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LEARNING OUTCOMES

An International Comparison of Countries and Declarations

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Introduction

The global population is growing at an exponential rate. Ecosystems are stressed and humans are consuming resources in ways that are unsustainable. Opportunities to create sustainable abundance and higher quality of life for present and future generations exist, but they will not be realized unless humans are educated about both sustainability challenges and opportunities, and are able and willing to engage in solutions at both the personal and systemic levels. Agenda 21, which derived from the first "Earth Summit" (World Conference on Environment and Development, Rio de Janeiro, 1992) included materials and conceptual frameworks focused on education. But while several European nations, Japan, Australia and a number of other regions' and countries' educational institutions and governments adopted that document's emphasis on education for a sustainable future and its provisions, the United States government has been much slower to respond. A national trend is now occurring regarding educating for a sustainable future (ESF) in the educational institutions in the United States. Thousands of individuals in a variety of institutional roles, and dozens of national academic disciplinary associations and national educational associations have taken on leadership roles.

In what follows, learning outcomes as well as some specific benchmarks related to education are discussed. Specific examples are provided of learning outcomes from Mexico, the United States, and Sweden in the context of international declarations and conferences. Common elements of these various approaches are highlighted. What will become clear is that education for sustainability does require and can help to produce a transformation toward systemic, interdisciplinary thinking and actions for a sustainable future. Committing to and utilizing

concrete learning outcomes and creating curricular and co-curricular programming that achieves them is one of the first and most important steps in this transformation.

Background: What Are LOs and Where Do They Come From?

In simplest terms, learning outcomes (LOs) are the specific skills, capacities, attitudes, and knowledge that a student ought to possess as a result of a particular educational activity. The Council for Higher Education Accreditation states that "Student learning outcomes are properly defined in terms of the knowledge, skills, and abilities that a student has attained at the end (or as a result) of his or her engagement in a particular set of higher education experiences." LOs are important both for teachers and for students. For educators, LOs provide an organizing concept (or set of ideas) which anchor academic instruction. In addition, student learning is enhanced when LOs are made explicit, and students can perceive the connection between learning activities and the proposed outcomes. This is a sort of frame alignment process – what Lindy Biggs has called "constructive alignment" (Biggs 1999) – that occurs between instructor and students, where checks built in to the curriculum ensure that LOs are achieved. These are valuable tools for achieving any set of educational goals. When it comes to education for sustainable development, however, there is an additional normative presupposition: that higher education institutions have an obligation to ensure that their graduates attain a set of LOs that enhance not only their professional lives, but also their life roles as family member, community member, consumer, and investor.

Education in this instance is not merely an intellectual exercise, but is a process through which learners become effective change agents who have the skills, persistence, and the resilience to catalyze the emergence of healthy ecosystems, social systems, and economies (the triple bottom line of sustainability). It is education with a purpose: it aims to create a higher quality of life for present day humans and for future generations, and fosters the health of the ecosystems we depend upon for survival. Progress toward such goals requires a way to assess and improve the attainment of these outcomes that are central to moving toward sustainability. This is where specific, sustainability-focused LOs, learning activities, assessments, and continuous improvement processes are necessary.

Such LOs have long been part of an international conversation, with perhaps the first focused international attention paid to education for sustainability occurring at the First Intergovernmental Conference on Environmental Education in 1977. Hosted by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations Environment Program (UNEP) in Tbilisi, Georgia (14–26 October), this conference addressed education at all levels and was the first attempt to formulate sustainability-oriented LOs. At this time, the idea that sustainable development should be an international

policy goal had only recently emerged into international public discourse (for instance at the Stockholm Conference on the Human Environment, 1972). Most references to education, however, used the trope of "environmental education" and focused on education for loosely defined holistic perspectives. The Tbilisi Declaration also emphasized the social and economic spheres of sustainability, and moreover emphasized the interconnectedness between the different dimensions of sustainable development.[1] The categories of *objectives* of environmental education in the document were:

1. Awareness – to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.
2. Knowledge – to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems.
3. Attitudes – to help social groups and individuals acquire a set of values and feelings of concern for the environment, and the motivation for actively participating in environmental improvement and protection.
4. Skills – to help social groups and individuals acquire the skills for identifying and solving environmental problems.
5. Participation – to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward the resolution of environmental problems.

