth, to remain curious, and to consider issues from multiple perspectives.

Some participants also noted that it is important for students to be willing to revise judgments as

needed, which requires them to accept that they could sometimes be wrong.

Summary

In summary, participants stressed that students need the ability to think critically because there is an abundance of different knowledge claims about sustainability issues. Many of these claims are incomplete, provisional, contested or subject to the influences of discourses and hidden assumptions. It is therefore important for students to be skeptical of unsubstantiated claims and assess their veracity before basing decisions on them. Thus, they need to examine assumptions, identify sources of bias, and evaluate supporting evidence. This means that students also need to identify their own values and assumptions and reflect on their influence on how they see the world. Participants also noted the importance of developing critical thinking dispositions.

Systems Thinking

Many participants in this research stressed that systems thinking is critical for understanding social-environmental issues and for plotting a different course. Thus, most courses in this research included learning objectives related to developing systems thinking or one or more dimensions of systems thinking. In addition to developing a better conceptual understanding of systems thinking, some participants hoped students would reflect on their own connections with systems and consider their impacts on the larger system when making decisions.

Participants noted that complex twenty-first century challenges cannot be solved using linear, monocausal and reductionist ways of thinking. They attested that systems thinking offers a holistic and integrative approach that is required to understand and address problems. For example, one participant stated that one of the purposes of sustainability education is to encourage students to develop integrative, systemic thinking:

"Fundamentally, I think that educating for sustainable development is asking students to think about things differently – to think about how things go together, how they integrate, what they mean systemically, to apply the knowledge that we have in a different way…. And so addressing these challenges requires a different way of thinking. And I think that what a lot of people are trying to achieve in sustainable development programs is a different means of thinking to achieve some of these integrative, systemic thinking skills, to really try to plot a different course than what we've charted out presently, based on more traditional ways of educating or thinking about these subjects."

- Jason Smerdon interview (Columbia University)

In their interviews, some participants heavily stressed the importance of systems thinking, attesting that one of their primary goals was to develop systems thinking. Daniel Childers, for example, suggested that he would have failed as an instructor if his students left the course without a more holistic understanding of the world. Participant 11 also highlighted systems thinking, attesting that when students start thinking in systems and seeing how everything is linked together, this "sets the right tone for the rest of the semester." Other participants also stressed the importance of understanding the Triple Bottom Line or developing holistic, integrative thinking.

Although not all courses emphasized systems thinking to the same degree, all courses had learning objective(s) that involved developing one or more of the following dimensions of systems thinking:

- Recognize complexity
- Understand interconnections across dimensions and scales
- Understand system structures
- Understand system dynamics
- Diagnose sustainability problems

This section will summarize the course objectives related to these dimensions, as well as why they are important for understanding and addressing sustainability issues.

Understand Complexity

Several participants highlighted the importance of recognizing and developing a better understanding the complex and interconnected nature of human and natural systems. They noted that human systems involve many components that interact in complex ways, including politics, cultural values, worldviews, ways of knowing, power dynamics, governance structures, institutions, built environments, etc. Natural systems are also complex, due to the many intricate interconnections among the living and non-living components of ecosystems. Moreover, these two systems, each of which is complex in its own right, interact with one another in ways that are often difficult to predict.

Some participants reported that developing an understanding the complexity of social-ecological systems is an important course objective. They want to encourage students to move away from seeking simple, straightforward answers toward more complex and nuanced ways of thinking about the causes, consequences and solutions to sustainability problems. Several participants emphasized that understanding the human dimensions of sustainability is important for developing a more complex understanding. As noted below, this includes understanding how human systems can create barriers to sustainability solutions:

> "A lot of them come into the class at the beginning and it's: 'Oh, here's this issue A. It would be so easy if people all just did this.' And the big thing I'm trying to get them… is that basically, if there was such an easy solution, it probably would have been done by now. The thing you need to look into is try to figure out why. What's actually causing the solutions not to be implemented? What's going on? And a lot of times it also falls down then into the human systems."

> - Pete Akers interview (University of Iowa)

Participants suggested that developing a more complex, nuanced way of thinking can broaden students' understanding of sustainability. For example, realizing that sustainability issues have interconnected environmental, social and economic dimensions can help students

93

understand that sustainability involves more than just trying to solve environmental problems. They will understand that it also includes social and economic goals, such as peace, social justice, equity and improving livelihoods. As suggested in the following text, this can broaden the scope of sustainability solutions beyond focusing on changing individual behaviours, such as recycling or taking public transportation to work and school:

> "On the surface, it may appear that things like finance, politics, and terrorism have little to do with sustainability studies. However, here at RU we take a more holistic and interdisciplinary approach to thinking about sustainability in which social issues, political conflict, cultural values, economic paradigms, and environmental degradation are all related to each other. If we think about sustainability in this complex, rather than simple way, sustainability clearly becomes more than a project to insulate our windows, buy organic food, and ride our bikes (even though these things are pretty cool). Instead, sustainability becomes a project of figuring out how to help people live better – as it turns out, less war, less poverty, and more democracy is good for the planet and for people."

- SUST 210 syllabus (Roosevelt University)

Finally, as will be outlined later in the section on strategic thinking, understanding structural barriers and the complexity of systems can help learners create more effective and pragmatic solutions.

Understand the Interconnectedness of Social-Environmental Systems

An important learning objective for almost all courses in this research was for students to develop an understanding of the interconnectedness of social-environmental systems. In particular, students in these courses learned about the interconnections across dimensions or scales. Participants attested that learning about interconnectedness helps students understand how humans rely on and impact human and natural systems. Additionally, it helps students understand their own connections to and impacts on those systems.

Understand Interconnections among Dimensions

Participants also emphasized that students need to understand that social-environmental problems involve linked environmental, social and economic dimensions. The following learning outcomes, for example, highlight the importance of understanding interconnections:

"Be able to discuss sustainability from different perspectives and scales

- describe the fundamental linkages between ecological, political, social, and economic systems
- display the ability to think across scales, from individual to global"

   - SUS 151 syllabus (Principia College)

"After taking this course, you should be able to:

- Evaluate the interconnectedness of ecological, economic, and social systems within the context of specific cases."

   - SOS 110 Course Prospectus (Arizona State University)

Many courses introduced students to the linked environmental, social and economic dimensions of sustainability through the three pillars or Triple Bottom Line model of sustainability. Participants also referred to this model as the three-legged stool, three E's (ecology, equity, economy), or three P's (people, planet and prosperity). The Triple Bottom Line model of sustainability conceives of the environmental, social and economic dimensions of sustainability as overlapping. Thus, participants emphasized that it is important to look at the environmental, social and economic factors that contribute to social-environmental problems. Greg Zilberbrant discussed the importance of including all three dimensions and understanding how they tie together:

"So, this is the approach I take to the course to help students understand truly that Triple Bottom Line and understanding the economics. So, I do quite a bit on the economic connection of sustainability to environmental issues. I talk about environmental issues specifically, so helping them understand sustainability from an environmental perspective, helping them understand sustainability from a social perspective, and then how those three pillars tie together without excluding any one of them."

- Greg Zilberbrant interview (McMaster University)

The interconnected nature of three dimensions entails that activities in one dimension of sustainability will affect the other two dimensions. Some of the consequences of these activities may be unintended and undesirable. Participants thus emphasized that it is important to consider the potential for impacts in all dimensions whenever looking at sustainability issues.

"With sustainability, we're talking about all these different fields… If you have an issue of waste in a community, you need to know about the economics of the waste. You need to know about the natural hazards from it, how the environment is accepting it. What's the effect on the ecosystem? How is it affecting underprivileged communities?"

- Pete Akers interview (University of Iowa)

In the quote below, Karen Eckert attested that systems thinking and the Triple Bottom Line involve a different way of looking at the world that is important for the twenty-first century:

"It's basically the way that you look at the world – through the Triple Bottom Line, through systems thinking, Cradle to Cradle, Ecological Footprint, One Planet principles, and so on. No matter what you're going to do out in the world, we want you to be looking at the world through that lens of the Triple Bottom Line. And so, we're thrilled that it attracts different majors, because, for my money, that ensures that our graduates, no matter what career they're pursuing, have the thought processes of the twenty-first century."

- Karen Eckert interview (Principia College)

Two main ways in which courses teach about the interconnections among dimensions include the impacts of human activities on all three dimensions, as well as how social and economic systems are affected by natural systems. First, an important objective in these courses

was for students to understand some of the ways that human activities impact the environmental, social and economic dimensions of sustainability. However, no two courses approached the topic of impacts in exactly the same way. For example, some courses focused on how things such as energy and resource use have contributed to global problems like climate change, biodiversity loss, and alterations to major biogeochemical cycles. Other courses focused on how past planning, land use, and transportation decisions led to car-dependent societies and contributed to detrimental impacts to wildlife habitat and regional air quality. Some courses focused more on how individual-level decisions impact each dimension of sustainability. Students in several courses do a lifecycle assessment or ecological footprint assessment to estimate the impacts of products or their own impacts in multiple areas. In Marian Brown's course, for example, students complete multiple assignments where they weigh the economic, environmental and social impacts of personal decisions regarding things such as food, energy and clothing consumption:

> "But what I am trying to do is to tease out the environmental, social and economic impacts of decision-making. Each homework assignment tries to tease that out…. We talk about things like sweatshop labour, so the impact of that. We talk about the environmental impact of natural fabrics versus synthetics. And we talk about the economic impacts of these various decisions."

> - Marian Brown interview (Wells College)

A second important objective in many courses is for students to understand how natural systems affect human systems. This includes understanding how humans depend on natural systems and how changes in natural systems impact social and economic systems. In some courses, human dependence on natural systems is illustrated by looking at the origins of resources and products, such as learning where the food and energy in their local community comes from. In a couple of courses, students learned about human dependence on natural systems through a model of nested systems. Rather than conceptualize sustainability dimensions

as partially overlapping but separate, as is commonly depicted in Venn diagrams, the nested systems model depicts the economic system as nested within the social system and the social system as nested within the natural system. In some courses, students learn about ecosystem services:

> "Another goal is that I want them to leave the course knowing more about the environment that is their life support system and more about the world around them than they did when they got there. And be able to think about ecosystem services.... But be able to think about ecosystem services as much more than just what humans are taking from nature. And the point that I'm trying to get to with them is to provide them with enough information so they can see how nature is actually providing those services."

> - Daniel Childers interview (Arizona State University)

Related to this, an objective in several courses is for students to learn how environmental changes impact social and economic systems. For example, some courses look at how ecological processes impact patterns of wealth, poverty and economic development. Some explore issues such as environmental justice or climate justice:

> "We wanted them to understand how it [climate change] affects people around the world, especially the poor and marginalized… And learn that climate change is not some big future thing. It's something that's causing real hardships in lives of real people all over the globe right now."

> - Philip Sakimoto interview (University of Notre Dame)

Understand Interconnections across Scales

An important objective for many courses was for students to develop an understanding of the interconnections of systems across scales, from local to global. Participants reported that it is important for students to understand the multi-scalar nature of sustainability and to understand interconnectivity across scales. Thus, many courses looked at how activities at one level (e.g. the individual level) can impact systems at other levels (e.g. the global level).

98

According to participants, understanding scale is important because complex social-environmental problems are not limited to a single scale. Instead, they often have local, regional, national and global impacts. Thus, it is important to understand how activities at different scales impact systems:

> "Insuring the sustainability of earth's natural and social systems is amongst the most important challenges of our time. Although global in scale, issues like climate change, species extinctions, inequality, population growth and economic instability find immediacy in individual and local concerns for a healthy environment, social justice, liveable cities and socio-economic development. Meanwhile, such concerns are raised in the context of an increasing recognition that natural and social systems interact in complex ways and that it is critical to better understand those interactions."

> - UU 101 syllabus, Wilfred Laurier University

SUST 1001 instructors at George Washington University use the Chesapeake Bay as a local example of how activities in different domains (e.g. urban and rural) and scales (from local to national) contribute in different ways to water pollution concerns. One of the course instructors, Lisa Benton-Short, noted that this case study provides an example of the complexity of sustainability issues:

> "It's a local issue that has regional and national implications. And so that scaling of an issue is one way that we get at how complex ecosystems can be. The Chesapeake Bay is actually a watershed that involves five different states. It involves cities and suburbs and rural areas, and some of the pollution is coming from agricultural runoff and some of it is coming from urban runoff. And the solutions to how you stop runoff are very different if you're talking about agricultural versus urban. So we love to give them this as a microcosm of how complex the real big sustainability questions and problems are."

> - Lisa Benton-Short interview (George Washington University)

A number of participants discussed the importance of understanding the role of individuals within societies, including the students' own relationships with different systems. Some participants emphasized that it is important to help students broaden their thinking to consider the impacts of their own actions on larger systems:

"I hope that they'll find a way to apply what they've learned in a couple of dimensions of their lives. I always say to them, 'Part of this is thinking about your own impact on the planet.'"

- Andrew Wingfield interview (George Mason University)

"I honestly don't believe you can just practice sustainability in your house, in your life, in your community.… You have to be thinking about the source of what you're using. Are you buying things from outside the United States or outside your community? Are you eating foods that are not grown locally? We have to get beyond this parochialism and think about natural systems on a global scale, and economic systems and social systems on a global scale."

- Participant 14 interview

Also related to understanding interconnectivity across scales, an objective in some courses was for students to understand how larger systems or sustainability problems can impact their own lives. For example, Philip Sakimoto (University of Notre Dame) noted that one of the "real" course goals was for students to understand that climate change personally affects them and is important. In his course, students wrote about how climate change affects their hometowns and how their hometown affects climate change. He noted that this also connects students with climate change on a personal, emotional level.

Finally, a few participants also contended that it is very important for students to understand that they belong to systems that can sometimes constrain their activities and provide barriers to intended sustainable behaviours. As will be discussed in the strategic thinking section, this means understanding the limits to what people can accomplish through individual action.

Understand System Structures

Part of systems thinking involves understanding how systems are structured. In SOS 110 (Arizona State University), one of the primary course objectives is for students to recognize and understand the social and natural elements of social-ecological systems. To help meet this

objective, students do a current state analysis to identify the factors that influence actions in a specific sustainability problem. They use the results of their analysis to create systems maps of the system's key components, external drivers and interactions. According to the assignment description, the systems map provides the basis for understanding environmental, social and economic interactions in the system.

Although most participants did not explicitly refer to system structures or components in their interviews or syllabi, most courses included topics on various kinds of system components. For example, several courses included topics about stocks, such as the amount of freshwater in an aquifer or the concentration of carbon dioxide in the atmosphere.

Understand System Dynamics

Although it was not a strong theme in the research, an objective in some courses was for students to develop some understanding of system dynamics. For example, this included understanding basic physical and ecological processes, such as biogeochemical cycles, energy and material flows, and population dynamics. It also included understanding the nature of cause and effect relationships in social-environmental systems. For example, students in SOS 110 (Arizona State University) learned how to perform a causal chain analysis and how to analyze variables, feedbacks and drivers in select systems.

Understanding system dynamics includes understanding social and environmental trends over time. For example, some courses included topics on how sustainability problems emerged and how the past influenced present problems. As will be discussed in the section on futures thinking, a few courses also look at potential future scenarios.

Diagnose Sustainability Problems

Developing the ability to diagnose sustainability problems was an important objective in some courses. As exemplified in the following syllabus excerpt, several participants stressed that understanding the root causes of problems is essential for thinking critically about how we can or should take action to make things better:

> "This course takes a diagnostic and a prescriptive approach to thinking about sustainability in a complex way that bridges the social and natural sciences. … In other words, if the planet and its inhabitants are our patients, we need as much information as we can gather in order to properly diagnose the ailment(s). We also need a robust understanding of what's wrong in order to offer a prescription for our patient needs to do. In this course we will think about what's going wrong as well as our options for collective change."

> - SUST 210 syllabus (Roosevelt University)

Diagnosing problems appears to involve several dimensions of systems thinking, including an understanding of interconnected systems, system dynamics, ecological and physical processes, and the history of how problems originated. It also includes the ability to understand the impacts of individual and collective actions.

Although the topic of solutions will be covered more in the strategic thinking sections, systems thinking also involves the recognition that activities in one part of a system often impact several other linked systems. In consequence, people cannot always anticipate all the potential impacts when intervening in complex systems. Thus, an objective in some courses is for students to learn about cascading effects and the potential for unintended consequences.

Summary

From the descriptions of systems thinking learning objectives in this research, systems thinking involves a different way of looking at things. Rather than perceive the world as simple, atomistic, mechanistic and monocausal, systems thinkers develop a more complex and integrated

understanding of things. They see the world in terms of relationships rather than isolated incidents and they seek interconnections and multiple causes instead of simple answers. They recognize that they are part of a greater whole – that their activities affect other people and places, and that larger issues affect them and the people and places they care about. Finally, they also understand that human and ecological systems are interrelated, so they recognize that values, norms, beliefs, practices, policies, laws and systemic structures can aid or impede solutions to environmental problems. The importance of learning objectives related to values, norms and ethics will be explored in more detail in the next section.

Values Thinking

> "I think sustainable development as a discipline is distinct from some of the traditional disciplines, in the sense that it has this normative component. It has built into how we think about sustainability and sustainable development an image of a world we think we should be able to achieve. Or a world that at least is not doing the kind of harm and damage that we currently are doing to the systems that support life on the planet."

> - Jason Smerdon interview (Columbia University)

This section summarizes course learning objectives that were related to values and ethics. These included recognizing the value-laden nature of sustainability, envisioning sustainable systems, understanding and balancing different values, and reflecting on students' own values. Some participants also expressed aspirational goals related to values, including the hope that students would connect sustainability values to their personal and professional lives.

Recognize the Value-Laden Nature of Sustainability

With few exceptions, most participants in this research noted the importance of discussing values and ethics in their courses. They emphasized that sustainability is value-laden. They noted that visions of sustainable systems involve discussions of how people want to live,

103

how they want the world to be, and what actions people should take to contribute to a more sustainable future. Some participants attested that values and ethics are needed to determine whether society's present trajectory is unstainable and to set a new course. As Philip Loring noted, values underlie the way people answer critical questions about sustainability:

> "One of the things that we say over, and over, and over again in the class is that sustainability involves a number of different unspoken questions of sustainability of what, for whom, by whom, and at what cost? And that it's impossible to not be answering those questions in whatever action we take when we're trying to make something sustainable. And it's our values regarding what success is, values regarding the right way to live, how you have to live in a philosophical sense – all of those values underlie how we answer those questions."
>
> -   Philip Loring interview (University of Saskatchewan)

A learning objective in several courses is to understand important values in sustainability. Interviews and course syllabi commonly referred to values such as equity, justice, environmental protection, poverty reduction, inclusion, human and ecosystem health, and intergenerational equity. In particular, several courses emphasized equity. Several participants pointed out that equity is a fundamental component in many conceptions of sustainability, such as the Three E model of sustainability (ecology, equity, economy). In the example below, Lisa Benton-Short attested that the United Nations Sustainable Development Goals helps students understand that equity is a fundamental part of sustainability:

"A lot of students come in with the preconceived notion that sustainability is just a code word for the environment and they don't oftentimes see the three E's. When you look at those 17 SDG's, more than half are around equity issues: poverty, education, gender discrimination and equality…. And I think a really important part of teaching intro sustainability is that it's not just about climate change and renewable energy. It's also about housing affordability and ending racial discrimination… Once you've introduced your definition of sustainability as those three E's and three dimensions and how this is a foundational part of how we're going to look at issues, then it's not about environmental science anymore. It's really much more broad and encompassing."

- Lisa Benton-Short interview (George Washington University)

Many participants explore the concept of equity by exploring issues such as global resource consumption, inequality, poverty, social inclusion and differential access to resources and services. Intergenerational equity was also an important concept in several courses. As a few participants observed, this concept is implicit in the concept of sustainability. For example, they noted that the Brundtland definition of sustainable development stresses the importance of meeting current needs while leaving future generations with sufficient resources to meet their own needs.

Participants also challenged students to reflect on how ethics relates to sustainability. Thus, these courses explored multiple ethical perspectives about how the world ought to be and how people should interact with one another and with other living beings. They explored the moral imperative that all people in current and future generations should have access to sufficient resources to meet their basic needs. Some courses also included topics on utilitarianism, libertarianism, duty ethics, environmental ethics, or faith-based ethics. Karen Eckert, for example, discussed how the Golden Rule could be applied to both humans and the planet, and she encouraged students to apply this concept to future generations:

"Basically, you want to look at the way that you treat each other. You know, the Golden Rule. It's a faith-based institution, so how important is it to you to care for the Earth, care for your fellow human beings? And, not only in an immediate sense but in the Iroquois

Nation fundamental concept of "seven generations"; that is, how do the decisions you make today roll out six, or seven, or eight generations forward? Are those still going to be positive decisions? Are you doing things that are regenerative, rather than depleting? Might there be unintended consequences?"

- Karen Eckert interview (Principia College)

Envision Sustainable Systems

Although not well emphasized in the research, a learning objective in a small number of courses included developing the abilities to envision sustainable systems and assess the sustainability of systems. Some participants wanted students to identify the values that they bring into their visions of a sustainable world. As described in the excerpt below, students in one course worked through a visioning process in one of their assignments. Of note, the excerpt below suggests that visioning involves creativity:

"But then we have them do a visioning process, where we have them think out of the box, get away from thinking about the current state, and then vision what their system might look like in the future if the goals of enhancing sustainability are met."

- Daniel Childers interview (Arizona State University)

In Daniel Childers' course, students completed a semester-long project. Part of the assignment was to develop a vision of a desirable future, including what the daily life of stakeholders might look like. As will be discussed in the strategic thinking section, students in this course also create a transition plan to get from the current state to the more desirable state.

Understand and Balance Values

Another less-emphasized learning objective was that of understanding the importance of identifying, understanding and balancing different needs, interests and values. Those who discussed this objective noted that students who plan and develop future sustainability initiatives will work with people with diverse values and priorities. They wanted students to understand that

106

they will need to identify, respect and balance these values if they want to gain the support needed for initiatives to be successful. A couple of participants encouraged students to look for "win-win" solutions. Since win-win solutions satisfy multiple needs and values simultaneously, the implication is that people will not have to choose among competing values. For example, one participant noted that conserving energy could simultaneously protect the environment and help businesses save money. However, another participant wanted students to realize that win-win scenarios are not always possible because sustainability solutions are imperfect. Thus, compromises and trade-offs are sometimes necessary.

Reflect on and Connect Values to their own Lives

Several participants wanted students to engage in values reflection, which included reflecting on their own values reflecting and on how sustainability values connect with their lives. An aspirational goal for some participants was for students to think beyond themselves and apply sustainability values to their lives.

Several participants asked students to reflect on their own values with respect to sustainability. Some participants wanted students to identify the values that they bring into their vision of a sustainable world. Others encouraged students to question whether their values align with their actions. For example, Philip Loring wanted his students to make their own values explicit, question them, and understand their origins. As mentioned in the critical thinking section, he attested that this important for building epistemological awareness. He implied that it can also lead to the realization that there is an incongruity between values and desired outcomes:

> "And I want them… to understand what their own values are and where they've come from, and to try to question them. Does it work? How does it play out? Is that a sustainable way to approach this? If not, what do you do about it? How do you handle that cognitive dissonance that you experience once you realize that a value you think you hold is incongruent with an environmental outcome that you want? So I just get them to

recognize them where they're in play. If they are not explicit then that's a problem. So I want them to learn to make them explicit."

- Philip Loring interview (University of Saskatchewan)

Almost half of the participants in this research discussed how they wanted students to reflect on the impacts of their actions on human and non-human life. Several participants hoped that, by understanding the implications of their actions, students would think beyond themselves. For example, a learning outcome in Marian Brown's course was for students to "be able to utilize their knowledge of sustainability to change their daily habits and consumer mentality." In her interview, she stated that she wanted students to become more mindful of the impacts of their actions, think beyond themselves, and weigh the impacts of their actions when making decisions:

"You start making decisions based on what you do, that you are part of a much larger system – wanting people to understand that. And that you as an individual have an impact on that system and can have a positive impact or a negative impact. It's interesting to try to break them out of the mould of, 'How does this system apply to me?' and not think about those larger impacts. And so, get them to break out of very me-centric to me as part of the global community and the global ecosystem."

- Marian Brown interview (Wells College)

Similarly, some participants hoped students would realize that they are a part of the world and that they have an individual and collective responsibility. For example, Allison Goebel emphasized the concept of ecological citizenship in her course and wanted students to think about what they would do with their knowledge about sustainability:

"But also taking ownership and responsibility for their knowledge – we also emphasize that through this idea of ecological citizenship… It's not enough to educate yourself. You have to place yourself in the world as an actor and think about what you're going to do with the knowledge that you have. And so there are many ways you can exercise that. It doesn't have to be becoming an activist – there are all kinds of things. So, just emphasizing the real life aspect of the learning that they're doing."