These educational objectives emphasize the capacity of learners to serve a positive function within the social group, to be engaged, invested, and sensitive citizens.

This language provided insight into the educational challenges of educating for sustainability. The goals for sustainability education and the means of achieving them were formulated more than 30 years ago, and yet few educational institutions have managed to completely implement the sort of transformational learning that the Tbilisi Declaration recommended for all of its students as the institutional norm. UNESCO and UNEP continue to be the lead UN agencies in these attempts to create behavior change to promote a more sustainable future.

The United Nations declared 2005–2014 the Decade of Education for Sustainable Development (DESD), with the goal of integrating the principles, values and practices of sustainable development into all aspects of education and learning.[2] Alluding to the language included in the Tbilisi Declaration, "The DESD at a Glance" document suggests that it is necessary to move beyond "environmental education" to "education for sustainable development." Citizen change agents prepared by the DESD are expected to be able to: "a) have acquired various skills (critical and creative thinking, communication, conflict management and problem solving strategies, project assessment) to take an active part in

and contribute to the life of society, b) be respectful of the Earth and life in all its diversity, and c) be committed to promoting democracy in a society without exclusion and where peace prevails."[3]

At the halfway mark of the DESD, UNESCO, and the German Federal Ministry of Education and Research hosted a World Conference on Education for Sustainable Development in Bonn, Germany. During this conference, and in the Declaration which resulted from it, the delegates created an agenda they called "Education for All," which focused on making improvements in pre-school and rural education, and adult literacy. The Declaration further noted the complicity of the now global economic system and its narrow focus on short-term financial gains in the generation of unsustainable societies, and highlighted the impacts of biocultural simplification and increasingly scarce resources on the world's poorest citizens. As with previous documents and declarations, this document called for re-orienting educational institutions for more systemic and holistic learning, providing problem-based education, and promoting education as a means to break the cycle of poverty.[4]

All of these examples illustrate that education is one of the keys to truly sustainable development. Education, especially of rural populations and of women, is an investment in peace-building and improvement in quality of life. It is crucial, however, to develop adequate monitoring tools to assess whether these important goals are being approached in the DESD. Among the examples of meaningful steps toward education for sustainable development, the Bonn Declaration noted that a global monitoring and evaluation framework had been designed.[5] Their call to action, however, also noted that further improvements were needed to strengthen these evaluation tools, and to generate better national monitoring programs. This work to re-orient systems to educate for a sustainable future has grown and become a substantial trend in many areas of the world. Some comparisons of the learning outcomes in use are instructive to understanding the common core of these efforts.

Example Sets of Learning Outcomes

In 2001, the Instituto Tecnológico y de Estudios Superiores de Monterrey, Monterrey Institute of Technology and Higher Education (ITESM) initiated their Sustainable Campus Program. The Program attempted to integrate sustainability into campus operations, but also sought to integrate a systems perspective into coursework by making sustainable development the "golden thread" that tied courses and curricula together (Lozano *et al.* 2006; see also Svanström *et al.* 2008). While these efforts began at the main campus in Monterrey, by 2005 ITESM had generated vision and mission statements for the other 32 satellite campuses.[6] These statements had a clear mandate to bring sustainability into most curricula. By 2006 sustainable development concepts had been incorporated into classes across the curriculum, and new mandatory courses (in ethics and

citizenship formation, and socio-political perspectives) were created to foster the vision and mission statements.

As ITESM began to investigate the possibilities for external accreditation, it became clear that LOs for sustainability were needed to assess progress toward education for sustainable development. LOs focused on two levels: "Broad education and learning" was intended to assess the capacity to reason and solve problems from a systems perspective; "Disciplinary education and learning" was meant to focus more specifically on relevant material from a particular academic discipline. Table 4.1 provides the LOs that are currently being tested at ITESM (for elaboration see Svanström *et al.* 2008).