- Allison Goebel interview (Queen's University)

Similarly, Steven Mannell's course objectives include understanding the moral and ethical dimension of knowledge, recognizing that knowledge comes with responsibility, and having the disposition to act. He suggests that the idea that knowledge comes with responsibility is opposed to some traditions:

> "And the other thing we're looking for are dispositions towards action and towards understanding that knowledge has a moral and ethical dimension. In that way we're quite explicit. And some of the science people we bring in are also, in their own careers and in their work, quite explicit that the disinterested pursuit of knowledge is a political construction that is not useful for sustainability. And so, to the extent that we say, 'If you know something, you have a responsibility to do something about it," we run counter to certain traditions in science and social science.'"
>
> - Steven Mannell interview (Dalhousie University)

Several participants also hoped students would reflect on their roles in addressing sustainability challenges. They emphasized that sustainability is such a large, umbrella topic that everyone can play a role, regardless of their occupation or position in life. While some participants hoped students would consider careers in sustainability, others noted that sustainability can be incorporated into most occupations. For example, some hoped that business students would think about how to run their businesses more sustainably. A few participants hoped students would become better civic actors, ecological citizens, or global citizens.

Finally, some participants hoped students would apply sustainability as a mindset or guiding principle to their careers or personal lives:

> "My hope is that if they're going to keep on going with whatever they were studying before – so if they were an Environmental Engineering major who was planning to work for an Environmental Engineering firm – that they would take this mindset of sustainability and global thinking of ethics with them and apply it in whatever they were going to do already."
>
> - Mark Orrs interview (Lehigh University)

"In whatever they do – certainly their careers but also in their everyday lives. What do they think about when they buy a home? How do they raise their kids? Because this [climate change] is such a huge problem, it will take so much work to solve it, that it has to become a guiding principle which you live every part of your life."

- Philip Sakimoto interview (University of Notre Dame)

Futures Thinking

Only one course (SOS 110, Arizona State University) explicitly listed the development of futures thinking (or anticipatory) competence:

"All courses in the School of Sustainability are designed develop your normative, anticipatory, strategic, and systems thinking competencies, enrich your interpersonal communication skills, and deepen your understanding of the following key concepts…"

- SOS 110 prospectus (Arizona State University)

Although most courses did not explicitly list the development of futures thinking as a course objective, several courses included one or more dimensions of futures thinking. As described below, these dimensions included developing future scenarios and visions, understanding the importance of considering the future, and applying futures thinking to the students' own lives.

Develop Future Scenarios and Visions

Several courses included material that looked to the future, such as discussing the future impacts of climate change. However, most courses did not explicitly focus on developing the ability to create future scenarios or visions that anticipate how sustainability problems can evolve over time. For example, most courses did not emphasize methodologies to assist with creating plausible scenarios. Only a few syllabi referred to methods such as scenario construction, envisioning methods or backcasting.

Arizona State University's course, SOS 110, is one of the exceptions that focused on developing futures thinking, along with the other key sustainability competencies. Students developed these competencies by working on a multi-staged, semester-long project. As outlined in the assignment description below, they developed plausible scenarios and desirable sustainable visions related to a sustainability challenge, which they later used to develop strategies to transition from the current state to a desirable future state:

> "Assignment #5 - Scenarios and Visioning: This assignment differentiates between scenarios and visions in the context of your topic area. You will generate multiple plausible future scenarios related to your sustainability challenge. In order to assess how these plausible future states compare to the current state, your research team will identify potential trends based on the indicators you have identified. Your team will also develop a desirable vision of the future. You will examine what a 'day in the life' of stakeholders might entail, and you will compose a general vision statement."
>
> - SOS 110 prospectus (Arizona State University)

Students in a small number of other courses also developed visions of the future. For example, Manuel Riemer's students imagined a desirable future in a visioning exercise. Riemer wanted them to understand that they shared a common vision but that we are moving away from that vision:

> "One thing that we do in the tutorial, for example, is a visioning exercise where they have to imagine the kind of future that they want – the kind of community that they want to live in 20 years from now. And I've done that same exercise multiple times… And it's interesting how images – these are actual images that they create – how similar they are every year… But I use the exercise to show them they have a shared vision here. But what we are moving towards is not that shared vision."
>
> - Manuel Riemer interview (Wilfred Laurier University)

In another example, Joanne Moyer's students worked in small groups to envision what a sustainable world might look like on a fictional colonized planet in the future. Following this

111

exercise, the class discussed how they might apply these ideas to Earth. Moyer noted that this

exercise is part of part of looking to the future and thinking about "Where do we go from here?"

> "At the end, I do what I call my speculative fiction exercise, where I tell them at the beginning of class that they're part of a group that's going to colonize another planet and they're the sustainability committee in this group. And so, in small groups they get the whole class to plan how they're going to organize their new planet so that it doesn't make the mistakes that we've made on Earth… And then I get them to share and we talk a little bit about: 'How could you apply some of the ideas that you came up with for your new planet on the planet where we're living?'"

> - Joanne Moyer interview (The King's University)

Finally, one participant noted that it is challenging to think into the future. Systems are

complex, dynamic and often unpredictable, so it is difficult to create scenarios and visions that

are plausible and evidence-based.

Understand the Importance of Considering the Future

Several participants in this research stressed the importance of being able to think about

the future in sustainability. This was reflected in the participants' definitions of sustainability or

sustainable development, where they talked about the need to live in a way that could be

sustained over the long term. As noted in the values thinking section, several participants

stressed that it is important in sustainability to consider the rights and welfare of future

generations, which requires the ability to think about the future impacts of current actions.

Participants provided several reasons for why visioning is important. As noted above,

Manuel Riemer wanted his students to realize that society is moving away from their shared

visions. Daniel Childers attested that visioning is valuable because it enables students to develop

plausible and tractable visions that are not "burdened" by the present. The implication is that this

frees people to think of different ways of doing things. Some participants attested that thinking

about the future prompts people to think about the potential consequences of current activities

112

and be proactive. As suggested in the quote below, if people think about the future and realize that the current trajectory is not heading toward a desirable vision, then they have the opportunity to create an alternative vision and consider how to contribute to a change in course:

> "I think it's fundamental for students to ask, 'What does that future look like? What do I think it should look like? And if my values are such that I believe we should be changing course and pursuing that vision that's different from business as usual, how do I go about addressing it?' And what I think is important for our students to have is both an image of what that looks like and then a sense of the tools that they need to really contribute to making changes in that direction."
>
> - Jason Smerdon interview (Columbia University)

This quote also suggests that there is a connection between futures thinking, values thinking and strategic thinking. Futures thinking allows students to envision plausible future scenarios, while values thinking enables them to assess if those scenarios are sustainable and develop a more sustainable vision. Strategic thinking provides the tools to head toward the new vision, as will be outlined in the strategic thinking section.

Apply Futures Thinking to the Students' Own Lives

A small number of participants encouraged students to think about how sustainability issues will connect with their own future lives. For example, Philip Sakimoto's course included futuristic literature to encourage students to think about what will happen in their own futures because of climate change. As part of a series of assignments on their hometowns, students in Sakimoto's course were asked to envision what their hometowns will look like in 50 years if a sustainable world has been brought about. They were asked to write a letter to their grandchildren from the future, where they described the transformative changes that will have taken place and their own roles in bringing about these changes. Philip Sakimoto attested that the objective of these assignments was to make climate change become a personal issue for students:

113

"But they're all aimed to get the students to think about themselves, where they grew up and where their hometown is, how climate affects it, so it becomes a very personal issue."

- Philip Sakimoto interview (University of Notre Dame)

Several participants also encouraged students to reflect on their career options and about how to put sustainability into practice in their future professions. For example, when talking about his role as an instructor, Jason Smerdon said that one of his roles was to help students think about how sustainable development might connect with their future career options:

"One of the prevailing questions is, 'What do I do in this field? What do I do with this major when I go on?' And giving them examples and ideas and sort of paths forward in their minds about how they can take the interest they have on this subject, the values that I think these students have and connect to the subject through, and how those might be put in practice in terms of their next career steps."

- Jason Smerdon interview (Columbia University)

In summary, although most courses did not emphasize the development of futures thinking, several participants attested to the importance of thinking about or envisioning the future. They noted that it enables people to assess whether the current trajectory is heading in a sustainable direction. It can also help people create visions of a more desirable future that they can work toward. Thus, students in a handful of courses were asked to create future scenarios and visions. Some participants also wanted students to understand the importance of the future and apply futures thinking to their own lives.

Strategic Thinking

As noted in Chapter 2, strategic thinking is the ability to understand, design, implement and evaluate sustainability strategies and initiatives. Although only one course (SOS 110 at Arizona State University) explicitly used the term "strategic thinking", most courses included one or more of the following strategic thinking learning objectives:

- Understand proposed sustainability solutions
- Develop feasible sustainability initiatives
- Implement sustainability initiatives
- Evaluate sustainability initiatives
- Connect strategic thinking to own lives and careers

These learning objectives are described below.

Understand Proposed Sustainability Solutions

Understanding proposed solutions to sustainability issues was a common course learning objective in this research. In fact, several participants reported that the topic of solutions was a strong course theme. Students in most courses were expected to be aware of or describe examples of proposed sustainability solutions. However, participants approached the topic of solutions in multiple ways, such as considering solutions at different scales and dimensions, looking at diverse kinds of solutions (e.g. technological or policy solutions), and focusing on solutions in different topic areas (e.g. climate change or waste).

Courses looked at solutions at different scales, from local to global. Some courses focused more on solutions to regional or global issues while others focused on local-level sustainability initiatives. For example, several participants take their students on field trips to sustainability initiatives or bring in guest speakers who work on addressing local issues in food production or distribution, water pollution, or alternative energy projects. A few participants noted that bringing in multiple people who work in different areas on local, real-world solutions gives students an opportunity to see sustainability in action and gives them the sense that sustainability is not just an abstract idea or academic exercise. It also encourages them to think differently about sustainability:

> "One of my pedagogical approaches is to bring experts of industry into the classroom, so that my students can see that it's not just an academic exercise, that this is literally the

way the world operates in the twenty-first century, and they cannot graduate and think that they can run a business the same way that it was run in 1974. It's just not an option."

- Karen Eckert interview (Principia College)

Some participants wanted students to understand the importance of implementing solutions at multiple scales. Students in Steven Mannell's course, for example, are exposed to a multi-level approach:

> "The other theme that's really strong, especially in the first-year course where we're doing a lot of survey of challenges, is: what solutions are people proposing? … And we tend to use Elinor Ostrom's approach of simultaneous, multi-level approaches. So, understanding what is possible in your own person, in your own life, what's possible in your community, what's possible in the international community. And understanding that the solution has to be at all those levels, not at any one level, but that you can start where you feel competent."

- Steven Mannell interview (Dalhousie University)

An objective in several courses was for students to understand that solutions must consider multiple dimensions. Many courses covered three sustainability dimensions (environmental, social and economic), although some instructors placed more emphasis on understanding the social or human dimensions of sustainability. For example, Steven Mannell attested that his course places more emphasis on the social dimension of sustainability because this dimension facilitates action that's immediate. Similarly, Pete Akers attested that understanding the human dimension of sustainability helps students develop a more complex understanding and create pragmatic sustainability solutions:

> "The big goal that I've made for this course is for students to better understand the human dimension of sustainability and to get a better understanding of the complexity that goes into sustainability. Basically come away from the course with a better understanding of how to engage with other people and incorporate sustainability into systems and ideas in a way that will actually work. So, how to be pragmatic about sustainability."

- Pete Akers interview (University of Iowa)

Many courses explored several different types of solutions, such as technological change, individual behaviour change, or social change. They also explored different kinds of strategies, such those that rely on market-based tools, policies or collective action. However, the courses differed in which types of solutions they focused on more. Some courses focused more on the role of "green technologies" while others placed more emphasis on civic or collective action in meeting sustainability goals. Graham Pickren, for example, wanted students get beyond a focus on individual behaviour change and think differently about environmental action:

> "I'm actually trying to push them away from that approach to sustainability that's about making individual changes in your lifestyle and your choices. I think those things are important but I think we overemphasize them. I think collective action, policy change, is dramatically more important than changing your light bulbs… We've actually been doing that for 40 years and there hasn't been systemic change in a lot of issues that come from just downshifting and living a green lifestyle. But my emphasis is trying to maybe have them come out of the class with a different thinking about what environmental action is than they came into it with."

> - Graham Pickren interview (Roosevelt University)

Finally, courses also differed in their focus on topic areas. Many courses, for example, emphasized potential solutions for problems related to water, climate, food production or biodiversity.

Develop Feasible Sustainability Initiatives

Students in several courses developed their abilities to design feasible sustainability initiatives, as indicated in the following learning outcomes:

> "At the end of this course, students will: … "Be equipped to instigate and develop small-scale sustainability projects of their own within the local community and beyond".

> - GEOG 2013 syllabus (University of Iowa)

"After completing the course, students will be able to do the following… Develop sustainability solutions that address the complexity of the issues but aim for practically feasible implementation".

- UU 101 syllabus (Wilfred Laurier University)

"After taking this course, you should be able to: … Outline an approach to frame and collaboratively solve sustainability problems."

- SOS 110 Prospectus (Arizona State University)

Many of the sustainability initiatives in these courses were at the level of the campus or community. For example, students in Philip Sakimoto's course gathered background research for a potential climate ordinance for the City of South Bend, Indiana. In Andrew Wingfield's course (George Mason University), students analyzed sustainability problems and developed potential solutions in their local community:

"Groups of students will engage in action-based sustainability scholarship to design a project that has the potential to promote sustainability goals within our community. Each group will choose one of the course's topic areas, and pick a specific problem facing our community within that topic area. Groups will analyze the root causes of the problem, come up with a potential solution, and present a plan on how to implement it."

- INTS 210 syllabus (George Mason University)

Participants used a variety of different approaches and frameworks to help students develop their abilities to design feasible solutions. For instance, these included a multi-level approach, a decision-making framework for making informed decisions, a planning approach, a project management approach, and a structured framework called the Transformational Sustainability Research (TSR). In Daniel Childers' course, for example, students learned how to use the TSR framework to develop plausible transition strategies to get from the current state to a desired future state for specific sustainability issues.

"Well, so one of the learning outcomes is that they learn how to approach a sustainability problem or a sustainability challenge from a solutions-oriented perspective and the steps

necessary to get from the current situation to solutions that are actually tractable and plausible. And so, that's what that whole semester-long process does. It maps them through the process of getting to that, to plausible solutions."

- Daniel Childers interview (Arizona State University)

Following this framework, Childers' students worked through a series of linked assignments throughout the semester to develop key sustainability competencies while helping them work toward plausible solutions to issues. In the first assignments, they performed current state analyses on the issue, which developed their competence in systems thinking. Then they created future scenarios and envisioned more sustainable systems, which developed futures thinking and values thinking competencies, respectively. Finally, they developed their strategic thinking by using the results of their previous assignments to develop and present plausible transition strategies to get from the current state to a desired future vision.

To develop feasible solutions, several participants stressed that it is important to understand barriers, incentives, values and motivations. For example, students in Lisa Benton-Short's course (SUST 1001) are expected to be able to describe the factors that motivate or hinder sustainable behaviour. As noted in the systems thinking section, an objective in Pete Akers' course was for students to understand that barriers to sustainability often arise from human systems. Allison Goebel stressed that learning about barriers helps students realize that knowing about problems is not sufficient for solving them. Like Pete Akers, she notes that this helps students understand that sustainability issues are complex:

"So, having a basic understanding of the big problems out there. What are the associated barriers to solving these problems? One of the most important things is getting across that just because we know about something doesn't mean we are going to fix it or we can fix it. And so introducing some of that political, and issues around social structures and power that are impediments to solving it… And those students coming to grips with the social complexity of these problems."

- Allison Goebel interview (Queen's University)

Several participants wanted their students to understand that it is important to consider different values and perspectives when developing sustainability initiatives. Pete Akers, for example, wanted students to realize that, to get people onboard with sustainability projects, you need to know their social systems and values. Knowing this can help people develop sustainability projects that are more pragmatic and successful:

"The big thing that I'm trying to focus them on is to really think and understand about how different people think and approach things and how to be pragmatic about solutions… One of the ways to get pragmatic about getting real solutions is always looking at the people that you're trying to engage and get involved with in sustainability. You need to know what their values are. What are they actually caring about? ... All the great case studies of people going into a community trying to solve an issue and coming back a year later and seeing that none of the people took up what they were trying to do… I think that the classic example is the cooking stove in Africa. They gave all these people cooking stoves that were solar but they completely ignored the fact that the people enjoyed cooking over the fire because they could cook later at night when the sun wasn't out and they enjoyed the community of talking to people."

- Pete Akers interview (University of Iowa)

Akers also wanted his students to consider some of the practical considerations of being a stakeholder group in an issue. In a role play activity on local sustainable forestry, he wanted students to consider the values of other stakeholder groups and think about which groups they might align with. He also wanted them to consider which compromises they might accept.

Finally, as noted earlier, some participants also wanted students to recognize the importance of creating solutions that balance multiple needs and values while considering the potential for trade-offs, unintended consequences and win-win scenarios.

Implement Sustainability Initiatives

Most courses in this research did not involve the implementation of sustainability initiatives. One exception was Marian Brown's course, where students were given the option to implement a tangible project for their final project:

> "And they're bringing all of those threads that they've learned along the way into their project, which can be actually doing something. We've had students who would create a workshop, for instance, or cycling workshop. Or they might do something around natural dyes."

> - Marian Brown interview (Wells College)

The lack of focus on implementing solutions in these courses may in part be due to the limited amount of time available during the semester. While students in Pete Akers' class proposed solutions, for example, he noted that they did not enact those solutions because they had only a semester to identify a problem in the local community, contact and engage with people, and propose a solution. This did not leave time for implementation.

Evaluate Sustainability Initiatives

In a small number of courses, students were asked to evaluate sustainability strategies or initiatives for their feasibility, effectiveness or limitations. The following is one example of a learning outcome involving evaluation:

> "After completing the course, students will be able to do the following: … Understand and engage in contemporary debates about sustainability, as well as critically evaluate policies, business practices and civil society initiatives to address sustainability issues…"

> - UU 101 syllabus (Wilfred Laurier University)

In another example, students in Daniel Childers' course developed indicators for evaluating the effectiveness of strategic actions:

"Assignment #6 – Transition Strategy: …In this assignment, your team will identify assets, barriers, and strategic actions at intervention points that will aid in the transition. In order to determine if the strategic actions are effective, indicators will be used as a means to track progress toward the identified vision."

- SOS 110 Prospectus (Arizona State University)

A learning objective in some courses was for students to develop the ability to think critically about proposed solutions. In Allison Goebel's course, for instance, students were encouraged to think critically about the potential and limitations of focusing on individual actions. In her interview, Goebel noted that people often think about individual actions when they want to make improvements. While she wanted students to explore the possibilities of individual actions, she also wanted them to reflect on the limitations of those actions and to understand how social structures can create barriers to sustainable behaviours:

"We talk about how our culture is based on individualism, and individual action is highly valued in our culture, so how that's often the first impulse around when you want to do something for the environment. So, things like greening consumption… But then we also talk about the limitations of that. Say that you really want to ride a bike and not have a car, but you live in a city where you can't afford to live downtown, and the only place you can live in is the suburbs, and there's no bus… So, we talk about how the social system and social structures can work as barriers in terms of actually exercising individually what you would prefer to do in your own life. So we try and teach both the possibilities and limitations of individual action and how that's linked to our whole cultural ideas of the primacy of the individual."

- Allison Goebel interview (Queen's University)

Some participants encouraged students to think critically about technological solutions. For example, one participant attested that it is important to consider the potential for unintended consequences in technological solutions. Another participant suggested that relying on

technological solutions feeds consumerism and encourages people to think they do not need to make any changes:

> "If anything, we've tended to put more emphasis on the social change dimensions of sustainability than on eco-modernist approaches or techno-fix approaches… So more generalizing and kind of a critique of eco-modernism that more or less says, 'It's okay. Don't worry. Somebody else will take care of it for you. Just keep doing what you're doing and Elon Musk or someone will solve it all.' Among other things, it just feeds consumer culture, which is its own kind of challenge."

> - Steven Mannell interview (Dalhousie University)

Connect Strategic Thinking to Personal Lives and Careers

Finally, a few participants hoped students would apply the ability to understand, design, implement or evaluate sustainability initiatives to their personal lives or careers. Marian Brown, for example, hoped her students would evaluate the impacts of their own decisions and continue to make more sustainable choices going forward:

> "The course is broken down into different things that they make decisions about and can make a more sustainable decision about... We look at greenwashing, we look at the impacts of toxins in home and personal care products and cleaners, food choices, energy use, waste habits… We'll look at the Triple Bottom Line. We look at the financial impact, the environmental impact, the human impact… So I want them to be aware of the larger issues but bring it back to them so that they feel actionable, that they can make better, more informed decisions. And then keep doing that going forward, so you're constantly bringing in new knowledge to refine that decision making."

> - Marian Brown interview (Wells College)

Pete Akers hoped that his students would have the knowledge, skills and confidence to initiate and implement sustainability projects in their future courses and careers:

> "For most of them, I'm hoping… in their careers in their future and their courses in the future, it's that whisper in the back of their head with sustainability. What they learned in this class about engaging with people, getting things done, how to get sustainability to work in projects and ideas, I'm hoping that a lot of the times they'll have the skills and be a little bit more confident that if they see something at their workplace, they identify,

'Oh, I bet we could make this more sustainable in a certain way or do something.' That because of this class they might not feel so helpless to actually change it… And maybe at least give them that foundation to see things differently – a little bit more sustainably – but also understanding how to actually get a project started and work through it to get some actual solutions done."

- Pete Akers interview (University of Iowa)

Summary

In summary, strategic thinking is about putting sustainability into practice important and is important for "getting things done". It gives people the tools to develop and implement feasible initiatives to address real world sustainability problems. These initiatives consider potential barriers and incentives while weighing different values and potential impacts. In this research, there was a strong focus in courses on understanding proposed sustainability solutions. Several courses also included learning objectives related to developing feasible sustainability initiatives. There was less emphasis on implementing or evaluating initiatives. A few participants also hoped students would apply skills and knowledge related to designing, implementing or evaluating sustainability initiatives to their personal lives or careers.

The next section notes how strategic thinking, as well as the other competencies, require the abilities to collaborate and to understand, integrate and clearly communicate diverse ideas and perspectives.

Interpersonal Competence

All introductory sustainability courses in this research included multiple learning objectives related to interpersonal competence. Interpersonal competence is the ability to facilitate and motivate collaborative research and problem solving in sustainability. As described in Chapter 2, it includes epistemological pluralism, understanding multiple disciplinary

perspectives (multi-, inter- and transdisciplinarity), and skills in communication, collaboration and leadership. The sub-sections below describe these different learning objectives, with the exception of leadership, since this skill was not emphasized in the research. This section will wrap up with a brief summary of the importance of interpersonal competence for sustainability scholarship and practice.

Epistemological Pluralism

The focus on perspectives was a strong theme in this research. Most courses included learning objectives that can be categorized under epistemological pluralism, the term used in this thesis to describe the ability and disposition to seek, respect and understand different perspectives. This section will summarize these learning objectives, which included being open to, respecting and understanding different perspectives, as well as sharing the students' own perspectives. It will highlight why these dispositions and abilities are important for sustainability education, and then briefly outline how some participants include multiple perspectives in their courses.

Several participants stated that they want their students to be open to, respect and appreciate the values and perspectives of others, including those who do not share their views. They emphasized that respecting different perspectives is particularly important in sustainability courses, given the multidisciplinary, value-laden, and contested nature of the subject. They noted that discussions about contentious topics, such as oil or genetically modified organisms, could quickly be derailed if they are not conducted in atmosphere of mutual respect. In the quote below, one participant attested that it is important to appreciate other perspectives because it helps students put themselves in other people's shoes:

> "I think one of my main roles, as I see it, is for students to leave my class with a critical mind towards sustainability, with an optimism towards addressing these issues, and an

appreciation for different points of view. That they can begin to learn those topics so they can debate it and have the discussion not coming from just their viewpoint but being able to put themselves in other people's shoes and other people's positions and really understand their issues."

- Greg Zilberbrant (McMaster University)

As will be discussed in Chapter 5, looking at issues from other perspectives can also foster empathy for others.

A learning objective in several courses was for students to understand a variety of perspectives on sustainability, including different cultural and stakeholder perspectives and various political, economic ideas. As some participants noted in their interviews, this also included understanding the perspectives of guest lecturers and fellow students. The following are two examples of course learning objectives:

"Understand a variety of political, cultural, and economic ideas and paradigms as they relate to sustainability."

- SUST 210 syllabus (Roosevelt University)

"By the end of the course, students will be able to: 1. Understand various perspectives of sustainability".

- SUSTAIN 1S03 syllabus (McMaster University)

In their interviews, the participants discussed several reasons why the ability to understand different perspectives is important for sustainability. As mentioned in the critical thinking section, they maintained that looking at issues from multiple perspectives helps students look at issues more critically and identify their own unquestioned assumptions. Some participants stated that they wanted students to realize that there are many sources of knowledge and many kinds of knowledge holders, both inside and outside of the academy. Understanding the perspectives of these different knowledge holders will help people develop a more nuanced and well-rounded perspective of sustainability. Several participants also emphasized that it is

important to look at multiple perspectives because sustainability is not a settled science. Thus, sustainability knowledge is incomplete and constantly changing and that there is no single authority or single right answer:

> "And I've always preferred my classes to be more of a conversation than just something where just somebody at the front of the room trying to impart knowledge. And that's important I think for sustainability because this is not settled science… And so dialogue is essential. There's no one right answer with a sustainability problem. And that's the first thing I need to get them to understand… And so this mix of things that we do in the class is really about that. It's about building an understanding of perspective..."
>
> - Philip Loring interview (University of Saskatchewan)

Some participants attested that examining issues from multiple perspectives helps develop students' aptitude for thinking, including helping them develop flexible thinking and make informed decisions. As suggested in the syllabus excerpt below, perspectives are important for building well-constructed arguments that can help in the development of workable and ethical solutions:

> "This class will explore these challenges and opportunities from multiple perspectives. The goal is to build a thinking foundation, upon which you can develop well-constructed arguments that can move us in the direction of finding workable and ethical sustainability solutions. The goal is not to teach text-book style information about sustainability, but to help you develop an aptitude for thinking and learning about sustainability."
>
> - ENVS 201 syllabus (University of Saskatchewan)

Similarly, several other participants maintained that diverse sets of knowledge, backgrounds and ideas are necessary for developing creative and pragmatic solutions for complex problems. Looking at multiple perspectives helps people understand the multi-dimensional and multi-scalar nature of sustainability challenges. This contributes to a more holistic and complex understanding that will enable people to develop more effective and pragmatic solutions:

"So, trying to get students to come out it with a little bit less ideological focus and a little bit more cooperative ability, pragmatism, and ability to look at a problem and not immediately think and try to find the one solution to it. Getting them to realize that oftentimes you need to have lots of ideas from a diverse set of backgrounds and knowledge and appreciate that in the system."

- Pete Akers (University of Iowa)

Finally, many participants introduced diverse perspectives to their courses through course materials and class discussions, and by bringing in different guest lecturers. Some participants also coordinated out-of-class activities, such as presentations or field trips. Many participants also arranged classroom activities involving the exploration of different perspectives, such as role-play activities, debates, jigsaws, peer teaching, small and large group discussions, and online discussions. Some participants emphasized that the students were also an important source of different perspectives. In the quote below, for example, Philip Loring emphasized the importance of creating a safe space to empower students to share their perspectives:

"The best resource for bringing in multiple perspectives is the room full of people. And that's why it's so important to us right from the start – to your earlier question about it being a safe space for discussion and sharing – is that we want to make them feel empowered to share their perspective on the problem, that it matters… And then if you can in these different ways, get them to participate online or in class discussion, then you are bringing 35 different perspectives in."

- Philip Loring interview (University of Saskatchewan)

In summary, most courses included one or more learning objectives related to epistemological pluralism. These included being open to, understanding and respecting different perspectives, as well as sharing students' own perspectives. Participants attested that perspectives are particularly important for sustainability because sustainability involves many ways of knowing and has no single right answer. Consequently, it is critical to examine issues and solutions using multiple ideas, perspectives and values. According to participants,

128

understanding different perspectives can help students develop a broader and more holistic understanding of complex problems and develop multiple solutions.

Understanding Multiple Disciplinary Perspectives

Participants in this research stressed the importance of introducing students to multiple disciplinary perspectives on sustainability challenges and solutions. Participants wanted students to understand that multiple disciplines are required to understand complex sustainability problems and develop more effective solutions. All courses included learning objectives related to multidisciplinarity or interdisciplinarity. Common learning objectives included understanding the multi- or interdisciplinary nature of sustainability, gaining a greater understanding of multiple disciplines, and learning how different disciplines approach sustainability issues. Only one course included a learning objective that explicitly referred to transdisciplinarity. The following sections outline these learning objectives, as well as why multiple disciplinary perspectives are thought to be important for sustainability.

Like epistemological pluralism, participants attested that understanding different disciplinary perspectives can provide students with a broader and more holistic understanding of sustainability. Where courses differ from each other is in the specific mix of disciplinary perspectives, as well as the degree to which disciplinary perspectives were integrated in the courses.

It is important to note that it was not always clear whether some learning objectives were multidisciplinary or interdisciplinary. Sometimes interviews or course syllabi referred to disciplinary perspectives without stating the degree to which those perspectives were integrated. Additionally, some participants used the terms "multidisciplinary" and "interdisciplinary" interchangeably in their interviews. To err on the side of caution, learning objectives were

categorized as multidisciplinary whenever it was uncertain whether they were multidisciplinary or interdisciplinary.

Multidisciplinary Learning Objectives

Most participants described multidisciplinary learning objectives in their interviews or course syllabi. These included understanding the multidisciplinary nature of sustainability, gaining a greater understanding of multiple disciplines, and learning how various disciplines approach sustainability. Participants also wanted students to realize that sustainability is relevant for many disciplines and that anyone can contribute to it.

An important learning objective in most courses was for students to understand that sustainability involves or crosses multiple disciplines, as noted in the following example:

> "But the purpose of the course and the level of the course is introductory. It's very much also about just ensuring that students get a broad-based understanding of sustainability and its multidisciplinary aspects."
>
> - Participant 11 interview

Some participants noted that it is important for students to learn about the content, methods or sources of knowledge of multiple disciplines. Steven Mannell's course, for example, emphasized understanding the way different disciplines approach topics and acquire knowledge. One of the learning objectives was for students to become more conscious of the sources of knowledge and authority for their own disciplines. Mannell noted that this was part of becoming more self-aware about knowledge:

"…we want to have them become conscious of their own discipline. What are their sources of knowledge? What are their sources of authority? How do those differ from other disciplines? … And we generally ask our various guest lecturers to talk about not just what they know about something, but how they know it… So we're looking for students to be self-aware about what knowledge is, in broad terms, and how their world of knowledge fits within that."

- Steven Mannell interview (Dalhousie University)

Several participants wanted students to realize that sustainability is relevant for many disciplines, due to its broad, multidisciplinary nature. They also wanted them to understand how different disciplines approach the topic of sustainability or try to address sustainability problems. Some participants also encouraged students to apply sustainability to their own disciplines:

"The main objective of this course is to expose students to the whole multidisciplinary area of sustainability and how it has made them aware that sustainability is a broader, overarching umbrella, within which their own areas of study fit in very well… No matter what discipline that they are coming from, sustainability is something they are encouraged to adapt to their own disciplines."

- Participant 11 interview

Several participants observed that the multidisciplinary nature of sustainability means that everyone can contribute to it, regardless of their interests. For example, Greg Zilberbrant stated that one of his roles as an instructor is to help students understand that sustainability professionals need to converse in multiple disciplinary "languages" to show people in different disciplines how sustainability works for them. It also demonstrates that sustainability is for everyone, not just environmentalists:

"…I think part of my role is to say, 'If you want to be a sustainability professional, and you want to be out there speaking to these issues and making a difference in these issues, you can't just learn one language. You have to learn as many as you can – all of them if you can.' And I mean that in terms of language of business, the language of engineering, the language of social science, the language of all of these different disciplines. So you can speak to people in their language and then show them how sustainability works for everybody, not just for the environmental science-minded person."

- Greg Zilberbrant interview (McMaster University)

Finally, while all courses introduced students to a mix of different disciplinary perspectives, it should be noted that no two courses provided the same mix of disciplines. For example, several courses focused more on social science disciplines while others emphasized the natural sciences, such as ecology.

Interdisciplinary Learning Objectives

Just over half of the courses included learning objectives related to interdisciplinarity. These learning objectives included applying an interdisciplinary lens to sustainability and using interdisciplinary tools to understand sustainability topics. This section will briefly summarize the importance of interdisciplinarity and describe interdisciplinary learning objectives. It will conclude with a description of some of the interdisciplinary approaches participants used in their courses, along with a brief note on some of the challenges of using these approaches.

Some participants contended that traditional, discipline-focused approaches in academia provide a fragmented and incomplete perspective of the causes and impacts of problems. These approaches are therefore not sufficient to address society's urgent and complex challenges. As one participant observed, siloed approaches not only limit people's ability to understand the broader impacts and unintended consequences of their actions but may in fact have contributed to society's current problems:

"In the academy, the idea that these stovepipe disciplines, as they have been established, are not sufficient for really addressing a lot of the challenges that have arisen, and in some ways are the product of a very stovepipe, disciplinary thinking, in some respects. A lot of the technological problems that we've created are because we haven't considered that technology in a broader context, in terms of impacts and unintended consequences."

- Jason Smerdon interview (Columbia University)

Several participants thus emphasized that using integrated, interdisciplinary approaches provides a more holistic understanding of complex, twenty-first century sustainability challenges than relying on a single disciplinary perspective. Some participants also maintained that interdisciplinary approaches can provide different ways to look at solutions, which increases the prospects for a more sustainable future:

"Effective solutions not only require the ability to comprehend various concepts but also the ability to productively integrate knowledge from different fields and communicate resulting solutions effectively… The course introduces perspectives from the natural and social sciences, arts and humanities, engineering, and professional disciplines and explores how their interconnection increases the prospects for a sustainable future."

- SUST 1001 syllabus (George Washington University)

Interdisciplinary learning objectives in this research included applying an interdisciplinary lens to sustainability and communicating across different disciplines about sustainability topics and challenges. The following are a few examples of these objectives:

"To explore the history and development of environmental, social, and economic sustainability through an interdisciplinary lens."

- ENVS 200 syllabus (the King's University)

"An introduction to sustainability from an interdisciplinary perspective, which examines the historical and societal lenses through which sustainability is viewed. Students will learn terminology, theories and concepts to effectively communicate across disciplines and on various topics of sustainability."

- Course overview, SUSTAIN 1S03 syllabus (McMaster University)

"I would really like them to have the ability to translate across different disciplines, understand how these different disciplines go together around specific twenty-first century challenges. And basically position themselves in the middle of all of these disciplines, have skills and understanding, and be conversant in these various fields, and be able to then apply the perspectives from each of those fields to these issues of sustainable development."

- Jason Smerdon interview (Columbia University)

Participants used many different interdisciplinary approaches in their courses, such as using concepts, tools and theories to understand the links between disciplines and communicate across disciplines. In some courses, participants invited guest lecturers from multiple disciplines and fields or placed students in interdisciplinary groups to discuss issues or work on projects.

In seven courses, interdisciplinary approaches involved team teaching with instructors from other disciplines. During their interviews, participants emphasized the benefits of team teaching. They attested that it allowed them to present a more complete and holistic perspective of sustainability to their students. They were also able to model interdisciplinary conversations and collaborations for students. For example, several participants talked about how they discuss issues in class with their co-instructors. One participant attested that team teaching can model how people from different disciplines can talk about issues and sometimes shift their positions as a result. Some observed that this helps set the tone for having respectful conversations about sustainability. In the excerpt below, Lisa Benton-Short noted that interdisciplinarity approaches not only show how different disciplines approach the same issues but also how they sometimes disagree about things. She attested that this demonstrates to students that there is no single authority or way of looking at things:

"The idea is that we've got different disciplines talking about a single common issue. And one of the purposes behind that is to show how different disciplines – whether it's Business, Engineering, Landscape Design, Biology, Public Health and Engineering – how their discipline approaches and addresses the same issues… And often disagree,

which is interesting for that classroom dynamic. Because it takes away the notion that there is a single voice and a single authority and says, 'Well, what do you guys think?'"

- Lisa Benton-Short interview (George Washington University)

Finally, some participants highlighted the challenges of teaching interdisciplinary courses. For example, some attested that it is hard to become an expert in multiple disciplines and that they sometimes have to lecture outside of their area of expertise.

Transdisciplinary Learning Objectives

In this research, only one course explicitly included a learning outcome concerning transdisciplinarity:

"After completing the course, students will be able to do the following: … Conceptualize sustainability issues in inter- and trans-disciplinary ways".

- UU 101 syllabus (Wilfred Laurier University)

According to the course instructor, Manuel Riemer, the term "transdisciplinary" can be understood in more than one way. In one conceptualization, people from different disciplines collaborate on issues without giving primacy to any particular disciplinary perspective. The second conceptualization, which Riemer uses, involves collaborations with non-academics on sustainability:

"Another understanding of transdisciplinary is that you're moving outside of academia and you have the sectors that you're working with. And I like that definition of transdisciplinary as well. And that's also what we mean by this, because this course has a lot of people who work here regionally in Waterloo on sustainability, for example in the city or in environmental organizations. They come to the course and teach the students about how they worked on sustainability in a very practical and professional way."

- Manuel Riemer interview (Wilfred Laurier University)

Although other courses did not explicitly include learning objectives or outcomes to conceptualize issues in transdisciplinary ways, several participants brought non-academic

perspectives into their classrooms. In addition to making sustainability more concrete for students, some participants noted that this demonstrates that non-academic sources provide valuable ways of knowing.

Communication Skills

Almost all participant interviews or course syllabi emphasized the importance of communication skills for listening, articulating issues and solution options, communicating with stakeholders and team members, communicating across disciplines, and getting ideas or projects to be successful.

The participants in this research noted that the ability to communicate is very important in sustainability. As noted earlier, some participants maintained that no single person can know everything. Thus, people from multiple backgrounds and disciplines need to work together to understand and address problems. Communication skills are needed for this collaboration to be effective. People must be able to listen to and critically reflect on what others say or write, as well as articulate their knowledge and ideas to people with diverse knowledge, beliefs and values. Since the diverse stakeholders, business people, experts and government officials who work together on problems will not all be like-minded, it is important to be able to speak to their particular interests, concerns and values.

In the excerpt below, Pete Akers emphasized that communication is needed to plan and implement successful sustainability projects. He noted that communication is necessary to learn people's values and motivations and get them onboard with projects:

"Your end goal is to get your sustainability project or your idea to actually succeed. And the best way to do that is to get people on your side. And so, let's talk about what keeps people from joining your cause, of doing these things. And how can you tweak your message and be more flexible and understand people? So a lot of it boils down to communication."

- Pete Akers interview (University of Iowa)

Participants emphasized the importance of developing written communication skills in particular. Some participants observed that it is not enough to understand ideas in sustainability. They attested that it is also essential to clearly express those ideas in writing. Thus, a number of learning objectives included the development of writing skills, such as the ability to write coherent, concise, grammatically correct and logical formal or informal papers that properly reference source material.

Although less emphasized than developing writing skills, several courses included learning objectives to improve students' oral communication skills. To develop this skill, participants encouraged students to participate in discussions in small or large groups or asked them to present ideas and research to their peers. One participant suggested that it is important to be able to engage the audience. Thus, he encouraged students to think about how to make their presentations engaging:

"I also have them work in small groups to discuss course materials. I have them presenting to each other… One of the things that I really challenge is I ask them to think about when they're being presented to and they're part of the audience. What are the kind of things that they find engaging? And they quickly start talking about when the presenter asks them questions or has them do an activity – finds some way to keep them from being passive listeners."

- Andrew Wingfield interview (George Mason University)

Collaboration Skills

> "You cannot accomplish sustainability on your own. It's a project that we all have to work on together, across disciplines, across sectors."
>
> - Manuel Riemer interview (Wilfred Laurier University)

The development of collaboration skills was not heavily emphasized in this research. Although several participants noted that they are important for people who work on sustainability projects, less than half of the courses explicitly included learning objectives that involved the development of collaborative skills. This section will summarize why collaboration skills are important for sustainability and briefly highlight the methods for developing teamwork and engagement skills in some of the courses.

Participants provided several reasons for why collaboration skills are required for sustainability. Several participants maintained that no one can know everything or solve sustainability problems on their own. Instead, people from different disciplines, occupations or cultural backgrounds are required to gain a better understanding of complex problems and create feasible solutions. It takes special skills to be able to work productively in teams and come to a consensus or agreeable compromise with team members or stakeholders who do not share the same values and perspectives.

The development of teamwork skills was an objective in several courses. A common way to develop these skills involved putting students in groups to solve problems or work on a project. Participants emphasized that students will need teamwork skills for future jobs or for working in sustainability. Manuel Riemer attested that group projects are important because students learn in a safe environment about how to work with people who have different values or ways of thinking:

"From a pedagogical standpoint, even though students don't always like group projects, I think they're really important because it's an important soft skill that they need to have. Again, in the context of sustainability, you need to work with people who think very differently from you, who might even have very different values than you have… So, better learn that now in a safe environment..."

- Manuel Riemer interview (Wilfred Laurier University)

Similarly, Philip Sakimoto suggested that one of the most valuable outcomes of his course may have come from students who learned that they are able to work on projects with people from other disciplines:

"We have a business student who said, 'I never worked with a scientist. What am I going to do?' And then discovered that he actually can do this… And they did that in the end. In many ways, that might be the most valuable blessing they got out of this whole thing – that they can work with people from other disciplines and that in order to solve sustainability issues they're going to have to."

- Philip Sakimoto interview (University of Notre Dame)

A couple of courses also included the objective of developing stakeholder engagement skills. To develop these skills, students in Akers' course worked on a sustainability project where they identified a problem in the local community, located and interviewed local stakeholders and proposed solutions based on their findings. In addition to developing engagement skills and the ability to work with stakeholders, Akers attested that students learned that contacting and engaging people can be difficult:

"Whenever they start talking to people in the community, the biggest lesson they learned is how hard it is just to get in contact with people, and get people to talk to you, and get people figuring out how to get things done. And that was one of the big eye openers for a lot of the students in the class..."

- Pete Akers interview (University of Iowa)

Finally, as previously noted, few courses included learning objectives to develop collaboration skills. Participants were not asked for the reason for the lack of emphasis, although one participant noted that students would develop collaboration skills later in their program.

Summary

In summary, all courses in this research included multiple learning objectives that fall under the umbrella of interpersonal competence. The most-emphasized ones were those that relate to epistemological pluralism, multidisciplinarity, interdisciplinarity, and the development of communication skills. Although participants also acknowledged the importance of collaboration, less than half of the courses included objectives to develop collaboration skills. Only one course explicitly included a learning outcome related to transdisciplinarity.

Participants attested that abilities related to interpersonal competence are important in sustainability education because individuals cannot understand and solve sustainability problems on their own. To develop and implement sustainability initiatives, they need to work with people who have different interests, values, backgrounds and ways of knowing. When these diverse perspectives are brought together, they paint a more complex and holistic picture of sustainability problems and can contribute to more effective solutions. Thus, it is important to be willing and able to understand diverse academic and non-academic perspectives, as well as be able to communicate and collaborate with others.

Student Engagement and Empowerment

Student engagement and empowerment were important objectives in many courses. According to several participants, engaging students in the course and with sustainability is important for students to develop the interest and motivation to learn challenging ideas, engage in additional learning, and take action on sustainability issues. Some participants also wanted

their students to feel confident that they can make a positive difference. This section will outline learning objectives and aspirational goals related to engagement and empowerment, followed by a brief summary of some of the strategies to engage and empower students.

Student Engagement

Most participants emphasized the importance of student engagement in their courses. Two common objectives were to engage students in the course and engage them in sustainability. According to some participants, the first objective is important because students who are engaged in the class are more willing and prepared to learn. The second objective is important for motivating students to learn more about sustainability and apply it to their personal or professional lives.

Participants who talked about engaging students in the course said they wanted students to be prepared, interested and actively involved in the class. They wanted students to do their readings and assignments, attend class, pay attention, ask questions, and actively take part in class discussions and activities, including small group and class discussions. They noted that engagement is important because sustainability issues do not have simple answers. Students need to grapple with ideas and explore issues from multiple perspectives to come to a more complete and holistic understanding of these issues. To undertake this challenging work, they need to be interested and engaged.

In their interviews, several participants also stated that they hoped to engage students in sustainability. They remarked that they could not cover everything about sustainability in a single introductory course, so they wanted students to get excited about sustainability and understand its importance. They hoped to whet students' appetites to continue learning about

sustainability once the course was complete, whether that learning took place in another sustainability course or as part of lifelong learning.

> "When I teach about sustainability, one of my main goals is to get people excited about it… One of my primary research interests is around engagement and how to engage people in sustainability. I see this course as their stepping stone to then do other things. There's no way that I can cover all of what sustainability is in one introductory course."
>
> - Manuel Riemer interview (Wilfred Laurier University)

Some participants noted that values are important for engaging people in sustainability because they can motivate people to act. For example, Philip Sakimoto attested that people will be motivated to act on climate change once they connect personally with the issue and it becomes a higher priority for them:

> "And we really need people to understand that this is real, this affects everybody at a deeply personal level. You have to be motivated to take care of it. … At this point, the majority of its [United States] citizens understand that climate change is a real and important problem. But when you ask them to rank its priority, it always comes out at the bottom of the list, which is why nothing ever happens. So we have to change the priority. You change people's priorities when something becomes important to them. It's no different than if you ignored everything from the American Cancer Society until your mother has cancer. And suddenly that becomes the most important issue in the world. Now that's the kind of response we need to get."
>
> - Philip Sakimoto interview (University of Notre Dame)

Empowerment

Several participants highlighted the importance of empowering students in sustainability courses. They attested that students will be more encouraged to take action on sustainability issues if they believe that they can make a difference. They hoped students would leave their courses with the optimism, hope, confidence and motivation to see themselves as civic actors or change agents and take action on issues.

Several participants emphasized that there is a potential to disempower students in sustainability courses. They observed that if courses focus too much on problems and not enough on the positive things people do to address these problems, students could feel overwhelmed, conclude that they are powerless to do anything about the problems, and give up:

> "Working with young people over the last two decades, one thing that I've seen is students feel very quickly overwhelmed by the complexity of the issue. And disempowered. Because they feel like as one individual they cannot do anything."

> - Manuel Riemer interview (Wilfred Laurier University)

> "I really had to think about this when I was designing the course because most of the things I was looking at were taking the framework of looking at all the big, humongous unsustainable issues in the world – energy dissent, species loss, deforestation and all the rest. They're all hugely important to know about, but you can feel completely powerless and shut down in the face of that if you don't know how to deal with it."

> - Marian Brown interview (Wells College)

Several participants attested that they wanted to encourage students to be hopeful, optimistic and motivated to take action on sustainability issues. Manuel Riemer's syllabus, for example, listed the following learning outcomes:

> "And, finally, after completing the course, students will

> - Be hopeful that the sustainability challenges can be addressed
> - Are excited about the opportunities a movement toward a more sustainable world provides
> - Be motivated to become agents of change".

> - UU 101 syllabus (Wilfred Laurier University)

In their interviews, several participants expressed the hope that students would come out of their course feeling confident and optimistic that they and others can make a positive difference. For example, as noted in the strategic thinking section, Pete Akers hoped students would not feel as helpless with respect to changing things once they left his course. He wanted

them to feel more confident that they have the skills and knowledge to contribute to sustainability initiatives in their future courses and careers. Similarly, an important goal for Manuel Riemer was to help students be hopeful and understand that they and others can do something about sustainability:

"I really see it [the course] as a teaser, where students get excited about the idea of sustainability and see the importance. They see the possibility and the hopefulness that we can actually do something. I think that that is one really important goal for me is making students understand that we can do something about it and that they can do something about it."

- Manuel Riemer interview (Wilfred Laurier University)

Philip Sakimoto stressed that it is critical to ensure that *every* student – not just those in his course – to come out of schools feeling empowered and able to become leaders:

"Everybody, no matter who you are, can actually get up and do something about this [climate change]. It's not somebody else's problem to solve. It's your problem, and you can. And that's really important, because other teachers – especially grade school teachers, middle school teachers – tell me that the students hear about all these climate issues and they become overwhelmed and they shut down. 'Well, there's nothing we can do about this. We're all doomed. Oh well.' We can't have that. We have to make sure every student emerges feeling empowered that they can get up and be leaders."

- Philip Sakimoto interview (University of Notre Dame)

Several participants expressed the hope that students would be empowered to take action in their campuses, communities, and personal or professional lives. For example, as noted in the strategic thinking section, Marian Brown wanted her students to feel empowered to make more informed and sustainable decisions. In the excerpt below, Steven Mannell hoped students would understand that they can choose to make a positive difference in issues of sustainability and justice, regardless of their position in life:

"I hope that they will, first of all, be aware of the implications of choices they make in their own lives and how those choices connect to choices at other levels… And that even if they choose for whatever reason to be not particularly activist, they will understand that

144

that's a choice rather than a default. So that out of this they'll have a sense that there are opportunities to make positive steps around issues of sustainability and justice, no matter where they are and no matter what their position is. No matter how disenfranchised or disempowered they feel they are."

- Steven Mannell University, Dalhousie University

Finally, some participants hoped that students would become engaged or empowered to become global or ecological citizens. For example, Andrew Wingfield hoped his students would realize that they have power as civic actors and use this power to advance the causes that are important to them:

"And it's very important to me that they think of themselves also as political actors, as citizens. Not in the sense of are you a United States citizen or a Canadian citizen, but just as civic beings. And to realize that they have a lot of power beyond their consumer choices if they choose to exercise that power… And I try to plant that seed, because what I really hope is that they'll use their power as civic actors – and as professionals and leaders as they pursue their careers – to advance the causes that are most important to them."