In addition to the LOs in Table 4.1, it was further suggested that the following are also crucially important outcomes: (1) an understanding of the social impacts

TABLE 4.1 ITESM learning outcomes

Broad education and learning

A. An understanding of the ethical responsibility, toward present and future generations.
B. A knowledge of contemporary issues.
C. An understanding of the carrying capacity of ecosystems, in order to provide services to humankind.
D. An understanding of the social responsibility as a future professional, and as a citizen.
E. An understanding of the impact that human activities have on the Planet, regarding sustainable and unsustainable resources appropriation.
F. Knowledge of global trends that impact the life quality of present and future generations.

Discipline education and learning

A. An ability to establish the connections to the triple bottom line (TBL) and other sustainable development (SD) dimensions that influence their own knowledge discipline.
B. An ability to apply assessment criteria or sets of principles or available tools related to sustainability in their own discipline.
C. The systemic education needed to understand the impact of their discipline solutions or actions in a TBL context.
D. For disciplines that prepare engineering professionals: An ability to design processes, products and components taking into account the life cycle analysis using the appropriate SD dimensions constraints.
E. For disciplines that prepare professionals that provide or design services: An ability to design services that take into account the connectedness and implications for those services as related to the SD dimensions constraints.
F. An ability to implement the needed actions to foster sustainability in their professional and personal life.

of human activities, especially the causes of human suffering; and (2) a capacity for systems thinking and the ability to motivate behavior change. Although the LOs in Table 4.1 focus on the triple bottom line (that is, maximizing economic, social, and ecological values), it is clear that sustainable development should be considered to have multiple additional dimensions, including normative, political, and legal dimensions.

The second example provides a perspective from the United States. The Disciplinary Associations Network for Sustainability (or DANS)[7] was formed after the US Partnership for Education for Sustainable Development convened the leaders of over 20 academic disciplinary associations to discuss each discipline's potential contributions to a more sustainable future.[8] These meetings included national associations for psychology, sociology, philosophy, religion, biology, chemistry, engineering, anthropology, political science, math, broadcasting, architecture, women's studies, and others. DANS focuses on infusing sustainability into curricula in all academic disciplines; providing professional development for faculty; creating standards (including tenure, promotion, and accreditation criteria) that value sustainability research, applied scholarship and action; initiating cross-disciplinary projects; informing policy makers; and educating the public about how to help to create a sustainable future. The network now includes 39 participating associations.

Another national network, the Higher Education Associations Sustainability Consortium, or HEASC, was formed to catalyze education for a sustainable future in the programs and operations of mainstream higher education associations and their members.[9] The HEASC includes the professional organizations for most of the, approximately 4,000, US college and university presidents, and the majority of facilities directors, business officers, college and university planners, purchasers, and residential and student affairs staff. These associations recognize that LOs are valuable for both academic and co-curricular experiences on campus, and are helping higher education institutions develop academic assignments that focus on real-world sustainability challenges on campus and in the surrounding communities, nationally and globally. HEASC also supports the efforts of the American College and University Presidents' Climate Commitment and called for the Sustainability Tracking and Rating System (STARS) assessment for higher education, which has been developed and deployed by AASHE.[10]

Some of the DANS and HEASC members have worked together on LOs. College Students Educators International (or the American College Personnel Association [ACPA]) took a lead role and has created a list of LOs being used by members of the associations in both networks (see Table 4.2). Note that these learning outcomes move from understanding societal and ecosystem sustainability challenges toward development and implementation of solutions. In addition, the outcomes hold students accountable for understanding the impacts of their personal choices on living systems and highlight the need for effective systemic transformations, including one outcome devoted to learning change agent skills.

TABLE 4.2 ACPA learning outcomes

In order to develop and maintain sustainable communities:

1. Each student will be able to define sustainability.
2. Each student will be able to explain how sustainability relates to their lives and their values, and how their actions impact issues of sustainability.
3. Each student will be able to utilize their knowledge of sustainability to change their daily habits and consumer mentality.
4. Each student will be able to explain how systems are interrelated.
5. Each student will learn change agent skills.
6. Each student will learn how to apply concepts of sustainability to their campus and community by engaging in the challenges and solutions of sustainability on their campus.
7. Each student will learn how to apply concepts of sustainability globally by engaging in the challenges and the solutions of sustainability in a world context.

The ACPA recognizes that these LOs can be promoted outside the classroom as well, and has published lists of competencies and possible development strategies to attain these LOs in a co-curricular context.[11]

Within the United States, there is increasing recognition of this need to move beyond critical thinking to be able to be effective at solving systemic problems. Accordingly, ACPA has delineated the skills required to be an effective change agent (see Table 4.3 below).[12]

TABLE 4.3 ACPA change agent skills

Change Agent Abilities Required to Help to Create a Sustainable Future

In order to be a successful sustainability change agent, an individual must have the following:

1. Knowledge of the environmental, economic, and social issues related to sustainability (understanding);
2. A value system and self-concept to support and under gird the actions of a change agent (motivation); and
3. Change agent abilities (skills).

Change agents are:

Resilient	Optimistic	Tenacious	Committed
Passionate	Patient	Emotionally intelligent	Assertive
Persuasive	Empathetic	Authentic	Ethical
Self-aware	Competent	Curious	

They can:

- Communicate ideas clearly, concisely, and precisely both orally and in writing
- Listen to others and incorporate their ideas and perspectives
- Accommodate individual differences (cultural, socioeconomic, global, etc.) in their decisions and actions and be able to negotiate across these differences

- Engage in self-assessment, self-reflection, and analysis
- Reflect on what is happening to make meaning, gain perspective and understanding
- Engage in civil discourse and debate
- Mediate and resolve conflicts
- Analyze power, structures of inequality, and social systems that govern individual and communal life
- Recognize the global implications of their actions
- Span boundaries
- Challenge the status quo effectively when appropriate
- Creatively and collaboratively solve problems using critical thinking skills; search for "families" of solutions for complex multi-faceted issues
- Collaborate, network, develop alliances and coalitions, build teams
- Involve others, inspire and excite participants, engender support and commitment
- See the big picture and the larger goal and understand the need for systemic change
- Adjust to the diverse and changing needs of both individuals and society as a whole
- Set realistic and clearly-defined goals and objectives
- Be both a leader and a follower, as necessary
- Analyze and influence group dynamics
- Make ethical decisions which incorporate responsibility to self, community, and society
- Help envision, articulate, and create positive scenarios for the future of society
- See the paths, small steps, for changes needed for a more sustainable future, convert it into a tasklist and timeline, and follow through effectively
- Tolerate ambiguity and cope effectively with change

They have:

- Insights into the functioning and interconnectedness of systems
- A commitment to finding solutions to societal problems
- Political efficacy, a belief that what they think and do civically and politically matters
- Integrity
- Courage
- An understanding of "organic" change

Hundreds of colleges and universities in the United States have instituted initiatives to include some sustainability learning outcomes into the general education core requirements for all degrees, into new minors in sustainability, or throughout the institution's curricular and co-curricular activities (Rowe 2002).[13,14] Each academic discipline brings unique and important perspectives and knowledge to solving societal sustainability challenges, so the participation of every academic discipline in educating for a sustainable future is important. Opportunities to problem solve and apply these solutions are increasingly recognized as essential by disciplinary societies and educational administrators as

well as faculty involved with education for sustainability.[15] The US Department of Education and the National Science Foundation have funded a variety of sustainability oriented grants that are part of this national trend. Faculty in many disciplines are recognizing the importance of such problem solving and change agent skill building both within their disciplinary courses and in interdisciplinary assignments. Revived attention to applied scholarship, action research, civic engagement, project-based learning and service learning suggests some promising trends.