- Andrew Wingfield interview (George Mason University)

Strategies to Engage and Empower Students

In their interviews, participants outlined several strategies to engage and empower their students. As summarized below, strategies to engage students included engaging students in active, participatory and experiential learning activities, and using course material that is interesting or relevant to the students. Strategies to empower students included being solution-oriented and helping students develop the abilities to make informed decisions and develop real-world projects.

Many participants used class discussions and activities to engage their students. Several participants emphasized that they would lose their students if they lectured too much. Some participants interspersed mini-lectures with class discussions. Some of those with smaller classes

145

used a number of small and large group activities. For example, some got students to work in groups to discuss material, work on problems or role-play activities, teach their peers, or play sustainability-oriented games. Some of the larger classes held discussion or tutorial sessions once a week, where students could gather in smaller groups to discuss issues or work on activities. Some participants remarked that these smaller sessions seem to engage students.

Some participants remarked that they brought in topics related to students' personal experiences or academic interests. They observed that this made the material more interesting and relevant to students. Some attested that this was important for student learning because it helped students begin to internalize concepts. Others noted that this spurred class discussions. For example, Jason Smerdon talked about campus sustainability initiatives. He reported that students had a lot to say about this topic because it was very relevant to their lives:

> "I also talk about campus sustainability initiatives, and we talk specifically about Columbia. And that generates a lot of discussion about what students are doing on campus and why they're doing it – everything from practices in the cafeteria to turning their lights off in the residents hall comes up. It's very much directly relevant to the way that they lead their lives, so they have a lot of very specific things to say about what seems to work, what doesn't, and who should be held accountable for those actions."

- Jason Smerdon interview (Columbia University)

Some participants also talked about their strategies for empowering students. Several participants attested that focusing on solutions can engage and empower students. As Steven Mannell noted in the excerpt below, students are interested in solutions and want to know what they and others can do to solve problems:

146

"We had done some focus groups before we taught the first courses with high school students. And the message that came back from a lot of students was, 'You don't need to tell us bad news. We've been hearing it since we were little. What we'd like to know is how can we deal with it? What can we do?' So, the other theme that's really strong – especially in the first-year course where we're doing a lot of survey of challenges – is what solutions are people proposing?"

- Steven Mannell interview (Dalhousie University)

Some participants remarked that focusing on solutions can help to counter the disempowering effects of focusing too much on the intractable nature of problems. Karen Eckert, for example, noted that the solution-oriented nature of her course helps her students envision a future role for themselves in sustainability:

"And especially at the undergraduate level I think you have to be very careful that it is taught from a positive, aspirational, solution-oriented perspective and not just one horrific statistic after another. And I think because I teach it in a solution-oriented way, they really see a role for themselves going forward. What I hear is, 'I can do that! That's so cool what that company is doing, or that city, or that country. I want to be involved with that.' And so, again, they become very engaged with it. They emerge as empowered and confident that they have learned the material that was set before them."

- Karen Eckert interview (Principia College)

Participants presented different solutions to students in a number of ways, including case studies, field trips, service learning, and guest lectures from local people working to address real world problems. In the quote below, Andrew Wingfield observed that service learning helps keep up student morale because it engages them in activities to address real-world problems:

"A lot of what we read about is about things like climate change, and the mass extinction of species, and the way in which humans are damaging the planet and damaging other humans. And it can be pretty depressing for students to read about that every week and talk about it incessantly. And I find that the service learning gives them an opportunity to get engaged with an activity that is trying to address some of the problems that we're reading about in the class. And so I find that it helps keep their morale up and keeps them active and engaged."

- Andrew Wingfield interview (George Mason University)

147

Some participants remarked that students will feel more confident that they can make a difference when they develop the skills and knowledge to make informed decisions or develop their own sustainability projects. For example, Philip Sakimoto's students worked on developing a climate recovery ordinance for the City of South Bend. He attested that they loved being able to do something concrete:

> "If I can paraphrase what I kept hearing from them, they said, 'You know, we've taken all these courses that tell us that our entire world is in trouble and here are all the issues and all the problems. And no one ever tells us what to do about it.' And so, giving them something concrete they can do about it, they just loved. Absolutely loved it."

> - Philip Sakimoto interview (University of Notre Dame)

Summary

In summary, several participants in this research emphasized the importance of student engagement and empowerment. They attested that student engagement is required to motivate students to learn about sustainability and address issues in their personal or professional lives. They also emphasized empowerment, stressing that it is important for students to be hopeful and confident that they and others can make a positive difference. Otherwise, they might give up. Several participants stated that they wanted to help their students become hopeful, excited, engaged and confident in their ability to make a difference.

Transforming Thinking and Putting Theory into Practice

> "Daniel Quinn, the author who writes the book that we read often says, 'If you want to change what people do, you have to change what people think.'"

> - Philip Loring interview (University of Saskatchewan)

Two of the themes that emerged from this research were those of developing or changing thinking and putting theory into practice. This section will briefly summarize some of the ways

that participants explicitly discussed these learning objectives. The next chapter will compare these themes with the ESD literature.

Transforming Thinking

Some participants explicitly stated that they hoped their course would transform students' thinking. This included developing the type of thinking that is needed to solve sustainability problems, raising consciousness,

According to Philip Loring, for example, this way of thinking includes critical thinking, reflexivity, and the ability to recognize and question discourse:

> "I think that that means not taking how they think about environmental problems for granted. That means being able to recognize discourse in something when they see it… And being able to think critically, and specifically critically about where they're coming from and what they're bringing to their understanding of the solution. So, reflexivity, critical thinking, the ability to recognize and question discourse, that's the kind of transformative thinking we need to solve sustainability problems."
>
> - Philip Loring interview (University of Saskatchewan)

Loring stated that he asked his students to question and unpack assumptions, such as the assumption that human nature is the root cause of environmental problems. He wanted students to consider the possibility that problems might come out of society's social and economic systems. He observed some students find this liberating while others push back. He noted that he and his co-instructor are trying to help students make a paradigm shift:

> "We've come to blame the environmental problems on human nature, and we're asking them to unpack that and question it. And that's a hard one to let go of. And that maybe it's the social system and the economic system that we've set up for ourselves… not just something about our fundamental nature. People either feel incredibly freed by that once they are exposed to it or they really push back against it. Because we're very indoctrinated by our culture to think that these problems are just innate to humanity. So, that's a tough one. That's a paradigm shift that we try to help them make in the class."
>
> - Philip Loring interview (University of Saskatchewan)

Loring also proposed that the purpose of sustainability education is to encourage a paradigm shift in how people think about their relationships with others and with nature:

> "I think the purpose is paradigm shift… Daniel Quinn, the author who writes the book that we read, often says, 'If you want to change what people do, you have to change what people think.' And so, it's not about learning more science or learning about technologies. A sustainable world is only going to perceive itself as change in the way that people think about themselves and their relationship with each other and their relationship with the natural world."

> - Philip Loring interview (University of Saskatchewan)

Other participants maintained that the purpose of sustainability education is to help students develop an understanding of the current state and what led to the current state, and then help them reflect on how things could or should be better. When talking about the purpose of sustainability education, Mark Orrs referred to efforts to see how things are and how they came to be as trying to "raise consciousness" and collectively "wake up". This suggests that one of the purposes of sustainability education is to change the way people think about and see the world.

> "And so I think we're trying to wake up, collectively. We're trying to raise consciousness and wake up to see how things really are, how they've come to be the way they are, and what kind of structures were in place that led them to be the way they've become. And then to think critically and thoughtfully about how they might be better, or maybe how things should be or what should be done to respond to some of these things."

> - Mark Orrs interview (Lehigh University)

One participant explicitly expressed an interest in fostering transformative learning. He stated that the biggest reward of his job was when students reported that they became a different person or chose a different path in life because of his course:

> "I'm very interested in transformational learning, so to facilitate that kind of transformation of people's thinking. For me, the biggest reward is when students come after the class, or years later, and say, 'I became a different person because of the class that I took with you. My whole life path has changed or the way I think about something

150

has changed. I am no longer the same person because I took that class.' And to me, that is the biggest reward. That's when I feel like, yes, that's when I've done my job."

- Manuel Riemer interview (Wilfred Laurier University)

Chapter 5 will compare these findings to the literature on transformative learning and discuss the potential for transformative learning in some of these courses.

Putting Theory into Practice

"It's not enough to educate yourself. You have to place yourself in the world as an actor and think about what you're going to do with the knowledge that you have, and so many ways you can exercise that."

- Allison Goebel interview (Queen's University)

Another strong theme in this research was that of putting theory into practice. Some participants explicitly stated that their courses were practice-oriented. Others did not explicitly state that their courses were practice-oriented, but they discussed several ways that they hoped students would put their knowledge into practice in their personal, academic or professional lives. Several participants maintained that it is not sufficient for students to memorize facts or be academics in sustainability.

Participants suggested many ways for students to put their knowledge into practice. As noted previously, some participants wanted students to apply their knowledge to future courses, make more informed decisions in their own lives, or initiate sustainability projects in future jobs. Others hoped students would become change agents, civic beings or ecological citizens. Instead of specifying particular outcomes, some participants stated that they wanted students to feel engaged and empowered to contribute to sustainability according to their own interests:

"We hope that they will go out into the world and try to be a positive actor, whether that's through joining a group, or becoming political, or developing their own research abilities and become a researcher, or a writer, a journalist, or a lawyer, or whatever. But that they would become motivated to engage with these issues in their later life."

- Allison Goebel interview (Queen's University)

Some participants explicitly stated that they wanted their students to become change agents, such as was indicated in the teaching philosophy and approach in Participant 3's syllabus:

"My ultimate goal is to transform you into effective agents of change by making you planners and problem solvers capable of marshaling your collective knowledge, skills, and creativity to forge common ground and solve the sustainability challenges facing humanity."

- Course 3 syllabus

Several other participants also stated that they wanted to encourage students to become change agents. They noted that individual actions, while important, are not sufficient to address sustainability problems. Thus, it is important for students to encourage their family, friends and communities to learn more about sustainability and enact it in their personal or professional lives. In the quote below, Karen Eckert attested that it is important for students to go beyond individual actions and become change agents at several scales:

"Do you take a short shower? Do you encourage a policy in your dorm to take a five minute shower? … Do you advocate for change? … Again, I think all this goes back to personal values – and not just keeping them to yourself, but making sure that you are bringing your roommate, your best friend, your family, your community, and your senators along. And so you become a change agent at scales large and small, transforming communities, transforming states, transforming nation. That's what needs to be done. It needs to go beyond our personal actions."

- Karen Eckert interview (Principia College)

Finally, some participants alluded to change agency without explicitly using the term. For example, Pete Akers stated that knowledge, combined with the practical ability of knowing how

to approach people and get them involved in sustainability projects, could spread a basic understanding about sustainability wherever students go. As will be discussed in the next chapter, many of the learning objectives and aspirational goals described in this research involve developing the types of knowledge, skills and dispositions needed by change agents.

Summary

In summary, this chapter outlined the main learning objectives and aspirational goals of 20 introductory sustainability undergraduate courses in Canada and the United States. These included the development of critical thinking, systems thinking, values thinking, futures thinking, strategic thinking and interpersonal competence. Participants also aimed to foster student engagement and empowerment. This chapter also briefly outlined two themes in the findings: transforming thinking and putting theory into practice.

Since knowledge about sustainability is constantly changing, an objective in many courses was not to have students to memorize information for exams but to learn how to find, assess, integrate and apply information in ways that can help them come to a deeper understanding of sustainability problems and solutions. Learning objectives that were particularly emphasized included the development of critical thinking, systems thinking, and several dimensions of interpersonal competence (epistemological pluralism, multi- and interdisciplinarity and communication skills). Several participants also emphasized student engagement and empowerment, and the ability to critically reflect on values. Futures thinking and collaboration skills were less emphasized. A few participants explicitly discussed objectives related to transforming thinking or putting theory into practice.

The next chapter will discuss the main themes in these findings, as well as what these themes imply about the potential for developing change agent skills and transformative learning.

Chapter 5: Discussion

Introduction

It is clear from the findings that the course objectives in this research did not solely focus on increasing awareness or disseminating information to students. In addition to developing knowledge about sustainability, these courses also fostered students' abilities to think differently and put theory into practice. Instructors aimed to help students develop the knowledge, thinking skills, dispositions and motivation to enable them to think for themselves, understand the role of values in sustainability, and develop a better understanding of the root causes and potential solutions for sustainability problems.

When these objectives are examined more closely, three main themes emerge:

- Fostering a different way of thinking
- Fostering the vision and drive to engage in sustainability
- Putting theory into practice

These themes highlight the importance of developing an understanding of what is going on and why it is important, and then developing the capacity to act on that understanding. The first theme is about the focus in these courses on developing the capacity to think differently. This included developing students' critical thinking, systems thinking and integrative thinking abilities. The second theme is about the important role that values and emotions play in directing, motivating and empowering engagement with sustainability. The third theme emphasizes that a broader educational goal in many of these courses was for students to put their knowledge, skills and dispositions into practice in their future personal, academic or professional lives.

This chapter will explore these themes and relate them to broader discussions in the literature about instrumental and emancipatory goals, as well as behaviourist, constructivist and transformative learning approaches. The chapter will conclude with implications of the research.

Fostering a Different Way of Thinking

> "So, fundamentally I think that educating for sustainable development is asking students to think about things differently, to think about how things go together, how they integrate, what they mean systemically, to apply the knowledge that we have in a different way."

> - Jason Smerdon interview (Columbia University)

A strong theme in this research is that it is important for these courses to help students develop a different way of thinking. Many participants stressed the importance of fostering students' *capacity* to think rather than teach them *what* to think. In particular, they emphasized critical thinking, systems thinking and integrative thinking. An important component of this was to seek, understand and integrate different perspectives, including different disciplinary perspectives. As will be discussed, this emphasis on developing the capacity to think corresponds with the learning objectives commonly recommended in the education for sustainable development (ESD) literature.

Critical Thinking: Freeing Minds to See and Think Differently

The focus on critical thinking in many courses in this research aligns with ESD articles and reports. The participants stressed the importance of developing an aptitude for learning and thinking about sustainability that will enable students to make more informed and sustainable decisions. The participants and literature both agree that critical thinking is important in ESD because there are no pre-determined solutions (Thomas 2009, 248) and knowledge about sustainability issues is often incomplete, provisional and contested (Huckle 2004, 35). Given

155

this, education needs to go beyond memorization or set responses (Thomas 2009, 251). Instead, learners need the ability to assess evidence for themselves (Brookfield 2012a, 12) and make their own informed decisions about what to do (Wals 2011, 179).

The participants and literature both emphasized the importance of questioning assumptions and looking for sources of bias in claims and discourses about sustainability. One of the participants, Philip Loring, attested that examining their own standpoints helps students build epistemological awareness. If they do not identify their standpoints, they may not recognize how their assumptions could be preventing them from other ways of looking at issues. Similarly, Senge (2006) writes that our assumptions and beliefs comprise the mental models through which we interpret the world and take action. When these mental models are unconscious and unquestioned, they can limit people's ability to see things differently or explore alternative ways of doing things (Laininen 2019, 166). If followed without question, some assumptions could influence decisions that contribute to unsustainable outcomes (Laininen 2019; Nolet 2016). Consequently, it is important to examine these assumptions and verify whether they provide a *reliable* guide to action (Brookfield 2012a, 11).

Interestingly, some participants alluded to the emancipatory elements of critical thinking. Philip Loring observed that some students feel "incredibly freed" when the class questions the discourse that attributes environmental problems to human nature rather than to the systems humans have created. Mark Orrs suggested that sustainable development is trying to help people collectively "wake up" and understand how things have come to be. He added that students will be able to think critically about how to make things better once they understand the structures that have contributed to the current circumstances. These statements suggest that critically thinking about the root causes of problems can help people realize that there are alternative ways

156

to see, think and act. In other words, it involves emancipatory learning (Brookfield 1987; Tilbury and Wortman 2004; Wals 2011). As Brookfield notes, becoming aware of the forces that led to the learners' current circumstances is emancipatory because it enables them to take action to change some aspects of those circumstances (1987, 12). People will also be empowered to think and act more independently once they identify the biases and assumptions underlying their ideas, as well as those of media, institutions and other people (Tilbury and Wortman 2004, 36-37).

Systems Thinking: Holistic and Relational Thinking

The research findings agree with the ESD literature that developing systems thinking is important in sustainability education (Dale and Newman 2005; Glasser and Hirsh 2016; Rieckmann 2012; Rowe and Johnston 2013; Sandri 2013; Sipos, Battisti, and Grimm 2008; Wals 2012; Wiek, Withycombe, and Redman 2011). As will be discussed below, the findings affirm that systems thinking is necessary for understanding the causes, impacts and potential solutions for sustainability problems. Some of the participants and ESD literature also suggest that systems thinking offers an alternative way of thinking to the atomistic and reductionist way of thinking currently prevalent in Western society (Laininen 2019; Sterling 2004b).

Many participants stressed that systems thinking is necessary for understanding and addressing sustainability problems. To develop this competence, most courses included one or more learning objectives to develop an understanding of system structures and dynamics or the interconnections across dimensions and scales. This aligns with the ESD literature, which affirms that traditional scientific tools cannot help solve "wicked" problems (Redman and Wiek 2013, 218). It contends that students need to develop an understanding of the complex, interconnected and dynamic nature of systems to understand and effectively address problems (Remington-Doucette et al. 2013; Wiek, Withycombe, and Redman 2011).

157

Descriptions of systems thinking in participant interviews and course syllabi suggest that it involves a different way of thinking. It is a way of seeing and thinking that is holistic, integrated, complex and interconnected. It is a recognition that one belongs to a greater whole that one both impacts and is impacted by in return. This corresponds with literature that attests that systems thinking is a holistic and relational way of thinking (Capra 1999; Sterling 2004b; Sterling 2009b). In fact, some of the literature suggests that a worldview based on ecological or systems thinking can offer an alternative to the dominant reductionist worldview, which views humans as distinct from nature and has resulted in an unsustainable relationship with the planet (Laininen 2019; Sterling 2004b).

Of interest, some participants hoped that having a better understanding of interconnectedness and their own impacts on systems would encourage students to consider others and make more informed and sustainable decisions in the future. There is some evidence that this hope may be warranted. As Sayal et al. (2016, 197) suggest, for example, learning about how climate change impacts people in other parts of the world may be associated with a greater sense of responsibility.

Understanding and Integrating Diverse Perspectives

The importance of seeking, understanding and integrating different perspectives was a strong theme in this research, a focus that is well-supported in the ESD literature (see for example Davies, K. 2009; Healy 2003; Longino 2002; Remington-Doucette et al. 2013; Wiek, Withycombe, and Redman 2011). In their courses, participants emphasized developing the ability and disposition to seek and understand different perspectives, which is called "epistemological pluralism" in this thesis. They also focused on developing multidisciplinarity, interdisciplinarity or transdisciplinarity to produce a broader and more holistic understanding of

issues. These learning objectives share an integrated and multi-perspectival approach to understanding and addressing problems.

Epistemological Pluralism: Cultivating an Ecology of Knowledges

Participants in this study highlighted the importance of examining issues from multiple perspectives. They noted an understanding of these diverse perspectives can contribute to a broader, more holistic and more complete understanding of problems and their potential solutions. Similar to arguments in the sustainability education literature, participants attested that the disposition and ability to respect, seek and understand perspectives is important for understanding and addressing sustainability problems. They attested that knowledge is incomplete (Healy 2003). Thus, no single perspective can provide a complete understanding of complex sustainability problems (Escrigas 2016; Miller et al. 2008; Wiek, Withycombe, and Redman 2011). They also emphasized that sustainability problems involve people from diverse cultures, regions, contexts and occupations. These people have distinct ways of knowing and perceiving problems and are impacted by problems in different ways. Many participants thus stressed the importance of understanding multiple perspectives, which accords with Escrigas' (2016) call to cultivate an "ecology of knowledges".

The foregoing discussion illustrates that developing the disposition and ability to respect and understand different perspectives helps to serve instrumental aims by increasing students' abilities to more effectively address sustainability problems. However, some participants also alluded to more emancipatory aims, including those of fostering participation, empowerment and capacity-building (Wals 2012, 23).

Some participants noted that exploring diverse perspectives helps students realize that there are many kinds of knowledge holders and sources of academic and non-academic

knowledge. Respecting and recognizing the authority of different knowledge sources offers a participative and democratic approach to knowledge construction and decision-making (Healy 2003, 689). It includes ways of knowing and seeing that tend to be marginalized when only a single (often scientific) form of knowledge is legitimized. This not only provides a richer perspective of the causes and impacts of issues but also helps give voice to people who otherwise may not have a say in policy decisions that will impact them (Miller and Erickson 2006).

This contrasts with the view that the environment is something that must be managed by experts and supports the idea that ordinary citizens can take part in decision-making (Luke 2001, 189). It also connects with a theme in the interviews that everyone – no matter their knowledge, experience or job – can have a role to play in sustainability discourse and practice. This also includes students, regardless of their chosen professions. Thus, some participants reported that they wanted students to have a sense of their authority and understand that their own perspectives are valuable. One participant also wanted students to understand that they have the right to add their voices to discussions about sustainability issues. This not only promotes knowledge democracy but can be empowering and motivating for students if it contributes to the belief that their ideas are important (Thomas and Velthouse 1990).

The participants noted that developing the ability to examine different perspectives is important because it fosters critical, independent and complex thinking and helps students develop a broader and more holistic perspective. Additionally, it can help them develop creative or pragmatic sustainability solutions. This aligns with the literature, which attests that understanding different perspectives plays an important role in fostering critical thinking (Brookfield 2012a, 12) and the key sustainability competencies (Wiek, Withycombe, and Redman 2011).

Finally, many participants stressed that they wanted students to respect, appreciate and be open to the values and perspectives of others, including those who do not share the same views as them. They emphasized that respecting different perspectives is particularly important in sustainability courses, given the multidisciplinary, value-laden, and contested nature of the subject. One participant wanted students to be able to understand issues from other people's perspectives and put themselves in their "shoes", which is thought to be an important part of fostering empathy (Goodman 2001, 144).

Integrating Disciplinary Perspectives

All courses in this research included learning objectives and approaches that included multiple disciplines, thus aligning with the ESD literature (Barth 2015; Boix Mansilla 2005; Clark and Wallace 2015; Dale and Newman 2005; Rieckmann 2012; Svanström, Lozano-García, and Rowe 2008). Participants observed that sustainability problems cross multiple disciplinary boundaries (Dale and Newman 2005, 353). Some participants noted that traditional, disciplinary thinking is insufficient for dealing with these problems because it does not consider the "larger, integrated system" (Clark and Wallace 2015, 240). In fact, as one participant attested, our technological problems have resulted in part from "stovepipe" disciplinary thinking that failed to consider technology in the broader context. Corresponding with the literature, the participants therefore attested that multidisciplinary, interdisciplinary or transdisciplinary approaches are needed for a broader, more complex, holistic and complete understanding of problems and potential solutions (Boix Mansilla 2005; Max-Neef 2005).

Of note, some participants used the terms "multidisciplinary" or "interdisciplinary" interchangeably to refer to their courses, similar to what Dyer (2003, 186) observed. This suggests that there could be some uncertainty or confusion about the distinctions between these

terms. This would not be surprising, since there is little agreement on the meaning of interdisciplinarity (Clark and Wallace 2015, 242) and some definitions fail to note the differences between multi-, inter- or transdisciplinarity (Clark et al. 2011, 719). However, this is not possible to verify, since the participants were not asked for their definition of these terms.

It is clear from the participant interviews and literature that interdisciplinarity and transdisciplinarity are challenging to learn, practice and teach. These approaches require more than just the accumulation of disciplinary knowledge and methods. They also require integrative thinking, which is not easy to do. As the literature points out, it is challenging to determine how to integrate these perspectives (Boix Mansilla 2005, 19-20), especially since explicit methods for integrating diverse kinds of knowledge are often lacking (Clark and Wallace 2015, 234). For transdisciplinarity, determining how to incorporate values and multiple non-academic forms of knowledge presents an additional challenge (Evans 2015b; Remington-Doucette et al. 2013).

The participants observed that interdisciplinarity is also challenging to teach. Similar to Domask (2007), they attested that it is hard to be an expert in multiple disciplines. Some of them noted that they sometimes need to lecture outside of their areas of expertise. Similarly, Evans (2015b, 90) notes that instructors of transdisciplinary courses may sometimes feel out of their depth, which can be a source of insecurity for them. In some courses, guest lecturers or co-instructors from other disciplines broadened the collective range of disciplinary expertise. However, this involved its own set of challenges, as it was often time-consuming to coordinate and collaborate with others on what and how to teach.

Fostering the Vision and Drive to Engage in Sustainability

A strong theme in this research is that values play an essential role in sustainability. Values can support the current unsustainable trajectory or they can provide the vision and drive

to pursue a different path. Thus, many participants wanted students to understand the importance of values in sustainability. In addition to this, some participants emphasized that they wanted students to think critically about societal values and reflect on their own values. Some participants also hoped students would apply sustainability values to their own lives. They noted that values and emotions play an important role in motivating action on sustainability issues. As will be discussed, the discussion on the roles of values and emotions reflects a mix of instrumental and emancipatory aims.

Values: The Vision that Guides

In contrast to the educational approach that seeks objective, value-free knowledge (Sipos, Battisti, and Grimm 2008, 70), many courses in this research included discussions of values. Similar to some of the education for sustainable development (ESD) literature, participants affirmed that sustainability is value-laden (Parker 2012; Remington-Doucette et al. 2013; Wiek, Withycombe, and Redman 2011). As one participant observed, the concept itself contains an implicit assumption that a sustainable future is valuable and worth striving for. Others noted that sustainability involves discussions about what kind of world people want to have and what that entails for relating to the world and to each other. In other words, values are a compass that provides direction to people when they are deciding between alternative paths.

Elements of the debate over whether sustainability education should promote specific values are reflected in this research. Some participants expressed the hope that students would apply sustainability values to their lives. For example, some hoped students would adopt sustainability as a guiding principle or consider the impacts on others when making decisions. This recognizes the importance of sustainability values. Since these were largely aspirational

goals, however, this aligns with the position that it is acceptable to encourage, but not prescribe, the adoption of sustainability values (Barth 2015, 61).

Several participants focused on encouraging students to critically think about values. For example, they asked students to reflect on common values and beliefs in mainstream discourse, such as the belief that economic growth and technological progress are always good. This helps students deconstruct values that have been inherited or socially embedded (Tilbury 2011, 31). A few participants also focused on encouraging students to identify and reflect on their own values. One participant, for example, wanted students to question where their values came from, how they play out, and whether they are sustainable. Clarifying their own values helps students become conscious of values that have been socially embedded (Tilbury 2011, 31), as well as how their values might be shaping their perceptions and knowledge (Tilbury and Wortman 2004, 32).

The focus in some courses on values reflection suggests an emancipatory and constructivist educational approach (Brookfield 1987; Sterling 2010; Tilbury and Wortman 2004; Wals 2011). Rather than push students toward specific values (Jickling and Spork 1998, 315), it enables students to explore, analyze and revise their own value systems (Barth 2015, 167). It therefore fosters autonomous thinking (Tilbury and Wortman 2004). As discussed next, this also helps students reflect on what sustainability means to them in their own lives, thus making it more personally relevant (Tilbury and Wortman 2004, 40).

The Drive: Fostering Student Engagement and Empowerment

Several participants wanted students to become engaged and empowered to learn about sustainability and apply sustainability values or principles to their own lives. They wanted students to feel optimistic and hopeful that they and others can make a positive difference. To this end, participants hoped to foster the understanding that sustainability is urgent and important

and that they and others can contribute to positive changes that will bring about a better world. In other words, they wanted to foster a sense of hope. When speaking about these aspirational goals, participants acknowledged the important role that values and emotions play in motivating interest and action in issues (Crompton 2010; Laininen 2019; Norgaard, K. M. 2011).

A few participants observed that students become engaged and motivated to get involved in sustainability issues when they connect with it on a personal level and realize its importance. For example, Philip Sakimoto stated that one of his "real" course goals was for students to understand that climate change is important and that it affects them. He attested that connecting personally with issues helps people understand that these issues affect them, as well as the people and places they care about. In consequence, those issues become a higher priority and people are more motivated to take care of them. This contention is supported by some of the literature on the motivational dimension of values (Schwartz 2012; Verplanken and Holland 2002). It also corresponds with Schwartz' theory of values, which maintains that people's behaviours are influenced by the way they prioritize their values (Schwartz 2012).

In other courses, participants encouraged students to connect with sustainability by asking them to think about how their own values relate to sustainability or how they might apply sustainability to their lives or future careers. Connecting students' learning to their own lives and values makes it more relevant and meaningful (Frisk and Larson 2011). In turn, this can foster a sense of intrinsic motivation and empowerment (Thomas and Velthouse 1990, 672-673).

Some participants wanted students to reflect on how their personal choices and actions can impact others. Marian Brown, for example, wanted students understand their impacts and then develop the confidence and capacity to make more informed and sustainable choices. If students feel competent and believe that their actions will have an impact, this can foster

empowerment (Thomas and Velthouse 1990). Additionally, since this learning is applied to practice and can have an impact beyond the assignment itself, it can be meaningful and memorable for students (de Haan 2006; DuPuis and Ball 2013; John et al. 2017; Nolet 2016).

Interestingly, several participants were cognizant of the potential for emotions to disempower students. Several participants stressed that students could "shut down" or become disempowered if there is too much focus on the intractable nature of problems. This is supported by the literature, which attests that focusing too much on sustainability challenges can engender a sense of universal helplessness and despair (Hicks 2002). If students come to the belief that no one can address these problems, then this kind of learning may lead to apathy rather than action (Rowe 2002).

To help students feel optimistic and empowered that they and others can make a positive difference, several participants remarked that they balance their exploration of problems with a focus on real-world solutions. Participants also observed that students are engaged by learning about real-world solutions. This can counter the sense of universal helplessness (Hicks 2002) by providing positive examples of what they and others can accomplish (Burns 2013, 174). Participants also remarked that working on active, participatory and experiential learning activities, such as sustainability projects, can empower students with the knowledge, skills and confidence to get involved in sustainability issues and projects in their future lives.

Putting Theory into Practice

"We're interested in an education that enables students to do things, rather than an education where we can examine students and be satisfied that they are aware of certain things or that they know about certain things… And so what we've tried to do was, to a great extent, build students towards understanding that sustainability could be the basis of practice."

- Steven Mannell interview (Dalhousie University)

166

Putting theory into practice was a strong theme in this research. Many participants indicated that their courses were not just about developing knowledge and understanding *about* sustainability. They also wanted students to *apply* their knowledge and skills to the real world. This focus on practice corresponds with much of the ESD literature, which attests that sustainability education is practice-oriented (Almers 2013; Boix Mansilla 2005; de Haan 2006; MacDonald and Shriberg 2016; Thomas 2009; Wiek, Withycombe, and Redman 2011). For example, the purpose of the key sustainability competencies is for students to engage in sustainability research and problem solving (Wiek, Withycombe, and Redman 2011, 207). It also aligns with the position that advocates a shift from theory-dominated to praxis-oriented learning (Sterling 2004a, 50).

Participants discussed several ways that they hoped students would put theory into practice in their personal, academic or professional lives. For example, they hoped students would pursue sustainability professions, bring sustainability practices in their jobs, or engage in the causes they believe in. This section will focus on two aspirational goals: 1) changing individual decision-making and practice; and 2) fostering sustainability change agents.

Changing Individual Decision-Making and Practice

Some participants hoped students would apply the knowledge, understanding and skills they gained from the course to make more informed and sustainable decisions in their own lives. One participant in particular contended that this would have a larger impact if it were scaled up over many people. However, several other participants contended that individual action has been over-emphasized in the sustainability discourse. Similar to critics of the ripple model of social change, they attested that focusing on changing individual behaviour ignores the physical and institutional structures that constrain individual pro-environmental behaviours (Miller 2016).

167

They agreed with the literature that encouraging individuals to change their lifestyles will not be sufficient to attain a sustainable future (Laininen 2019, 182). Thus, in addition to exploring ways for individuals to act sustainably in their own lives, they also encouraged their students to consider becoming agents of change that engage others in sustainability.

Fostering Sustainability Change Agents

Corresponding with the recommendations in many articles and reports about sustainability education, participants expressed the hope that students would become sustainability change agents (Barth 2015; Laininen 2019; Marcus et al. 2015; Rowe 2002; Svanström, Lozano-García, and Rowe 2008). Participants attested that it is important to engage others because individual actions are not sufficient on their own to effectively address sustainability challenges. Thus, they hoped students would use their knowledge and capabilities to initiate initiatives and engage others in sustainability. While not all participants explicitly discussed change agency, many of the learning objectives and aspirational goals described throughout this thesis involved the development of abilities and attributes that are considered important for change agents.

Participants attested that change agents are important because they initiate positive change and inspire others to become involved. Many people are needed to address sustainability problems, but there are limits to what they can accomplish through private sphere individual actions (Miller 2016). Addressing these problems requires collaborations among scientists, practitioners and stakeholders from many different regions, backgrounds and professions (Brundiers and Wiek 2017, 5-6). Change agents who are sustainability practitioners can work with others to create future scenarios, shared visions of a sustainable state, and strategies to transition to this sustainable state. As described by participants, change agents might also work at

168

smaller scales in their communities or workplaces initiating projects to bring about positive change and communicating the importance of sustainability to their family and friends.

Most courses in this research aimed to develop some of the knowledge, understanding, skills and dispositions that are recommended by the literature for change agents. For example, many courses included learning objectives of developing knowledge and skills important for action competence, especially the knowledge of a problem's root causes and consequences and the ability to put knowledge into practice (Almers 2013, 117). Learning objectives in several courses also included developing the knowledge of how to change conditions or the ability to create solutions. For example, students in some courses researched real world problems and helped come up with potential solutions to address them. In one course, students did the background research to come up with a climate ordinance for the local city. In another course, students used a structured framework to research and develop plausible transition strategies to address specific sustainability issues. Additionally, some learning objectives or aspirational goals included other components of action competence, such as the ability to create visions and the willingness to act.

Many learning objectives in this research also included the development of abilities and attributes recommended by the American College Personnel Association (ACPA) for change agents, as presented in Table 2 in Chapter 2. Change agent abilities that were particularly emphasized included: seeing the big picture; having insights into the interconnectedness of systems; recognizing the global implications of their actions: making ethical (i.e., sustainable) decisions that incorporate responsibility to self and others; listening to others and incorporating their ideas and perspectives; spanning boundaries; and communicating ideas clearly and concisely. Several courses also emphasized: engaging in self-assessment, self-reflection and

analysis; creatively and collaboratively solving problems; and civil discourse and debate. Additionally, some participants hoped to foster some change agents attributes, such as self-awareness, competence, optimism and curiosity (ACPA n.d.).

If learning objectives include the development of many of the abilities and attributes that are needed for change agents, and if those objectives are achieved, then this suggests the possibility that some courses could be fostering change agents. It must be emphasized, however, that this is a tentative conclusion. To get a better idea of the potential for fostering change agents in these courses, a more rigorous analysis would be required. This would require systematically analyzing the learning objectives in each course and comparing them against a framework of change agent skills and attributes that is well-supported by research. Such an analysis is outside the scope of this thesis. Moreover, complicating such an analysis is the fact that there is a lack of consensus and clarity in the literature on which abilities or attributes are most important for sustainability change agents. ACPA's abilities and attributes are not prioritized, for example, so it is not clear which ones are required and which are optional. The key sustainability competencies proposed by Wiek and colleagues (2011) is well-cited in the ESD literature and could potentially provide a framework for analyzing change agent skills for professionals who engage in sustainability research and problem solving. However, it is not clear that this framework includes all the abilities and dispositions needed for other types of change agents, such as engaged citizens or those who work in local communities (Van Poeck, Læssøe, and Block 2017). This is an important consideration for introductory sustainability courses, which often include students who do not major in sustainability and may not intend to have careers as sustainability professionals.

It should be noted that only a small number of courses included learning objectives to develop the following abilities that were recommended by ACPA:

- "Help envision, articulate and create positive scenarios for the future of society"
- "Search for 'families' of solutions for complex multi-faceted issues"
- "Adjust to the diverse and changing needs of both individuals and society as a whole"
- "Be both a leader and a follower, as necessary"
- "Mediate and resolve conflicts"
- "Analyze and influence group dynamics"

These courses did not emphasize leadership skills, envisioning future sustainable systems or negotiating and balancing different values. Effective leadership is a key attribute of change agents (Laininen 2019, 183) and important for motivating others to engage in positive change (Quinn and Matkin 2012, 207). Having clear images of a more sustainable future is necessary for creating sustainability transitions (Wiek, Withycombe, and Redman 2011). Additionally, being able to envision a more sustainable future world can be a powerful way to inspire people with hope and motivate them to strive for that vision (Hicks 2002; Tilbury 2011). Finally, sustainability initiatives frequently involve people with disparate interests, beliefs and value systems. To mitigate conflicts and help people agree on goals and targets, effective change makers thus require the ability to negotiate values (Dale and Newman 2005; Remington-Doucette et al. 2013).

The lack of emphasis on some change agent abilities suggests that it is unlikely that students would become fully effective change agents by the end of these courses. This is not surprising, however, given that time is restricted in a single course and these abilities take time to develop.

Instrumental and Emancipatory Goals

As noted in Chapter 2, there is an important debate in the literature about whether sustainability education should serve instrumental or emancipatory purposes (Barth 2015; Sterling 2004a). The introductory sustainability courses in this research generally included a mix of instrumental and emancipatory goals.

Several learning objectives and aspirational goals referred to enabling or motivating students to get involved in sustainability efforts. This reflects an instrumental goal – that of promoting sustainability. Aligning with those who emphasize the importance of using education to address urgent sustainability problems (Sterling 2010, 513), many learning objectives involved developing knowledge, skills or competencies that are needed to promote sustainability goals. These included objectives such as developing critical thinking, systems thinking and the other key sustainability competencies proposed by Wiek and colleagues (2011). Several other participants also expressed the aspirational goal of engaging and empowering students to get involved in sustainability.

Many courses also included emancipatory learning objectives that aimed to develop students' abilities to think and act according to their own interests. This included building their capacities to understand the root causes of problems and make their own informed decisions about how to think, value and act (Barth 2015; Sterling 2010; Thomas 2009; Wals 2012). It also included the development of critical thinking. Critical thinking helps students identify assumptions or sources of bias that might direct their thinking in certain directions (Tilbury and Wortman 2004) or prevent them from alternative ways of seeing (Laininen 2019). Along with values clarification, it fosters autonomous thinking, an important goal of emancipatory learning (Brookfield 1987; Wals 2011). Without critical thinking and values clarification, students'

decisions and actions may be unknowingly influenced in ways that neither serve their own best interests nor contribute to a more sustainable future (Brookfield 1987; Tilbury and Wortman 2004). Additionally, teaching students how to think rather than what to think will enable them to cope better with uncertainty and unpredictability and adjust their thinking as information changes (Dale and Newman 2005, 356). This will be important for helping them deal with divergent knowledge claims and cope with uncertainty (Wals 2011, 179).

A number of courses included both instrumental and emancipatory goals. For example, although many participants hoped students would use their knowledge and capacities to get involved in sustainability (an instrumental goal), they also hoped students would pursue sustainability according to their own interests (an emancipatory goal). Some learning objectives also serve dual purposes. For example, the development of critical thinking enables people to understand and more effectively address sustainability problems, which serves an instrumental purpose. However, it also helps to achieve the emancipatory goal of fostering learner autonomy (Brookfield 1987).

Sterling suggests that it may be important to include both instrumental and emancipatory approaches in sustainability education because neither approach is sufficient on its own to help address sustainability challenges. The instrumental approach often recognizes the urgency of the sustainability challenges facing society but has been criticized for being prescriptive and deterministic (Sterling 2010, 514). The emancipatory approach recognizes the importance of capacity building and individual autonomy but may not sufficiently consider the urgent nature of sustainability problems. Although we may not have all the answers, Sterling attests that we have principles and a general direction (Sterling 2010, 515).

Behaviourist, Constructivist and Transformative Learning Approaches

Many of the learning objectives in this research reflected a constructivist learning approach. Participants noted that learning is not about "pouring material" into students' heads (Jickling and Wals 2008, 7). Instead, they wanted students to actively engage in learning (Sterling 2004a, 47). Constructivist learning objectives included developing the ability and disposition to think critically about assumptions and values (Sterling 2010, 518). For example, asking students to identify and reflect on their values or the values acknowledges the importance of values in sustainability while respecting the autonomy of the learner. It also enables students to deconstruct values they inherited from others (Tilbury 2011, 31) and potentially revise their own value systems (Barth 2015, 167). This helps students develop the capacities to think independently, form their own conclusions, and potentially revise their own values (Brookfield 1987; Sterling 2010; Tilbury and Wortman 2004; Wals 2011). Epistemological pluralism and interdisciplinarity also involve constructivist approaches because they involve active learning and integrating different ways of knowing (Sterling 2004a, 47). Additionally, participants wanted students to apply concepts to their lives and to different context, which encourages students to create their own meaning (Mezirow 1985).

A number of courses included both behaviourist and constructivist elements, suggesting that these courses fall along the continuum between behaviourist or constructivist approaches. For example, some participants hoped students would make more informed and sustainable decisions or apply sustainability concepts, ideas or principles to their future lives and careers. These aspirational goals suggest an interest in seeking to change the learner's behaviour through education (Sterling 2010, 513). However, most of these participants did not prescribe *specific* decisions, behaviours or values, leaving it up to students to determine this. Similar to the ESD

literature (Wals 2011, 179), they noted that knowledge about which actions are considered sustainable changes over time. Because of this, they emphasized that it is important for students to develop the capacity to determine for themselves how to make informed decisions and how to apply sustainability ideas according to their own interests. The focus on building these capacities indicates a constructivist educational approach (Sterling 2004a, 52).

The Potential for Transformative Learning

The research findings suggest that transformative learning could be an aspirational goal for some participants. In fact, one participant directly expressed an interest in facilitating transformative learning. He stated that one of his biggest rewards was to hear from students who told him that they became a different person or chose a different life path due to his course. While other participants did not explicitly use the term "transformative learning", some of their comments implied an interest in transformative learning. Additionally, the focus on critical thinking, critical reflection and discussion in some courses suggest that there may be a potential to foster second-order learning (Sterling 2011) or transformative learning in those courses. .

First, several comments suggested an interest in transformative learning. For example, some participants discussed the need to recognize and question discourse, "open their minds" or look at things differently. When discussing the purpose of sustainability education, Mark Orrs suggested that we are trying to "raise consciousness" and collectively "wake up" to see how things really are and understand the structures that led to the current state. Once people understand this, he said, they can think critically about how things could or should be different. This suggests a large shift in how people view the world and therefore implies an interest in transformative learning.

The hope expressed by some participants that students would adopt and apply a sustainability mindset or lens to their future courses or lives also implies an interest in transformative learning. One participant, for instance, hoped students would take a "mindset of sustainability and global thinking of ethics" into their future careers. Another participant wanted students of the Sustainability program in general to look at the world through the lens of the Triple Bottom Line in whatever they do. A lens is "something that facilitates and influences perception, comprehension, or evaluation" (Merriam-Webster Dictionary n.d.). According to Cranton, it is akin to a perspective. She maintains that people's interlinked assumptions, beliefs, values and emotions create the lens through which they see the world (Cranton 2016, 22). If students adopt a sustainability lens, this implies that they undergo a change in perspective, which suggests transformative learning according to Mezirow's theory (Mezirow 2003, 58). Moreover, Nolet (2016, 62) suggests that viewing and interacting with the world through a sustainability lens involves having a sustainability worldview, which implies that adopting a sustainability lens would involve a change of worldview. This would be transformative according to the frameworks of both Mezirow (2000) and Sterling (2011).

In some courses, the focus on critical thinking, critical reflection and discussion suggest that there may be a potential for transformative learning. Mezirow maintains that transformative learning can occur through subjective or objective reframing, where people critically reflect on their own assumptions or those of others, respectively (Mezirow 2000, 23). A number of courses included reflective writing assignments, where students were asked to identify and reflect on their own assumptions, beliefs or values. One participant stated that this helps students see how their assumptions influence their perceptions. Once students identify their assumptions and understand how they affect the way they see the world, this may prompt them to question and

change those assumptions. If this leads to changing "sets of fixed assumptions… to make them more inclusive, discriminating, open, reflective, and emotionally able to change" (Mezirow 2003, 58), this would entail transformative learning according to Mezirow's theory. According to Sterling, however, this would entail second-order learning and change. While this could lead to significant changes in thinking or doing, Sterling attests that it would not be transformative unless it results in a change of paradigm or worldview (2011, 22-23).

Some participants stated that they encouraged students to identify and question some of the common assumptions in discourse, often through class discussions. For example, some participants wanted students to question the assumptions that technology will provide the solutions to problems. Allison Goebel's course included discussions about how our culture is based on individualism and how sustainability efforts often focus on individual actions as a result. Philip Loring wanted students to question and unpack the common assumption that human nature is to blame for environmental problems. He wanted them to consider instead that these problems may be caused by the social and economic systems that people set up. This involves a deeper assumption about the way the world works and could therefore be considered a paradigmatic assumption. According to Sterling, calling paradigmatic assumptions into question involves second-order change. Moreover, if this process results in a "deep, conscious reordering of assumptions", this would entail paradigm change and be transformative (Sterling 2004b, 58). Indeed, Loring affirmed that he and his co-instructor were trying to help students make a paradigm shift, suggesting that may have been both an interest in and a potential for transformative learning in his course.

Of interest, Philip Loring also remarked that questioning assumptions about the root causes of problems was tough for some students – while some felt "incredibly freed", others

pushed back. Similarly, Lange (2009) finds that there is often a point in the transformative learning process where students project their confusion, anxiety or anger onto her. This aligns with research on transformative learning that indicates that it can be difficult, uncomfortable and disorienting to question and restructure one's basic assumptions (Moore 2005; Sterling 2011).

Several participants attested that they aim to provide a safe and respectful learning environment to empower students to share their perspectives in class discussions. A safe space, or "learning sanctuary", is believed to be important for nurturing transformative learning (Lange 2009). It encourages discussion, which plays an important role in transformative learning (Mezirow 2000). It encourages students to express their feelings (Taylor and Jarecke 2009, 283). According to Lange (2009, 197), it also enable them to have a "deep encounter" with self, relationships, myths and "habits of thinking and living.

Finally, courses that encourage students to question common assumptions in sustainability discourse appear to touch on elements of critical theory. According to Brookfield (2012b), critiquing ideological assumptions is central to a theory of transformative learning that is informed by critical theory. He argues that dominant ideology represents the unequal state of affairs in Western democracies as normal and natural, thus making it seem unquestionable. Courses that encourage students to question the assumptions of dominant ideology – such as those that are based on individualism or that blame problems on human nature – might identify how these common assumptions serve dominant interests in a hegemonic system (Brookfield 2012b). According to Brookfield, identifying and questioning these assumptions can free people to explore alternative ways of thinking and living (1987, 8). This may encourage people to think beyond the behaviour changes, voluntary actions or technological fixes that are commonly proposed in discourse and consider the possibility of more radical, systemic change.

It should be noted that this discussion on the potential for transformative learning has tentative. While some of the comments suggested an interest in transformative learning, none of the interview questions specifically asked about transformative learning. Additional research would therefore be required to more rigorously explore the interest in and potential for transformative learning in these courses.

Summary and Implications of the Research

Putting these themes together, it is clear that the broader educational goals of the introductory sustainability courses in this research include more than just disseminating information *about* sustainability. They also include fostering different ways of thinking, engaging students in sustainability, empowering them to take action, and helping them to develop the capacity and motivation to put their knowledge into practice. Together, these goals suggest that an educational goal is to motivate and enable students to put theory into practice by taking action on sustainability. The implications of these findings are explored below.

Fostering Different Ways of Thinking

Fostering different ways of thinking in these courses enables students to better understand root causes, impacts and potential solutions for sustainability problems. Critical thinking helps students assess whether or not knowledge claims about sustainability problems are incomplete, incorrect, biased or intentionally misleading (Brookfield 1987; Huckle 2004; Tilbury and Wortman 2004). When there are many competing claims about what causes problems or what should be done about it, the ability to discern trustworthy information and form one's own independent conclusions is crucial. As reflected in the ESD literature, developing systems thinking is critical for understanding and effectively addressing complex sustainability problems (Remington-Doucette et al. 2013; Wiek, Withycombe, and Redman 2011). Since these problems

arise in complex, interconnected and multidimensional systems, people need the ability to think in terms of context, connectedness and relationships (Capra 1999, 2). Moreover, if atomistic and reductionist thinking is one of the factors that contributed to the current state of unsustainability, then it will be important to counter this with different ways of thinking that are broader, holistic and relational (Boix Mansilla 2005; Laininen 2019; Max-Neef 2005; Sterling 2004b).

Finally, the participants and literature agreed that no single perspective provides a complete understanding of complex sustainability problems on its own (Escrigas 2016; Miller et al. 2008; Wiek, Withycombe, and Redman 2011). Thus, epistemological pluralism – the ability to seek, understand and integrate different perspectives – or inter- or transdisciplinary thinking are required to understand these problems. Employing epistemological pluralism can fill in gaps that were missed by looking through the lens of a single perspective and suggest alternative ways of approaching problems and solutions (Barth 2015, 171-172). Additionally, by including voices that might be missed in expert or scientific perspectives, epistemological pluralism offers a more democratic way to construct knowledge and make decisions (Healy 2003). Interdisciplinarity provides a more complete and holistic understanding of problems because it highlights interrelationship. This is critical to understand and address sustainability issues (Jones, Selby, and Sterling 2010, 20-21).

Fostering the Vision and Drive to Engage in Sustainability

In addition to helping students develop the capacities to more clearly understand and effectively address sustainability issues, several courses appeared to include the broader goal of fostering the vision and drive to engage in sustainability. Values and emotions played an important role in these goals. First, several participants observed that values provide the vision that helps direct people's actions. In agreement with the sustainability and ESD literature, they

noted that sustainability contains diverse implicit and explicit values about what people want the world to become (Parker 2012; Remington-Doucette et al. 2013; Wiek, Withycombe, and Redman 2011). It also includes ethical claims about how people ought to relate to current and future generations and to other lifeforms. On their own, knowledge, skills and an understanding of problems cannot tell people which potential futures will be desirable, ethical or just. However, some participants indicated that values can act like a compass to guide people in their choice of paths. For instance, it can help people decide between actions that serve only their own interests or that also consider the needs of others. It is therefore important to question whether these values lead in a direction that is sustainable or that will result in desirable outcomes. By asking students to identify and critically reflect on their own values and those of others, several courses appear to help students develop the basic tools needed to assess – and potentially reprioritize – their guiding values.

Second, several courses also included the goal of fostering the drive to engage in sustainability. Several participants, for example, hoped to foster student engagement and a sense of empowerment. Aligning with some of the literature on empowerment, participants remarked that students will be more motivated to get involved in sustainability efforts if they understand that sustainability is urgent and important, that it impacts them personally, and that they have the capacity to make a difference in a way that aligns with their own values, interests and talents (Thomas and Velthouse 1990). Thus, some participants tried to connect sustainability to student's own lives and values to engage them in sustainability, a view that is supported by literature on the motivational dimension of values (Schwartz 2012).

Putting Theory into Practice

The foregoing discussion suggests that the first two themes – fostering different ways of thinking and fostering the vision and drive to engage in sustainability – support the theme of putting theory into practice. Engagement and empowerment can motivate students to take action, while critical thinking, systems thinking and integrative thinking help them take action that is more informed and effective.

One of the ways that some participants hoped students would put theory into practice was to become change agents. Additionally, even though not all participants explicitly talked about change agency, many courses included objectives of developing the capacities and dispositions recommended in the literature for change agents. As previously noted, many learning objectives included components of action competence (Almers 2013, 117) and the change agent abilities and attributes recommended by the American College Personnel Association (ACPA). If these objectives are achieved, this suggests the interesting possibility that some courses might foster change agents. It must be noted that this is speculative, however. A more rigorous analysis would be needed to compare the mix of learning objectives in each course against a framework of change agent skills and attributes. Such an analysis was outside the scope of this thesis.

A single introductory sustainability course would not enable students to develop all the knowledge, capacities and dispositions they need to become effective change agents. However, if the course provides some foundational concepts, develops students' abilities to think differently, sparks their interest in sustainability, helps them realize that sustainability is important, and helps empower them to believe that they and others can to make a positive difference, then it is possible that even a single introductory sustainability course could encourage students to start on the road to becoming effective change agents.

Chapter 6: Conclusions

The purpose of this research was to look at which learning objectives were selected in a sample of introductory sustainability undergraduate courses in U.S. and Canadian higher education institutions and explore what this choice indicates about the broader educational goals of these courses. The literature recommends many different learning objectives, learning outcomes and competencies for sustainability education. However, there is a limited amount of time in a single course, so educators must choose which ones to focus on. It is important to consider the implications of this choice because it influences what is taught and how it is taught. In turn, this affects the knowledge, capacities and dispositions that students may develop by the end of the program or course. This can impact students' development as autonomous learners or how well-prepared they are for sustainability challenges (Barth 2015).

To achieve the research objective, semi-structured interviews were conducted with 20 instructors of introductory sustainability undergraduate courses in the United States and Canada. Interview transcripts and course syllabi were iteratively coded to develop categories of learning objectives and identify themes.

This research adds to an existing body of literature on learning objectives in sustainability in higher education. To date, there has been relatively little research specifically on learning objectives in introductory sustainability courses in the United States and Canada. Thus, this research contributes to a better understanding of which learning objectives are selected in practice, as well as the broader educational goals that they indicate. The findings in this research may be useful for educators or curriculum developers who are involved in teaching or planning introductory sustainability courses.

This chapter begins with a summary of findings and how they relate to the literature. This is followed by recommendations to consider when selecting learning outcomes. Finally, it ends with suggestions for future research and some concluding remarks.

Summary of Findings

It is clear that the courses in this research focused on more than just raising awareness or increasing knowledge about sustainability. As described in Chapter 4, the most common learning objectives in these courses included the development of critical thinking, systems thinking, values thinking, strategic thinking and several dimensions of interpersonal competence. Fostering student engagement and empowerment were also important objectives in several courses. Futures thinking and the development of leadership and collaborative skills were less emphasized in these courses. More generally, an analysis of these learning objectives identified three larger themes: fostering a different way of thinking, fostering the vision and drive to engage in sustainability, and putting theory into practice. Some participants also expressed an interest in encouraging students to transform how they think about and see the world, which suggested an interest in transformative learning. These themes are briefly summarized below.

Participants aimed to foster different ways of thinking in their courses. These included critical thinking, systems thinking and the ability to seek, understand and integrate different perspectives. Participants attested that different ways of thinking are needed to see more clearly how things are, how they came to be, and what can be done to make things better. Critical thinking is needed because of the abundance of information and assertions that students are inundated with. They need the ability to assess when this information is incomplete, incorrect, or based on unquestioned assumptions. Critical thinking can therefore provide the tools to help

students more clearly understand the root causes of problems and question solutions that are proposed for them.

Participants attested that the abilities to think systemically and integrate different perspectives are an important part of thinking differently because they help students develop a broader, more interconnected and holistic way of looking at problems and potential solutions. Systems thinking helps students see the interconnectedness of systems and the problems that arise in them. It enables them to look carefully at problems using multiple scales and dimensions, look for multiple causes and impacts, and consider the potential for unintended consequences before intervening in systems. Participants attested that seeking and understanding different perspectives is important because no one person has all the answers in sustainability but many people hold pieces of information. Thus, looking at many perspectives allows students to develop a broader and more complete understanding of problems and their solutions.

Many participants attested to the importance of values in their courses. They noted that values are essential for discussions of what a sustainable world would look like. Values also guide people when they are choosing among alternative paths for society or for their own lives. Thus, several participants asked students to critically reflect on their own values as well as those of others. They asked them to think about the implications of these values, as well as whether those values were reflected in their behaviours. Some participants also highlighted the role that values and emotions play in motivating people to learn about and take action on sustainability. Some participants noted that students are more motivated to act when they personally connect with and care about an issue. Others observed that feelings of despair or helplessness can occur when courses focus too much on the intractable nature of problems. This is problematic if students "shut down" and become disempowered as a result. To counter this, these participants

focused on presenting positive solutions or engaging students in active, participatory and experiential learning activities. They attested that this helps students realize that they and others can make a positive difference.

The third theme in this research was that of putting theory into practice. Many participants hoped students would apply the knowledge, skills and thinking processes developed in their courses to real world problems or to their personal, academic, civic or professional lives. Participants suggested several ways that students could put theory into practice, such as initiating sustainability projects at work or advancing the causes they believe in. Some participants stressed the value of helping students make more informed and sustainable individual decisions. Other participants, while noting the importance of individual responsibility and action, contended that it would not be sufficient for the types of broader, structural changes required to transition to a more sustainable future. Thus, several participants hoped students would become change agents who initiate change and motivate others to get involved in sustainability. In addition to this, many of the learning objectives in this research align with the development of abilities and attributes recommended in the literature for change agents.

Finally, the previous chapter explored the possibility that transformative learning may be an aspirational goal in some courses. A few participants suggested that people's ways of knowing and seeing might be contributing to the current unsustainable state. One participant explicitly expressed an interest in transformative learning. Several other participants hoped students would adopt a sustainability lens or mindset, adopt sustainability principles, make a paradigm change or see things differently. Additionally, some participants asked students to critically reflect on their assumptions, beliefs and values, which could lead to second order learning and change or transformative learning.

Recommendations for Introductory Sustainability Courses

The literature recommends many learning objectives, learning outcomes and competencies, but there is a limited amount of time in a single introductory sustainability course. Educators and institutions therefore need to carefully think about the broader educational goal of the course and which learning objectives will contribute to that goal. This decision is important because it may influence how well-prepared students will be for sustainability challenges (Barth 2015). For non-sustainability majors who take the introductory sustainability courses, this might be the only time in their undergraduate programs where they take a sustainability-focused course and have the opportunity to grapple with some of the concepts and ideas in sustainability.

While each instructor or curriculum planner will need to select learning objectives according to their own unique contexts and needs, the research findings and literature on sustainability education suggest several recommendations to consider when planning these courses. The following recommendations are briefly described below:

- Encourage different ways of thinking
- Consider the role of values and emotions
- Consider the potential for transformative learning

Encourage Different Ways of Thinking

One of the recommendations of this research is to develop critical thinking, systems thinking, epistemological pluralism, and inter- or transdisciplinary thinking in introductory sustainability courses. These competencies and abilities were emphasized in this research and corroborated by the ESD literature.

The development of critical thinking is an important learning objective to include in these courses because there is an abundance of knowledge claims about sustainability issues. To assess

the truth of these claims and develop a better understanding of the causes, impacts and solutions to issues, students need to assess whether claims are supported by the available evidence.

It is important for students to develop systems thinking because it will help them more clearly understand how sustainability problems arise in interconnected systems and how they impact people and places in multiple dimensions and scales. This understanding is necessary for developing more effective solutions (Wiek, Withycombe, and Redman 2011). Developing a more holistic and relational way of thinking is also important because linear, atomistic and reductionist ways of thinking have not only failed to solve sustainability challenges but may in fact have contributed to their creation (Sterling 2004b, 53).

Finally, epistemological pluralism and inter- and transdisciplinarity are important because no single perspective will provide a complete understanding of the causes, impacts or potential solutions to problems. Multiple perspectives are needed for a more holistic and complete understanding (Escrigas 2016; Miller et al. 2008; Wiek, Withycombe, and Redman 2011).

Although students will not become proficient at critical thinking, systems thinking, epistemological pluralism or interdisciplinary thinking by the end of a single course, they may be able to develop some basic competence and an appreciation for why these thinking processes are important. If they understand their importance, they might continue to hone these abilities after the course has ended.

Consider the Role of Values and Emotions

It is important to consider the role that values and emotions play in learning about and taking action on sustainability. Values are important in sustainability because they provide the compass that can help people individually and collectively choose among alternative paths. It is

therefore important for people to be able to critically reflect on those values and consider whether they are pointing to a direction that is desirable.

Values reflection provides a way to discuss values in sustainability courses without pushing students toward specific values (Jickling and Spork 1998, 315). Identifying and reflecting on their own values or those of others enables students to deconstruct inherited values (Tilbury 2011, 31) and potentially revise their own value systems (Barth 2015, 167). This acknowledges the importance of values in sustainability while respecting the autonomy of the learner (Tilbury and Wortman 2004).

It is also important to consider values in sustainability courses because of their role in motivating behaviour (Schwartz 2012). If one of the goals of sustainability education is to motivate students to engage in sustainability, then it will be important for students to understand its importance. In agreement with some of the literature, the research findings suggest that connecting sustainability with student's lives and values may be an effective way for students to understand that these issues are relevant and that taking action on them would be meaningful (Frisk and Larson 2011). As a result, this may foster an intrinsic motivation to take action (Thomas and Velthouse 1990, 672-673).

Connecting sustainability to students' lives could include giving assignments that ask students to reflect on how sustainability values align with their own values. As one participant in this research discussed, it could also involve an assignment where students research and discover the impacts of climate change on their hometowns. As this participant noted, this connects students with climate change on a personal and emotional level.

Students will also be able to connect with sustainability if they understand that they can make a positive difference with issues regardless of their interests or chosen professions.

Moreover, this role need not be limited to buying "green" products or recycling in their homes. Sustainability involves multiple dimensions and requires the collaborative efforts of people from numerous disciplines and professions. To encourage students to think about their own roles in sustainability, instructors could therefore ask students reflect on how sustainability concepts or principles can be applied to their own disciplines. Having guest speakers from multiple disciplines and professions would also provide ideas of how students might get involved with sustainability initiatives according to their own interests.

Finally, educators should also consider the potential emotional impacts of focusing on sustainability problems. While it is important to clearly understand problems and the barriers to solving them, participants in this research observed that focusing too much on the intractable nature of these problems can be disempowering. The literature suggests that students need to believe that they and others can make a positive difference before they will take action on sustainability (Thomas and Velthouse 1990). Thus, another recommendation is to balance information about the sustainability problems with a focus on solutions. For example, instructors might bring in real-life stories of what people are doing to solve problems. They could also get students to work on projects where they research or implement solutions to local problems. This is a way to engage students and provide an opportunity for them to feel the satisfaction of being part of a solution (Barth 2015, 89).

Consider the Potential for Transformative Learning

According to some scholars, transformative learning has the potential to contribute to broader educational purpose of fostering individual emancipation. It is thought to help learners make more autonomous and informed decisions (Mezirow 2000) and recognize how the dominant ideology may work against their own interests (Brookfield 1987; Wals 2011).

Transformative learning could also play an important role in challenging and changing the dominant worldview that gave rise to an unsustainable relationship with the ecosphere (Laininen 2019; Leiserowitz and Fernandez 2008; Norgaard, R. B. 1994; Sterling 2011). If people shift from a worldview based on atomism, reductionism, technological optimism and continuous economic growth toward an ecological worldview that is holistic, systemic and participative and that prioritizes relationships over things (2004a, 49), this would have the potential to foster more sustainable and just relationships with other people and with the planet. Once people think differently about the world and their own place in it, they might also be better equipped to collaborate with others to create shared visions and chart a path to a better future. If fostered on a larger scale, this kind of transformative learning could potentially help to shift society toward a more sustainable future. Given these potential benefits, it would be worthwhile to consider the benefits and potential for fostering transformative learning in introductory sustainability courses.

However, the literature also suggests that transformative learning should not be approached lightly (Moore 2005; Taylor 2009). This suggests that educators should use forethought and careful planning whenever deliberately attempting to foster transformative learning. This would entail having a clear understanding of the processes, benefits and risks of transformative learning before attempting it. This would also involve creating a safe learning environment, such as Lange's (2009) learning sanctuary, to foster transformative learning. Since transformative learning can be uncomfortable, disorienting, emotional and challenging for learners (Sterling 2011), this also implies that it is important to provide adequate supports to help students deal with these strong emotions and disorientations (Moore 2005).

Moore (2005) questions whether transformative learning can be properly supported during the short time-frame of most courses, which involve having a one-hour class three times a

week. It is also questionable whether transformative learning could be achieved or properly supported in large classes with a single instructor because it is unlikely that all students would be able or empowered to become actively involved in discussion. To better support transformative learning, universities and colleges could consider restricting class sizes for their introductory sustainability courses. For example, they could offer several smaller sections. In this research, some of the courses were smaller in size (20 to 40 students), and several participants noted that this encouraged student discussion. Some of the larger classes provided opportunities for students to talk by creating weekly tutorial or breakout sessions, where students met in smaller numbers to discuss course material or work in group projects. Strategies such as these have the potential to create learning environments that foster transformative learning, particularly if they are led by educators with experience in facilitating transformative learning.

Future Areas for Research

This research suggested several future areas of research that would contribute to a better understanding of the learning objectives and educational goals of introductory sustainability courses. These include the following:

- Compare the mix of learning objectives in courses
- Examine the factors in the selection of learning objectives
- Explore whether the selection of learning objectives has the potential to foster change agency
- Explore the potential for transformative learning in courses

One recommended area of future research is to compare the mix of learning objectives in individual courses. This would give a more detailed understanding of what each of these courses were designed to accomplish, as well as highlight the similarities and differences between these

courses. For example, researchers could categorize courses based on the extent to which they focus on the following objectives:

- The acquisition of knowledge about sustainability
- The development of thinking processes (critical thinking, systems thinking, etc.)
- The development of key sustainability competencies
- Fostering student engagement or empowerment
- Transformative learning

If researchers select a large enough sample size and employ quantitative analysis, this would contribute to a more general understanding of the broader educational goals of introductory courses. With this general understanding, researchers would have a clearer picture of the broader implications of the selection of learning objectives.

Another recommended future area for research is to examine the contextual factors involved in the selection of learning objectives. These might include: broader educational goals; class size; student backgrounds and programs; the instructor's expertise or disciplinary backgrounds; whether the course is a standalone course or part of a program; requirements for higher-level courses; the institution's expected graduate outcomes; and available institutional resources. The results of this research could be used to create a decision matrix for the selection of learning objectives, which may provide a useful guide to educators or curriculum developers who are tasked with designing an introductory sustainability course.

Future research might also explore the potential of introductory sustainability courses to foster change agency. Researchers could look at the mix of learning objectives in these courses and compare them against a framework of change agent abilities and attributes. This could be combined with research on the pedagogies to achieve these learning objectives. Finally, to determine the actual outcomes of these learning objectives and pedagogies, researchers could interview some of the students who take these courses. This research would provide useful

information to educators and curriculum planners who are interested to learn how to foster change agency.

Finally, another future area of research would be to explore the potential for transformative learning in introductory sustainability courses. Researchers could interview instructors and curriculum planners to find out if one of their objectives is to foster transformative learning. If it is, they could ask instructors about the processes they use to foster transformative learning. In addition, researchers could interview students to find out whether they shifted their thoughts, values or actions as a result of the course. They could also ask students what this experience was like for them. This would provide a richer understanding of the potential for transformative learning in these courses, as well as the potential implications of pursuing this type of learning.

Concluding Remarks: The Sustainability Journey

The courses in this research focused on more than just disseminating information or raising awareness about sustainability. In addition to increasing students' knowledge about sustainability, they also aimed to build students' capacities and foster their motivation to put knowledge into practice. This recognizes that it is not sufficient for students to simply memorize facts and practice pre-determined tips for green living. To effectively cope with complex, dynamic problems and contribute to positive change, students will need to build their capacities to think and to apply their knowledge in their personal, professional or civic lives. They need the ability to understand the nature of problems, diagnose their root causes, envision how things might be better, reflect on their own role in contributing to that better vision, and then plot their first steps.

The results of this research suggest that an introductory sustainability course has the potential to provide an initial orientation on sustainability to help guide students on a personal sustainability journey. Instructors can chart the sustainability landscape and point out different topographical features, such as different sustainability problems and topic areas. They can help students develop the capabilities and tools to help them understand the processes that led to the current state and think about where society's current trajectory is heading. Instructors can invite students to reflect on what a better path might look like and help them develop the tools to plan the first steps down an alternative path. They might also offer some initial guidance and help motivate students to start along their own chosen paths. In the end, however, the decision about whether to start the journey or about which paths to take will be up to the students.

References

Abramson, Lyn Y., Martin E. P. Seligman, and John D. Teasdale. 1978. "Learned Helplessness in Humans: Critique and Reformulation." *Journal of Abnormal Psychology* 87, no. 1: 49-74.

ACPA. n.d. *Change Agent Abilities Required to Help Create a Sustainable Future*: American College Personnel Association (ACPA). http://www.myacpa.org/sites/default/files/Change_Agent_Skills_and_Resources.pdf.

Aktas, Can B., Rosemary Whelan, Howard Stoffer, Edmund Todd, and Cindy L. Kern. 2015. "Developing a University-Wide Course on Sustainability: A Critical Evaluation of Planning and Implementation." *Journal of Cleaner Production* 106: 216-221. http://dx.doi.org/10.1016/j.jclepro.2014.11.037.

Almers, Ellen. 2013. "Pathways to Action Competence for Sustainability - Six Themes." *The Journal of Environmental Education* 44, no. 2: 116-127. http://dx.doi.org/10.1080/00958964.2012.719939.

Armstrong, Cosette Marie. 2011. "Implementing Education for Sustainable Development: The Potential use of Time-Honored Pedagogical Practice from the Progressive Era of Education." *Journal of Sustainability Education* 2. http://www.susted.com/wordpress/content/implementing-education-for-sustainable-development-the-potential-use-of-time-honored-pedagogical-practice-from-the-progressive-era-of-education_2011_03/.

Association of American Colleges and Universities, (AAC&U). 2009. *Critical Thinking VALUE Rubric*. https://www.aacu.org/value/rubrics/critical-thinking.

Bandura, Albert. 1977. "Self-Efficacy: Toward a Unifying Theory of Behavioral Change." *Psychological Review* 84, no. 2: 191-215.

———. 1991. "Social Cognitive Theory of Self-Regulation." *Organizational Behavior and Human Decision Processes* 50, no. 2: 248-287. https://doi.org/10.1016/0749-5978(91)90022-L.

Barth, Matthias. 2015. *Implementing Sustainability in Higher Education: Learning in an Age of Transformation*. Routledge Studies in Sustainable Development. Abingdon and New York: Routledge.

Barth, Matthias, Jasmin Godemann, Marco Rieckmann, and Ute Stoltenberg. 2007. "Developing Key Competencies for Sustainable Development in Higher Education." *International Journal of Sustainability in Higher Education* 8, no. 4: 416-430.

Barth, Matthias and Marco Rieckmann. 2015. "State of the Art in Research on Higher Education for Sustainable Development." Chap. 7, In *Routledge Handbook of Higher Education for Sustainable Development*, edited by Matthias Barth, Gerd Michelsen, Marco Rieckmann

and Ian Thomas, 100-113. London: Routledge. https://www-routledgehandbooks-com.login.ezproxy.library.ualberta.ca/doi/10.4324/9781315852249.ch7.

Baumgartner, Lisa M. 2012. "Mezirow's Theory of Transformative Learning from 1975 to Present." Chap. 6, In *The Handbook of Transformative Learning: Theory, Research, and Practice*, edited by Edward W. Taylor, Patricia Cranton and Associates, 99-115. San Francisco, CA: Jossey-Bass.

Bentz, Valerie Malhotra and Jeremy J. Shapiro. 1998. *Mindful Inquiry in Social Research*. Thousand Oaks, CA: Sage.

Blake, Joanna, Stephen Sterling, and Ivor Goodson. 2013. "Transformative Learning for a Sustainable Future: An Exploration of Pedagogies for Change at an Alternative College." *Sustainability* 5, no. 12: 5347-5372. doi:10.3390/su5125347.

Bloom, Benjamin S., Max D. Engelhart, Edward J. Furst, Walker H. Hill, and David R. Krathwohl. 1956. *Taxonomy of Educational Objectives: The Classification of Educational Goals: Handbook 1: Cognitive Domain*. New York: David McKay Company.

Boix Mansilla, Veronica. 2005. "Assessing Student Work at Disciplinary Crossroads." *Change: The Magazine of Higher Learning* 37, no. 1: 14-21. doi:http://dx.doi.org/10.3200/CHNG.37.1.14-21.

Brookfield, Stephen D. 1987. *Developing Critical Thinkers: Challenging Adults to Explore Alternative Ways of Thinking and Acting*. Jossey-Bass Management Series. 1st ed. San Francisco: Jossey-Bass.

———. 2012a. *Teaching for Critical Thinking: Tools and Techniques to Help Students Question their Assumptions*. San Francisco: Jossey-Bass.

Brookfield, Stephen D. 2012b. "Critical Theory and Transformative Learning." Chap. 8, In *The Handbook of Transformative Learning: Theory, Research, and Practice*, edited by Edward W. Taylor, Patricia Cranton and Associates, 131-146. San Francisco, CA: Jossey-Bass.

———. 2015. "Speaking Truth to Power: Teaching Critical Thinking in the Critical Theory Tradition." Chap. 30, In *The Palgrave Handbook of Critical Thinking in Higher Education*, edited by Martin Davies and Ronald Barnett, 529-543. New York, NY: Palgrave Macmillan.

Brundiers, Katja and Arnim Wiek. 2017. "Beyond Interpersonal Competence: Teaching and Learning Professional Skills in Sustainability." *Education Sciences* 7, no. 1: 39. https://doi.org/10.3390/educsci7010039.

Brundtland, Gro Harlem. 1987. *Report of the World Commission on Environment and Development: Our Common Future*. http://www.un-documents.net/our-common-future.pdf.

Bullock, Clair and Gregory Hitzhusen. 2015. "Participatory Development of Key Sustainability Concepts for Dialogue and Curricula at the Ohio State University." *Sustainability* 7, no. 10: 14063-14091. doi:10.3390/su71014063.

Burns, Heather. 2011. "Teaching for Transformation: (Re)Designing Sustainability Courses Based on Ecological Principles." *Journal of Sustainability Education* 2. http://pdxscholar.library.pdx.edu/elp_fac.

———. 2013. "Meaningful Sustainability Learning: A Study of Sustainability Pedagogy in Two University Courses." *International Journal of Teaching and Learning in Higher Education* 25, no. 2: 166-175. http://login.ezproxy.library.ualberta.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1016542&site=ehost-live&scope=site.

Capra, Fritjof. 1999. Ecoliteracy: The Challenge for Education in the Next Century. Berkeley, CA: Center for Ecoliteracy.

Charmaz, Kathy. 2014. *Constructing Grounded Theory*. Introducing Qualitative Methods. Second ed. London and Thousand Oaks, CA: Sage Publications.

Cilliers, Paul. 1998. *Complexity and Postmodernism: Understanding Complex Systems*. London: Routledge.

Clark, Susan G., Murray B. Rutherford, Matthew R. Auer, David N. Cherney, Richard L. Wallace, David J. Mattson, Douglas A. Clark, et al. 2011. "College and University Environmental Programs as a Policy Problem (Part 2): Strategies for Improvement." *Environmental Management* 47, no. 5: 716-726. https://link.springer.com/article/10.1007%2Fs00267-011-9635-2.

Clark, Susan G. and Richard L. Wallace. 2015. "Integration and Interdisciplinarity: Concepts, Frameworks, and Education." *Policy Sciences* 48, no. 2: 233-255.

Coates, Hamish. 2006. *Student Engagement in Campus-Based and Online Education: University Connections*. London: Routledge.

Coops, Nicholas C., Jean Marcus, Ileana Construt, Erica Frank, Ron Kellett, Eric Mazzi, Alison Munro, et al. 2015. "How an Entry-Level, Interdisciplinary Sustainability Course Revealed the Benefits and Challenges of a University-Wide Initiative for Sustainability Education." *International Journal of Sustainability in Higher Education* 16, no. 5: 729-747. https://www.doi.org/10.1108/IJSHE-04-2014-0059.

Corbin, Juliet M. and Anselm L. Strauss. 2008. *Basics of Qualitative Research*. 3e [] ed. Los Angeles, Calif. ;London: Sage. http://methods.sagepub.com/book/basics-of-qualitative-research http://methods.sagepub.com/book/basics-of-qualitative-research.

Cortese, Anthony D. 2003. "The Critical Role of Higher Education in Creating a Sustainable Future." *Planning for Higher Education* 31, no. 3: 15-22.

Cotton, Deborah R. E. 2006. "Teaching Controversial Environmental Issues: Neutrality and Balance in the Reality of the Classroom." *Educational Research* 48, no. 2: 223-241. https://doi.org/10.1080/00131880600732306.

Cotton, Deborah R. E., Martyn F. Warren, Olga Maiboroda, and Ian Bailey. 2007. "Sustainable Development, Higher Education and Pedagogy: A Study of Lecturers' Beliefs and Attitudes." *Environmental Education Research* 13, no. 5: 579-597. http://dx.doi.org/10.1080/13504620701659061.

Cotton, Deborah R. E. and Jennie Winter. 2010. "It's Not just Bits of Paper and Light Bulbs': A Review of Sustainability Pedagogies and their Potential for use in Higher Education." Chap. 3, In *Sustainability Education: Perspectives and Practice Across Higher Education*, edited by Paula Jones, David Selby and Stephen Sterling, 39-54. London: Earthscan.

Council for Higher Education Accreditation. 2019. *Accreditation and Student Learning Outcomes: Perspectives from Accrediting Organizations*. Washington, DC: Council for Higher Education Accreditation. https://www.chea.org/accreditation-and-student-learning-outcomes-perspectives-accrediting-organizations.

Cranton, Patricia. 2016. *Understanding and Promoting Transformative Learning: A Guide to Theory and Practice*. 3rd ed. Sterling, Virginia: Stylus Publishing.

Crofton, Fiona S. 2000. "Educating for Sustainability: Opportunities in Undergraduate Engineering." *Journal of Cleaner Production* 8, no. 5: 397-405.

Crompton, Tom. 2010. *Common Cause: The Case for Working with our Cultural Values*. United Kingdom: WWF-UK. https://policy-practice.oxfam.org.uk/publications/common-cause-the-case-for-working-with-our-cultural-values-112367.

Dale, Ann and Lenore Newman. 2005. "Sustainable Development, Education and Literacy." *International Journal of Sustainability in Higher Education* 6, no. 4: 351-362. http://dx.doi.org/10.1108/14676370510623847.

Davies, Kate. 2009. "A Learning Society." Chap. 32, In *The Handbook of Sustainability Literacy: Skills for a Changing World*, edited by Arran Stibbe, 215-220. Totnes, UK: Green Books.

Davies, Martin and Ronald Barnett. 2015. "Introduction." In *The Palgrave Handbook of Critical Thinking in Higher Education*, edited by Martin Davies and Ronald Barnett, 1-25. New York, NY: Palgrave Macmillan. doi:10.1057/9781137378057_1.

de Haan, Gerhard. 2006. "The BLK '21'programme in Germany: A 'Gestaltungskompetenz'-based Model for Education for Sustainable Development." *Environmental Education Research* 12, no. 1: 19-32. http://dx.doi.org.login.ezproxy.library.ualberta.ca/10.1080/13504620500526362.

Deci, Edward L. and Richard M. Ryan. 1985. *Intrinsic Motivation and Self-Determination in Human Behavior*. Perspectives in Social Psychology, edited by Elliott Aronson. New York: Springer Science + Business Media. http://link.springer.com/10.1007/978-1-4899-2271-7.

Dobson, Helen E. and C. Bland Tomkinson. 2012. "Creating Sustainable Development Change Agents through Problem-Based Learning: Designing Appropriate Student PBL Projects." *International Journal of Sustainability in Higher Education* 13, no. 3: 263-278. http://dx.doi.org/10.1108/14676371211242571.

Domask, Joseph J. 2007. "Achieving Goals in Higher Education: An Experiential Approach to Sustainability Studies." *International Journal of Sustainability in Higher Education* 8, no. 1: 53-68.

DuPuis, E. Melanie and Tamara Ball. 2013. "How Not what: Teaching Sustainability as Process." *Sustainability: Science, Practice, & Policy* 9, no. 1: 64-75.

Dyer, Jean A. 2003. "Multidisciplinary, Interdisciplinary, and Transdisciplinary Educational Models and Nursing Education." *Nursing Education Perspectives* 24, no. 4: 186-188.

Escrigas, Cristina. 2016. "A Higher Calling for Higher Education." *Great Transition Initiative*. https://www.greattransition.org/images/GTI_publications/A-Higher-Calling-for-Higher-Education.pdf.

Evans, Tina Lynn. 2015a. "Finding Heart: Generating and Maintaining Hope and Agency through Sustainability Education." *Journal of Sustainability Education* 10: 1-38.

———. 2015b. "Transdisciplinary Collaborations for Sustainability Education: Institutional and Intragroup Challenges and Opportunities." *Policy Futures in Education* 13, no. 1: 70-96. https://doi.org/10.1177/1478210314566731.

Fagan, Geoff. 2009. "Citizen Engagement." Chap. 29, In *The Handbook of Sustainability Literacy: Skills for a Changing World*, edited by Arran Stibbe, 199-203. Totnes, UK: Green Books.

Feinberg, Matthew and Robb Willer. 2015. "From Gulf to Bridge: When do Moral Arguments Facilitate Political Influence?" *Personality and Social Psychology Bulletin* 41, no. 12: 1665-1681. https://doi.org/10.1177/0146167215607842.

Fisher, P. Brian and Erin McAdams. 2015. "Gaps in Sustainability Education: The Impact of Higher Education Coursework on Perceptions of Sustainability." *International Journal of Sustainability in Higher Education* 16, no. 4: 407-423. doi:10.1108/IJSHE-08-2013-0106.

Fredricks, Jennifer A., Phyllis C. Blumenfeld, and Alison H. Paris. 2004. "School Engagement: Potential of the Concept, State of the Evidence." *Review of Educational Research* 74, no. 1: 59-109. https://journals.sagepub.com/doi/10.3102/00346543074001059.

Frisk, Erin and Kelli L. Larson. 2011. "Educating for Sustainability: Competencies & Practices for Transformative Action." *Journal of Sustainability Education* 2, no. March: 20 pp.

Fry, Heather, Steve Ketteridge, and Stephanie Marshall. 2009. *A Handbook for Teaching and Learning in Higher Education*. Third ed. New York and London: Routledge.

http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=236541.

Fuchs, Doris, Antonietta Di Giulio, Katharina Glaab, Sylvia Lorek, Michael Maniates, Thomas Princen, and Inge Røpke. 2016. "Power: The Missing Element in Sustainable Consumption and Absolute Reductions Research and Action." *Journal of Cleaner Production* 132: 298-307. http://dx.doi.org/10.1016/j.jclepro.2015.02.006.

Gibbs, Graham R. 2007. *Analyzing Qualitative Data*. The SAGE Qualitative Research Kit. London: Sage Publications. http://dx.doi.org/10.4135/9781849208574.

Glasser, Harold and Jamie Hirsh. 2016. "Toward the Development of Robust Learning for Sustainability Core Competencies." *Sustainability: The Journal of Record* 9, no. 3: 121-134.

Godemann, Jasmin and Gerd Michelsen. 2011. "Sustainability Communication - an Introduction." Chap. 1, In *Sustainability Communication: Interdisciplinary Perspectives and Theoretical Foundations*, edited by Jasmin Godemann and Gerd Michelsen, 3-11. Dordrecht: Springer Netherlands.

Goekler, John. 2003. "Teaching for the Future: Systems Thinking and Sustainability." *Green Teacher*, no. 70: 8-14.

Goodman, Diane. 2001. *Promoting Diversity and Social Justice: Educating People from Privileged Groups*. Winter Roundtable Series. Vol. 2. Thousand Oaks, CA: Sage Publications.

Gravett, Sarah and Nadine Petersen. 2009. "Promoting Dialogic Teaching among Higher Education Faculty in South Africa." Chap. 9, In *Transformative Learning in Practice: Insights from Community, Workplace, and Higher Education*, edited by Jack Mezirow, Edward W. Taylor and Associates, 100-110. San Francisco, CA: Jossey-Bass.

Green, Tom L. 2013. "Teaching (Un)Sustainability? University Sustainability Commitments and Student Experiences of Introductory Economics." *Ecological Economics* 94: 135-142. https://doi.org/10.1016/j.ecolecon.2013.08.003.

Gruenewald, David A. 2003. "Foundations of Place: A Multidisciplinary Framework for Place-Conscious Education." *American Educational Research Journal* 40, no. 3: 619-654.

Habron, Geoffrey. 2012. "Competency-Based Sustainability Specialization at Michigan State University." *Sustainability: The Journal of Record* 5, no. 6: 379-385. https://www.liebertpub.com/doi/10.1089/SUS.2012.9912.

Harvey, Lee. "Analytic Quality Glossary." Quality Research International, accessed July 26, 2019, http://www.qualityresearchinternational.com/glossary/.

Healy, Stephen. 2003. "Epistemological Pluralism and the 'Politics of Choice'." *Futures* 35, no. 7: 689-701. https://doi.org/10.1016/S0016-3287(03)00022-3.

Hegarty, Kathryn, Ian Thomas, Cathryn Kriewaldt, Sarah Holdsworth, and Sarah Bekessy. 2011. "Insights into the Value of a 'stand-alone' Course for Sustainability Education." *Environmental Education Research* 17, no. 4: 451-469. doi:10.1080/13504622.2010.547931.

Hickman, Gina, Manuel Riemer, and the YLEC Collaborative. 2016. "A Theory of Engagement for Fostering Collective Action in Youth Leading Environmental Change." *Ecopsychology* 8, no. 3: 167-173. doi:10.1089/eco.2016.0024.

Hicks, David. 2002. *Lessons for the Future: The Missing Dimension in Education*. Futures and Education Series. London and New York: RoutledgeFalmer.

Hilchey, Joel and Mallory Drumm. 2013. "Lessons Learned from McMaster's First Crack at a Sustainability Course." Proceedings of the 2013 Canadian Engineering Education Association (CEEA13) Conference, École Polytechnique de Montréal, Montreal, QC, June 17-20, 2013. https://doi.org/10.24908/pceea.v0i0.4822.

Holling, Crawford S. 2001. "Understanding the Complexity of Economic, Ecological, and Social Systems." *Ecosystems* 4, no. 5: 390-405. https://link.springer.com/article/10.1007%2Fs10021-001-0101-5.

Howlett, Cathy, Jo-Anne Ferreira, and Jessica Blomfield. 2016. "Teaching Sustainable Development in Higher Education: Building Critical, Reflective Thinkers through an Interdisciplinary Approach." *International Journal of Sustainability in Higher Education* 17, no. 3: 305-321. https://doi.org/10.1108/IJSHE-07-2014-0102.

Huckle, John. 2004. "Critical Realism: A Philosophical Framework for Higher Education for Sustainability." In *Higher Education and the Challenge of Sustainability: Problematics, Promise, and Practice*, edited by Peter Blaze Corcoran and Arjen E. J. Wals, 33-47. Dordrecht, The Netherlands: Kluwer Academic Publishers.

International Association of Universities. 1993. *IAU Policy Statement. Kyoto Declaration on Sustainable Development*. https://iau-aiu.net/IMG/pdf/sustainable_development_policy_statement.pdf.

Jickling, Bob. 2017. "Education Revisited: Creating Educational Experiences that are Held, Felt, and Disruptive." In *Post-Sustainability and Environmental Education: Remaking Education for the Future*, edited by Bob Jickling and Stephen Sterling, 15-30. Cham: Palgrave Macmillan.

Jickling, Bob and Helen Spork. 1998. "Education for the Environment: A Critique." *Environmental Education Research* 4, no. 3: 309-327. http://dx.doi.org/10.1080/1350462980040306.

Jickling, Bob and Arjen E. J. Wals. 2008. "Globalization and Environmental Education: Looking Beyond Sustainable Development." *Journal of Curriculum Studies* 40, no. 1: 1-21. https://doi.org/10.1080/00220270701684667.

John, Beatrice, Guido Caniglia, Leonie Bellina, Daniel J. Lang, and Manfred Laubichler. 2017. *The Glocal Curriculum: A Practical Guide to Teaching and Learning in an Interconnected World*. Baden-Baden: [sic!] Critical Aesthetics Publishing. https://artrelated.net/sic/publication/9783933809308/.

Johnson, Peter G. 2014. *Using the Telephone to Interview Professionals: Understanding the use of Models in Environmental Policy*. SAGE Research Methods Cases. London: SAGE Publications. https://dx.doi.org/10.4135/978144627305013508886.

Jones, Anna. 2009. "Generic Attributes as Espoused Theory: The Importance of Context." *Higher Education* 58, no. 2: 175-191. https://link.springer.com/article/10.1007%2Fs10734-008-9189-2.

Jones, Paula, David Selby, and Stephen Sterling. 2010. "More than the Sum of their Parts? Interdisciplinarity and Sustainability." Chap. 2, In *Sustainability Education: Perspectives and Practice Across Higher Education*, edited by Paula Jones, David Selby and Stephen Sterling, 17-37. London: Earthscan.

Kagawa, Fumiyo. 2007. "Dissonance in Students' Perceptions of Sustainable Development and Sustainability: Implications for Curriculum Change." *International Journal of Sustainability in Higher Education* 8, no. 3: 317-338. doi:10.1108/14676370710817174.

Kearins, Kate and Delyse Springett. 2003. "Educating for Sustainability: Developing Critical Skills." *Journal of Management Education* 27, no. 2: 188-204. https://doi.org/10.1177/1052562903251411.

Klein, Julie Thompson. 2004. "Interdisciplinarity and Complexity: An Evolving Relationship." *Emergence: Complexity & Organization* 6, no. 1-2: 2-10.

Kollmuss, Anja and Julian Agyeman. 2002. "Mind the Gap: Why do People Act Environmentally and what are the Barriers to Pro-Environmental Behavior?" *Environmental Education Research* 8, no. 3: 239-260. https://doi.org/10.1080/13504620220145401.

Krathwohl, David R., Benjamin S. Bloom, and Bertram B. Masia. 1964. *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook II: Affective Domain*. New York: David McKay Company.

Kvale, Steinar. 2007. *Doing Interviews*. SAGE Qualitative Research Kit. London: SAGE Publications.

Laininen, Erkka. 2019. "Transforming our Worldview Towards a Sustainable Future." In *Sustainability, Human Well-being, and the Future of Education*, edited by Justin W. Cook, 161-200. Cham: Palgrave Macmillan. https://doi.org/10.1007/978-3-319-78580-6_5.

Lange, Elizabeth A. 2009. "Fostering a Learning Sanctuary for Transformation in Sustainability Education." Chap. 17, In *Transformative Learning in Practice: Insights from Community,*

Workplace, and Higher Education, edited by Jack Mezirow, Edward W. Taylor and Associates, 193-204. San Francisco, CA: Jossey-Bass.

Learning for a Sustainable Future. "About LSF.", last modified n.d., accessed June 11, 2019, http://lsf-lst.ca/en/about-lsf.

Leiserowitz, Anthony A. and Lisa O. Fernandez. 2008. "Toward a New Consciousness: Values to Sustain Human and Natural Communities." *Environment: Science and Policy for Sustainable Development* 50, no. 5: 62-69. https://doi.org/10.3200/ENVT.50.5.62-69.

Longino, Helen E. 2002. *The Fate of Knowledge*. Princeton, New Jersey: Princeton University Press.

Lozano, Rodrigo, Kim Ceulemans, Mar Alonso-Almeida, Donald Huisingh, Francisco J. Lozano, Tom Waas, Wim Lambrechts, Rebeka Lukman, and Jean Hugé. 2015. "A Review of Commitment and Implementation of Sustainable Development in Higher Education: Results from a Worldwide Survey." *Journal of Cleaner Production* 108: 1-18. http://dx.doi.org/10.1016/j.jclepro.2014.09.048.

Lozano, Rodrigo, Kim Ceulemans, and Carol Scarff Seatter. 2015. "Teaching Organisational Change Management for Sustainability: Designing and Delivering a Course at the University of Leeds to Better Prepare Future Sustainability Change Agents." *Journal of Cleaner Production* 106: 205-215. http://dx.doi.org/10.1016/j.jclepro.2014.03.031.

Lozano, Rodrigo, Rebeka Lukman, Francisco J. Lozano, Donald Huisingh, and Wim Lambrechts. 2013. "Declarations for Sustainability in Higher Education: Becoming Better Leaders, through Addressing the University System." *Journal of Cleaner Production* 48: 10-19.

MacDonald, Lindsey and Mike Shriberg. 2016. "Sustainability Leadership Programs in Higher Education: Alumni Outcomes and Impacts." *Journal of Environmental Studies and Sciences* 6, no. 2: 360-370. doi:10.1007/s13412-015-0344-7.

Marcus, Jean, Nicholas C. Coops, Shona Ellis, and John Robinson. 2015. "Embedding Sustainability Learning Pathways Across the University." *Current Opinion in Environmental Sustainability* 16: 7-13. http://dx.doi.org/10.1016/j.cosust.2015.07.012.

Max-Neef, Manfred A. 2005. "Foundations of Transdisciplinarity." *Ecological Economics* 53, no. 1: 5-16.

Maxwell, Joseph A. 2013. *Qualitative Research Design: An Interactive Approach*. Applied Social Research Methods. 3rd ed. Vol. 41. Thousand Oaks, CA: SAGE Publications, Inc.

McKeown, Rosalyn. 2006. *Education for Sustainable Development Toolkit*. Paris: UNESCO. https://unesdoc-unesco-org.login.ezproxy.library.ualberta.ca/.

Meadows, Donella H. 2008. *Thinking in Systems: A Primer*, edited by Diana Wright. White River Junction, VT: Chelsea Green Publishing.

Merriam-Webster Dictionary. "Definition of Lens." Merriam-Webster, Inc., last modified n.d., accessed September 19, 2019, https://www.merriam-webster.com/dictionary/lens.

Mezirow, Jack. 1985. "A Critical Theory of Self-directed Learning." In *Self-Directed Learning: From Theory to Practice*, edited by Stephen Brookfield, 17-30. San Francisco: Jossey-Bass.

———. 2000. "Learning to Think Like an Adult: Core Concepts of Transformation Theory." Chap. 1, In *Learning as Transformation: Critical Perspectives on a Theory in Progress*, edited by Jack Mezirow and Associates, 3-33. San Francisco, CA: Jossey-Bass.

———. 2003. "Transformative Learning as Discourse." *Journal of Transformative Education* 1, no. 1: 58-63. doi:10.1177/1541344603252172.

———. 2009. "Transformative Learning Theory." Chap. 2, In *Transformative Learning in Practice: Insights from Community, Workplace, and Higher Education*, edited by Jack Mezirow, Edward W. Taylor and Associates, 18-31. San Francisco, CA: Jossey-Bass.

Miles, Matthew B., A. Michael Huberman, and Johnny Saldaña. 2014. *Qualitative Data Analysis: A Methods Sourcebook*. 3rd ed. Thousand Oaks, CA: Sage Publications.

Miller, Clark and Paul Erickson. 2006. "The Politics of Bridging Scales and Epistemologies: Science and Democracy in Global Environmental Governance." Chap. 16, In *Bridging Scales and Knowledge Systems: Concepts and Applications in Ecosystem Assessment*, edited by Walter V. Reid, Fikret Berkes, Thomas Wilbanks and Doris Capistrano, 297-314. Washington, D.C.: Island Press.

Miller, Hannah K. 2016. "Undergraduates in a Sustainability Semester: Models of Social Change for Sustainability." *Journal of Environmental Education* 47, no. 1: 52-67. http://dx.doi.org/10.1080/00958964.2015.1072703.

Miller, Thaddeus R., Timothy D. Baird, Caitlin M. Littlefield, Gary Kofinas, F. Stuart Chapin III, and Charles L. Redman. 2008. "Epistemological Pluralism: Reorganizing Interdisciplinary Research." *Ecology and Society* 13, no. 2: 46. http://www.ecologyandsociety.org/vol13/iss2/art46/.

Mintz, Keren and Tali Tal. 2014. "Sustainability in Higher Education Courses: Multiple Learning Outcomes." *Studies in Educational Evaluation* 41: 113-123.

———. 2016. "The Place of Content and Pedagogy in Shaping Sustainability Learning Outcomes in Higher Education." *Environmental Education Research*: 1-23.

Moore, Janet. 2005. "Is Higher Education Ready for Transformative Learning? A Question Explored in the Study of Sustainability." *Journal of Transformative Education* 3, no. 1: 76-91. doi:10.1177/1541344604270862.

Mulkey, Stephen. 2015. "Sustainability Programming is an Ethical Obligation for Higher Education in the Environmental Century." *Journal of Sustainability Education* 10.

http://www.jsedimensions.org/wordpress/wp-content/uploads/2015/11/Mulkey-JSE-November-2015-Hope-Issue-PDF1.pdf.

Murray, Paul, Julie Goodhew, and Sheran Murray. 2014. "The Heart of ESD: Personally Engaging Learners with Sustainability." *Environmental Education Research* 20, no. 5: 718-734. https://doi.org/10.1080/13504622.2013.836623.

Newman, Jeffrey. 2009. "Values Reflection and the Earth Charter: The Ability to Critique the Values of an Unsustainable Society and Consider Alternatives." Chap. 14, In *The Handbook of Sustainability Literacy Skills for a Changing World*, edited by Arran Stibbe, 99-104. Totnes, UK: Green Books.

Nolet, Victor. 2016. *Educating for Sustainability: Principles and Practices for Teachers*. New York: Routledge.

Norgaard, Kari Marie. 2011. *Living in Denial: Climate Change, Emotions, and Everyday Life*. Cambridge, Massachusetts: The MIT Press.

Norgaard, Richard B. 1994. *Development Betrayed: The End of Progress and a Co-Evolutionary Revisioning of the Future*. London: Routledge.

Ojala, Maria. 2012. "Hope and Climate Change: The Importance of Hope for Environmental Engagement among Young People." *Environmental Education Research* 18, no. 5: 625-642. http://dx.doi.org/10.1080/13504622.2011.637157.

Osman, Amina, Sultana Ladhani, Emma Findlater, and Veronica McKay. 2017. *Curriculum Framework for the Sustainable Development Goals*: Commonwealth Secretariat.

O'Sullivan, Edmund. 2004. "Sustainability and Transformative Educational Vision." Chap. 13, In *Higher Education and the Challenge of Sustainability: Problematics, Promise, and Practice*, edited by Peter Blaze Corcoran and Arjen E. J. Wals, 163-180. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Oulton, Chris, Justin Dillon, and Marcus M. Grace. 2004. "Reconceptualizing the Teaching of Controversial Issues." *International Journal of Science Education* 26, no. 4: 411-423. https://doi.org/10.1080/0950069032000072746.

Palys, Ted. 2008. "Purposive Sampling." In *The Sage Encyclopedia of Qualitative Research Methods*, edited by Lisa M. Given, 697-698. Thousand Oaks, CA: Sage Publications.

Park, Ji-Yong and Jeong-Bae Son. 2010. "Transitioning Toward Transdisciplinary Learning in a Multidisciplinary Environment." *International Journal of Pedagogies and Learning* 6, no. 1: 82-93. doi:http://dx.doi.org/10.5172/ijpl.6.1.82.

Parker, Kelly A. 2012. "Introduction: Sustainability in Higher Education." In *Teaching Sustainability / Teaching Sustainably*, edited by Kirsten A. Bartels and Kelly A. Parker, 1-15. Sterling, Virginia: Stylus Publishing, LLC.

Plutarch. 1927. "On Listening to Lectures." In *Moralia*. Translated by Frank Cole Babbitt. Vol. 1, 201-259. Cambridge, MA: Harvard University Press. doi:10.4159/DLCL.plutarch-moralia_education_children.1927.

QSR International. "What is NVivo?", accessed July 19, 2019, https://www.qsrinternational.com/nvivo/what-is-nvivo.

Quinn, Courtney and Gina Matkin. 2012. "Teaching Sustainability Leadership." Chap. 17, In *Teaching Sustainability / Teaching Sustainably*, edited by Kirsten Allen Bartels and Kelly A. Parker, 207-218. Sterling, VA: Stylus Publishing.

Raskin, Paul D. 2008. "World Lines: A Framework for Exploring Global Pathways." *Ecological Economics* 65, no. 3: 461-470. doi:10.1016/j.ecolecon.2008.01.021.

Redman, Charles L. and Arnim Wiek. 2013. "Sustainability as a Transformation in Education." In *Higher Education for Sustainability: Cases, Challenges, and Opportunities from Across the Curriculum*, edited by Lucas F. Johnston, 214-222. New York: Routledge.

Remington-Doucette, Sonya M., Kim Y. Hiller Connell, Cosette M. Armstrong, and Sheryl L. Musgrove. 2013. "Assessing Sustainability Education in a Transdisciplinary Undergraduate Course Focused on Real-World Problem Solving: A Case for Disciplinary Grounding." *International Journal of Sustainability in Higher Education* 14, no. 4: 404-433.

Rieckmann, Marco. 2012. "Future-Oriented Higher Education: Which Key Competencies should be Fostered through University Teaching and Learning?" *Futures* 44, no. 2: 127-135. https://doi.org/10.1016/j.futures.2011.09.005.

Riemer, Manuel, Jennifer Lynes, and Gina Hickman. 2014. "A Model for Developing and Assessing Youth-Based Environmental Engagement Programmes." *Environmental Education Research* 20, no. 4: 552-574. doi:10.1080/13504622.2013.812721.

Rockström, Johan, Will Steffen, Kevin Noone, Åsa Persson, F. Stuart Chapin III, Eric F. Lambin, Timothy M. Lenton, et al. 2009. "A Safe Operating Space for Humanity." *Nature* 461: 472-475. doi:10.1038/461472a.

Rowe, Debra. 2002. "Environmental Literacy and Sustainability as Core Requirements: Success Stories and Models." Reprinted from *Teaching Sustainability at Universities: Towards Curriculum Greening*, Edited by W. L. Filho. New York: Peter Lang. https://www.stmarys-ca.edu/sites/default/files/attachments/files/Sustainability%20as%20a%20general%20education%20requirement.pdf.

Rowe, Debra and Lucas Johnston. 2013. "Learning Outcomes: An International Comparison of Countries and Declarations." In *Higher Education for Sustainability: Cases, Challenges, and Opportunities from Across the Curriculum*, edited by Lucas Johnston, 45-60. New York: Routledge.

Saldaña, Johnny. 2016. *The Coding Manual for Qualitative Researchers*. 3rd ed. London: Sage Publications.

Sandri, Orana Jade. 2013. "Threshold Concepts, Systems and Learning for Sustainability." *Environmental Education Research* 19, no. 6: 810-822. http://dx.doi.org/10.1080/13504622.2012.753413.

Sayal, Radha, Sayema Haque Bidisha, Jennifer Lynes, Manuel Riemer, Janjri Jasani, Edel Monteiro, Brandon Hey, Arun De Souza, Sara Wicks, and Allison Eady. 2016. "Fostering Systems Thinking for Youth Leading Environmental Change: A Multinational Exploration." *Ecopsychology* 8, no. 3: 188-201. https://www.liebertpub.com/doi/10.1089/eco.2016.0023.

Schwartz, Shalom H. 2012. "An Overview of the Schwartz Theory of Basic Values." *Online Readings in Psychology and Culture* 2, no. 1: 1-20. https://doi.org/10.9707/2307-0919.1116.

Senge, Peter M. 2006. *The Fifth Discipline: The Art and Practice of the Learning Organization.* Revised and updated ed. New York: Doubleday.

Shashkevich, Alex. 2017. "Can Empathy Bridge Political Divides?" *Greater Good Magazine*, January 23,. https://greatergood.berkeley.edu/article/item/can_empathy_bridge_political_divides.

Sipos, Yona, Bryce Battisti, and Kurt Grimm. 2008. "Achieving Transformative Sustainability Learning: Engaging Head, Hands and Heart." *International Journal of Sustainability in Higher Education* 9, no. 1: 68-86.

Steiner, Gerald and Alfred Posch. 2006. "Higher Education for Sustainability by Means of Transdisciplinary Case Studies: An Innovative Approach for Solving Complex, Real-World Problems." *Journal of Cleaner Production* 14, no. 9–11: 877-890. doi:10.1016/j.jclepro.2005.11.054.

Sterling, Stephen. 2001. *Sustainable Education: Re-Visioning Learning and Change*. Schumacher Briefings. Totnes, Devon, U.K.: Green Books.

———. 2004a. "An Analysis of the Development of Sustainability Education Internationally: Evolution, Interpretation and Transformative Potential." Chap. 4, In *The Sustainability Curriculum: The Challenge for Higher Education*, edited by John Blewitt and Cedric Cullingford, 40-53. London and New York: Earthscan.

———. 2004b. "Higher Education, Sustainability, and the Role of Systemic Learning." Chap. 5, In *Higher Education and the Challenge of Sustainability: Problematics, Promise, and Practice*, edited by Peter Blaze Corcoran and Arjen E. J. Wals, 49-70. Dordecht, The Netherlands: Kluwer Academic Publishers.

———. 2009a. "Ecological Intelligence." In *Higher Education and the Challenge of Sustainability: Problematics, Promise, and Practice*, edited by Peter Blaze Corcoran and Arjen E. J. Wals, 49-70. Dordrecht: Springer Netherlands.

———. 2009b. "Ecological Intelligence: Viewing the World Relationally." Chap. 10, In *The Handbook of Sustainability Literacy: Skills for a Changing World*, edited by Arran Stibbe, 77-83. Green Books: Totnes, UK.

———. 2010. "Learning for Resilience, Or the Resilient Learner? Towards a Necessary Reconciliation in a Paradigm of Sustainable Education." *Environmental Education Research* 16, no. 5-6: 511-528. https://doi-org.login.ezproxy.library.ualberta.ca/10.1080/13504622.2010.505427.

———. 2011. "Transformative Learning and Sustainability: Sketching the Conceptual Ground." *Learning and Teaching in Higher Education*, no. 5: 17-33.

———. 2017. "Assuming the Future: Repurposing Education in a Volatile Age." In *Post-Sustainability and Environmental Education: Remaking Education for the Future*, edited by Bob Jickling and Stephen Sterling, 31-45. Cham, Switzerland: Springer.

Sterling, Stephen, Harold Glasser, Marco Rieckmann, and Paul Warwick. 2017. "'More than Scaling Up': A Critical and Practical Inquiry into Operationalizing Sustainability Competencies." Chap. 10, In *Envisioning Futures for Environmental and Sustainability Education*, edited by Peter Blaze Corcoran, Joseph P. Weakland and Arjen E. J. Wals, 153-168. Wageningen, The Netherlands: Wageningen Academic Publishers.

Stern, Paul C. 2000. "New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior." *Journal of Social Issues* 56, no. 3: 407-424. https://doi.org/10.1111/0022-4537.00175.

Svanström, Magdalena. 2016. "Developing Change Agency for Sustainable Development—Experiences from a New Chemical Engineering Course." In *New Developments in Engineering Education for Sustainable Development*, edited by Walter Leal Filho and Susan Nesbit, 295-307. Cham: Springer.

Svanström, Magdalena, Francisco J. Lozano-García, and Debra Rowe. 2008. "Learning Outcomes for Sustainable Development in Higher Education." *International Journal of Sustainability in Higher Education* 9, no. 3: 339-351. http://dx.doi.org/10.1108/14676370810885925.

Tarrant, Seaton Patrick and Leslie Paul Thiele. 2016. "Practice Makes pedagogy–John Dewey and Skills-Based Sustainability Education." *International Journal of Sustainability in Higher Education* 17, no. 1: 54-67.

Taylor, Edward W. 2000. "Analyzing Research on Transformative Learning Theory." Chap. 11, In *Learning as Transformation: Critical Perspectives on a Theory in Progress*, edited by Jack Mezirow and Associates, 285-328. San Francisco, CA: Jossey-Bass.

———. 2009. "Fostering Transformative Learning." Chap. 1, In *Transformative Learning in Practice: Insights from Community, Workplace, and Higher Education*, edited by Jack Mezirow, Edward W. Taylor and Associates, 3-17. San Francisco, CA: Jossey-Bass.

Taylor, Edward W. and Jodi Jarecke. 2009. "Looking Forward by Looking Back." Chap. 24, In *Transformative Learning in Practice: Insights from Community, Workplace, and Higher Education*, edited by Jack Mezirow, Edward W. Taylor and Associates, 275-289. San Francisco, CA: Jossey-Bass.

Thomas, Ian. 2009. "Critical Thinking, Transformative Learning, Sustainable Education, and Problem-Based Learning in Universities." *Journal of Transformative Education* 7, no. 3: 245-264.

Thomas, Ian and Teresa Day. 2014. "Sustainability Capabilities, Graduate Capabilities, and Australian Universities." *International Journal of Sustainability in Higher Education* 15, no. 2: 208-227. http://dx.doi.org/10.1108/IJSHE-05-2012-0046.

Thomas, Kenneth W. and Betty A. Velthouse. 1990. "Cognitive Elements of Empowerment: An 'Interpretive' Model of Intrinsic Task Motivation." *The Academy of Management Review* 15, no. 4: 666-681. https://www.jstor.org/stable/258687.

Tilbury, Daniella. 2011. *Education for Sustainable Development: An Expert Review of Processes and Learning*. Paris: UNESCO.

———. 2015. "Student Engagement and Leadership in Higher Education for Sustainability." Chap. 18, In *Routledge Handbook of Higher Education for Sustainable Development*, edited by Matthias Barth, Gerd Michelsen, Marco Rieckmann and Ian Thomas, 273-286. London: Routledge.

Tilbury, Daniella and Dave Wortman. 2004. *Engaging People in Sustainability*. Gland, Switzerland and Cambridge, UK: IUCN Commission on Education and Communication. https://portals.iucn.org/library/efiles/documents/2004-055.pdf.

UNESCO. 1997. *Education for a Sustainable Future: A Transdisciplinary Vision for Concerted Action*. Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO).

———. . 2002. *Education for Sustainability: From Rio to Johannesburg: Lessons Learnt from a Decade of Commitment*. Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO).

———. . 2005. *United Nations Decade of Education for Sustainable Development (2005-2014): International Implementation Scheme*. Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO).

———. . 2014. *Roadmap for Implementing the Global Action Programme on Education for Sustainable Development*. Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO). https://unesdoc.unesco.org/ark:/48223/pf0000230514.

United Nations Conference on Environment and Development, (UNCED). 1992. "Agenda 21: Program of Action for Sustainable Development, Rio Declaration on Environment and

Development." United Nation Conference on Environment and Development, . https://sustainabledevelopment.un.org/outcomedocuments/agenda21.

University Leaders for a Sustainable Future. 1990. *Report and Declaration of the Presidents Conference (1990)*. http://ulsf.org/report-and-declaration-of-the-presidents-conference-1990/.

van der Leeuw, Sander, Arnim Wiek, John Harlow, and James Buizer. 2012. "How Much Time do we have? Urgency and Rhetoric in Sustainability Science." *Sustainability Science* 7, no. 1: 115-120. doi:10.1007/s11625-011-0153-1.

Van Meter, Kimberly, Erica Blair, Alexandra Swift, Carolyn Colvin, and Craig Just. 2012. "An Introduction to Sustainability Service-Learning Course for the Creation of Sustainable Citizens to Engage Wicked Problems." *Journal of Service-Learning in Higher Education* 1: 30-49.

Van Poeck, Katrien, Jeppe Læssøe, and Thomas Block. 2017. "An Exploration of Sustainability Change Agents as Facilitators of Nonformal Learning: Mapping a Moving and Intertwined Landscape." *Ecology and Society* 22, no. 2: 33. doi:10.5751/ES-09308-220233.

Vann, John, Pedro Pacheco, and John Motloch. 2006. "Cross-Cultural Education for Sustainability: Development of an Introduction to Sustainability Course." *Journal of Cleaner Production* 14, no. 9–11: 900-905. https://doi.org/10.1016/j.jclepro.2006.01.002.

Vare, Paul and William Scott. 2007. "Learning for a Change: Exploring the Relationship between Education and Sustainable Development." *Journal of Education for Sustainable Development* 1, no. 2: 191-198. https://journals.sagepub.com/doi/10.1177/097340820700100209.

Vaughter, Philip, Tarah Wright, and Yuill Herbert. 2015. "50 Shades of Green: An Examination of Sustainability Policy on Canadian Campuses." *The Canadian Journal of Higher Education* 45, no. 4: 81-100.

Verplanken, Bas and Rob W. Holland. 2002. "Motivated Decision Making: Effects of Activation and Self-Centrality of Values on Choices and Behavior." *Journal of Personality and Social Psychology* 82, no. 3: 434-447.

Wals, Arjen E. J. 2011. "Learning our Way to Sustainability." *Journal of Education for Sustainable Development* 5, no. 2: 177-186.

———. . 2012. *Shaping the Education of Tomorrow: 2012 Full Length Report on the UN Decade of Education for Sustainable Development*. Paris: UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000216472.

Wals, Arjen E. J., Floor Geerling-Eijff, Francisca Hubeek, Sandra van der Kroon, and Janneke Vader. 2008. "All Mixed Up? Instrumental and Emancipatory Learning Toward a More

Sustainable World: Considerations for EE Policymakers." *Applied Environmental Education and Communication* 7, no. 3: 55-65.

Wals, Arjen E. J. and Bob Jickling. 2002. "'Sustainability' in Higher Education: From Doublethink and Newspeak to Critical Thinking and Meaningful Learning." *Higher Education Policy* 15, no. 2: 121-131.

Warburton, Kevin. 2003. "Deep Learning and Education for Sustainability." *International Journal of Sustainability in Higher Education* 4, no. 1: 44-56. http://dx.doi.org/10.1108/14676370310455332.

Wiek, Arnim, Michael J. Bernstein, Rider W. Foley, Matthew Cohen, Nigel Forrest, Christopher Kuzdas, Braden Kay, and Lauren Withycombe Keeler. 2015. "Operationalising Competencies in Higher Education for Sustainable Development." In *Handbook of Higher Education for Sustainable Development*, edited by M. Barth, G. Michelsen, M. Rieckmann and I. Thomas, 241-260. London: Routledge.

Wiek, Arnim, Lauren Withycombe, and Charles L. Redman. 2011. "Key Competencies in Sustainability: A Reference Framework for Academic Program Development." *Sustainability Science* 6, no. 2: 203-218. doi:10.1007/s11625-011-0132-6.

Wiessner, Colleen Aalsburg and Jack Mezirow. 2000. "Theory Building and the Search for Common Ground." Chap. 12, In *Learning as Transformation: Critical Perspectives on a Theory in Progress*, edited by Jack Mezirow and Associates, 329-358. San Francisco, CA: Jossey-Bass.

Willard, Marsha, Carole Wiedmeyer, R. Warren Flint, John S. Weedon, Rick Woodward, Ira Feldman, and Mark Edwards. 2010. *The Sustainability Professional: 2010 Competency Survey Report*: International Society of Sustainability Professionals. https://www.sustainabilityprofessionals.org/credential-history.

Wright, Tarah. 2004. "The Evolution of Sustainability Declarations in Higher Education." In *Higher Education and the Challenge of Sustainability*, edited by Peter Blaze Corcoran and Arjen E. J. Wals, 7-19. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Zhan, Zehui, Patrick S. W. Fong, Hu Mei, Xuhua Chang, Ting Liang, and Zicheng Ma. 2015. "Sustainability Education in Massive Open Online Courses: A Content Analysis Approach." *Sustainability* 7, no. 3: 2274-2300. https://doi.org/10.3390/su7032274.

Appendix A: Information and Consent Form

Title: Teaching Sustainability 101: The goals and practices of introductory sustainability courses

Background

You have been invited to participate in a research project on the educational goals and practices of introductory sustainability courses. You have been selected because you teach an introductory sustainability course that meets the criteria of this research project. Your course was found either by an Internet search or by a search of sustainability courses that were posted on the Association for the Advancement of Sustainability in Higher Education's (AASHE) Sustainability Tracking, Assessment & Rating System™ (STARS) website (https://stars.aashe.org/). I found your contact information by searching your university website and/or contacting your Faculty, Department or School.

The results of this study will be used in support of my Master of Science thesis. There is also a possibility that I will do a presentation on the results of my research or that my supervisor and I may wish to use data from this study in future academic publications.

Purpose

This research will focus on a sample of introductory sustainability courses in Canada and the United States. Through interviews with course instructors and an analysis of course documents, this study will look at what these instructors believe to be the purpose of sustainability education, the educational goals for these courses, and which teaching and learning approaches instructors implement. Two examples of teaching and learning approaches are the subject-oriented approach (which focuses on students mastering the subject) and an experience-based approach (where students learn by doing).

The research aims to answer the following sets of questions:

1. What are the main educational goals of a sample of introductory sustainability undergraduate courses in Canadian and U.S. four-year, degree-granting colleges and universities? What do the instructors of these courses perceive as the purpose of sustainability education?
2. What types of knowledge, skills, attitudes and/or behaviours do the instructors of these courses aim to develop in students?
3. What teaching and learning approaches do instructors use in these courses?

Study Procedures

You were selected to be invited to take part in this research because you and the introductory course you teach appear to meet the criteria of the study. Prior to our interview, I will confirm the following with you:

- The course contains sustainability content throughout the course and not just in one lecture or course unit.
- The course examines multiple dimensions of sustainability (e.g. environmental, social and economic dimensions).
- The course looks at sustainability from more than one disciplinary perspective.
- The course has been offered at least twice and is still being offered.
- You have taught in a college or university setting for at least three years.
- You have taught the introductory sustainability course within the last two years.

If you agree to participate in this study, I will interview you for approximately 60 minutes. The interview will take place by phone, Skype, Apple FaceTime, Google Hangouts or another communication platform, depending on your preference.

The interview will be semi-structured, which means that I will ask a number of prepared questions. You will be free to respond with as much or as little detail as you prefer. I will send the interview guide to you prior to the interview in case you wish to review the kinds of questions that I will be asking. With your consent, I will make a digital audio recording of the interview. I will use this recording solely for the purposes of transcribing the interview. I will delete the audio recording at the end of this study. If you would like to verify the interview transcript for its accuracy and completeness, please let me know and I will email it to you.

Prior to our interview, I will request your most recent course syllabus. If you consent to provide your syllabus, I will use it to supplement information that you provide during our interview. I may be asked to share some of the content of your syllabus with my supervisor, Dr. Naomi Krogman, so that she can provide feedback on my analysis. Prior to sharing this content with Dr. Krogman, I will remove all identifying information, including your name, contact information, course title, and college or university.

Benefits

There may be a small benefit to you from reflecting on the goals and practices of your introductory sustainability course.

This research also has the potential to contribute to a better understanding of the different kinds of goals and practices of introductory sustainability courses in the U.S. and Canada. It is important to ask what we are striving for in sustainability education and to question if those goals will best serve learners and society in a future that is uncertain and turbulent. It is also important

to look at what teaching and learning approaches instructors implement, because the choice of approaches impacts how and what students learn and which educational goals might be attained.

If you are interested, I will send you a copy of my Master's thesis and any academic publications that are based on this research.

Costs

If you use a land line to take part in the interview, I will initiate the phone call, so you should not receive any long distance charges. If you use a cell phone, however, you may receive long distance or airtime charges, depending on your mobile plan. I do not have a research budget for this study, so I will not be able to reimburse you for cell phone charges that result from this interview. If possible, I would like to work with you to find an option that does not incur any costs, such as Skype, Apple FaceTime, or Google Hangouts.

Risk

Although the utmost efforts will be made to remove any identifiable information from the research results, there is a remote risk that someone who is familiar with you or your introductory course might be able to guess your identity from a description of your course in my thesis or academic publication. It is possible that this person could negatively judge you.

Voluntary Participation

Your participation in this study is completely voluntary. You may cancel the interview at any time. During the interview, you may decline to answer any interview question that you do not wish to answer and you may end the interview at <u>any</u> time. You are also welcome to indicate if you would like certain comments to be "off the record." These comments would not be included in the thesis, thesis notes, or any future papers based on the results from this research.

After the interview, you are free to modify or withdraw any data that you provided to the study, including your syllabus or the interview transcript (either in whole or in part), any time before <u>August 31, 2017</u>. Data that is removed from the study will be destroyed upon request. After August 31, 2017, it may no longer be possible to withdraw your data.

Confidentiality and Anonymity

The results of this study will be used in support of my Master of Science thesis and potential academic publications and presentations. If you wish, you may participate in this study with your name and identity. If you consent to this, you can specify which identifying information may be included in the Master's thesis and academic publications (e.g. your name, the course title, and/or your institution's name). If you do *not* wish to participate in this study with your name and identity, all information that you provide will be treated confidentially and used anonymously, as described below.

I will not personally identify you or include any information that might be used to identify you, your course, or your institution in any written materials or oral presentations. Despite all measures to remove identifiable information, I cannot completely guarantee your anonymity. It is possible that someone who is familiar with you or your introductory course might be able to attribute a particular passage in my thesis or in an academic article to you or your course.

Your data will be kept confidential. I will be the only one in the study who will have access to your name and contact information. I will remove and code any identifying information in the interview transcript and syllabus before sharing copies with my supervisor, Dr. Naomi Krogman. The University of Alberta Research Ethics Committee has the right to review study data.

I will take the utmost care to keep study data secure. Study data will be stored on an encrypted and password-protected laptop with up-to-date virus protection. At the end of the study, I will delete the interview audio files, original interview transcripts (with identifiable information), and course syllabus. The remaining study data, including the interview transcript where identifiable information has been removed, will be securely stored indefinitely on a password-protected external hard drive in a locked filing cabinet that only I have access to.

Further Information

If you have any further questions regarding this study, please do not hesitate to contact Apryl Bergstrom or Dr. Naomi Krogman.

The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615.

Consent Statement

I have read this form and the research study has been explained to me. I have been given the opportunity to ask questions and my questions have been answered. If I have additional questions, I have been told whom to contact. I agree to participate in the research study described above. I will receive a copy of this consent form after the researcher and I both sign it.

_____   _____   _____

Participant's Name   Participant's Signature   Date

_____   _____   _____

Researcher's Name   Researcher's Signature   Date

Please circle "Yes" or "No" for each of the following:

1. I consent to an audio recording of this interview.   Yes   No

2. Send me the transcript of the interview so that I may verify it for its accuracy and completeness.   Yes   No

3. Send me a copy of the Master's thesis and any academic publications based on this research.   Yes   No

You may choose to be identified for your contributions to this study or to remain anonymous.
Circle "Yes" in question 4 if you wish to be identified in this study for your contributions.
Circle "No" if you wish to remain anonymous.

4. I consent to participate in this study with my name and identity.   Yes   No

If you chose "Yes" above, there are several potential ways to be identified in this study.
For each option below, circle "Yes" if this identifying information may be included
in the study. Circle "No" if this information may not be included:

     a.   My full name   Yes   No

     b.   The title of my course   Yes   No

     c.   My institution's name   Yes   No

Appendix B: Interview Guide

This is the final version of the interview guide that was used during participant interviews. Questions with an asterisk were priority questions while questions without an asterisk were optional.

- *How long have you been teaching at your university?
- What was your area of study when you completed your postsecondary education?
- *When was this course first developed?
- *How did you come to teach this course?
- How were you involved in developing or revising this course?
- *How many times have you taught this course?
- *How many students are usually enrolled in this course?
- *What are the typical programs of the students who take this course?
- *Broadly speaking, what are the primary goals for your course?
- *Why are these goals important for this course?
- *What kinds of course activities and methods of assessment do you use in your course?
  - *Can you tell me a little bit about why you chose these course activities and assessment methods?
  - *How have you found these course activities and assessment methods to be useful or fruitful?
  - *What challenges have you experienced with any of the activities or methods of assessment that you use?
  - *If time and other resources were not limited, is there anything else that you would like to try in this course?
- *What disciplinary perspectives do you bring into this course?
- *As an instructor, what do you see as your role in the classroom?
- *How did you select your course topics?
- *Do students appear to find any concepts or topics difficult to understand or accept? If so, which ones?
  - How do you approach discussions about these concepts or topics?
- *Which types of skills are important for your students to develop in this course? For example, these might include critical thinking, communication, problem-solving, or practical skills.
  - *Why is it important for your students to develop these skills?
- *Do you talk about values in this course?
  - *What do you want students to learn or understand about values?

- *Do you discuss human actions or behaviour in this course? If so, how do you approach this topic?
  - How important is it for students in this course to examine their own behaviours?
- *After students take your course, what do you hope they will do with what they have learned?
- Would you say that you use the concept of "sustainability" or "sustainable development" more in your course?
- *In your own words, how would you describe "sustainability" (or "sustainable development")?
- *In your view, what is the purpose of sustainability education (or education for sustainable development)?
- *What is your age range: 25 – 34, 35 – 44, 45 – 54, 55 – 64, or 65 or older?
- *Is there anything else that you would like to add about this course or about sustainability education in general?