Some other sets of LOs available in English may provide additional input for higher education institutions that are in the process of formulating or developing their student sustainability LOs. Most of them exhibit some of the commonalities discussed below, and they have in some cases provided input to this analysis. These include the LOs provided by The Washington Center for Improving the Quality of Undergraduate Education's "Curriculum for the Bioregion" initiative.[16] Or, as an example from Canada, the Learning for a Sustainable Future organization initiated a program to integrate education for sustainable development into the curricula at all grade levels, and has vetted its set of LOs online.[17] An education for sustainable development initiative in Manitoba, Canada (connected to the UNESCO DESD) lists sustainability LOs from kindergarten through grade 10 which are specific to three disciplinary areas: social studies, science, and physical/health education.[18] The US Partnership for Education for Sustainable Development has developed a set of sustainability standards for K-12 education that has been utilized to help inform and formulate knowledge and skills statements and performance elements for national career and technical education, STEM education, and the curricula of specific school districts throughout the country.[19]

Globally, there are many other initiatives that are presently described only in languages other than English. Examples providing LOs which are similar to those detailed above include the network Higher Education for Sustainable Development (HU2) in Sweden.[20] At Chalmers University of Technology in Göteborg, Sweden, one of those leading the charge toward sustainability education, LOs for education for sustainable development are under development in a process involving teachers, program directors, students and other stakeholders in the educational system. The on-going workshop discussions that are part of this process provide a model for other higher education entities.[21] Chalmers provides innovative programming which attempts to create partnerships with companies and corporations in Sweden which are developing green technologies, chemistries, and other industrial systems and consumer products. They are helping to create new types of educational structures, and such developments can inspire other countries and institutions of higher learning to reevaluate traditional educational arrangements.

The Tbilisi and DESD initiatives discussed above address educational efforts in society as a whole (including, for instance, on-going adult education), but there

are also many initiatives that target higher education or specific professions. One example is the Declaration of Barcelona, formulated during the Engineering Education for Sustainable Development conference in 2004, which specifically dealt with education for sustainability among engineers.[22] Another example of an organization which has provided input and strategic pressure on higher education over the last 15 years is the World Business Council for Sustainable Development (WBCSD), a set of concerned businesses who recognize that the adoption of sustainable business models and a sustainable consumer base are important for their own financial futures.[23]

These examples of learning outcomes and institutional commitment to education for sustainable development, though drawn from very different associations and from different socio-cultural-political contexts, do exhibit some similarities. While ideas about what sustainable development *is* and the means to achieve it vary somewhat among these various nations, their institutions, and their educational partners, there is a remarkable convergence in their vision of the desired learning outcomes that create the effective change agents who can make sustainable societies a reality. Descriptions of some of these commonalities may be instructive.

Common Elements, Transformational Learning

For education for SD, LOs typically focus on what Wals and Corcoran (2006) have termed "transformative learning." Transformative learning includes the ability to integrate, connect, confront, and reconcile multiple ways of looking at the world. Additional competencies that students require include the ability of students to cope with uncertainty, poorly defined situations, and conflicting or at least diverging norms, values, interests, and reality constructions. Transformative learning, in other words, does not focus on mastering clearly defined sets of text-based competencies. Rather, it emphasizes students' dynamic qualities and competencies, attitudes, and self-concepts. Crucially important to navigating an increasingly complex and dynamic world, students must be able to empathetically engage the perspectives of cultural others, to think across disciplinary boundaries, and to recognize the influences of geographical and temporal constraints. This means that they must develop the capacity to integrate local and global analyses, as well as short-term and long-term planning considerations. Transformative learning goes beyond fact-based, instrumental learning to promote critical reflection on a students' own knowledge, experiences, beliefs, and values, ensuring that personal and professional decisions reflect this enhanced self-awareness. Common attributes of education for sustainability strategies, which aim to produce this type of student, typically include the following:

- systems thinking or holistic perspectives
- integrating different perspectives or viewpoints

- change agent skill sets
- analysis of attitudes and values
- efficacy in creating positive change

Analytical thinking is about breaking things into their constituent parts, while *systemic or holistic* thinking is about connecting the dots between them. It is clear that all things interact in complex ways with other entities and with their environments. This complex web of relationships often exhibits properties or patterns that are not apparent in constituent parts. Systems thinking is concerned with discerning these larger patterns, being able to conceptually model such a system, and being able to pinpoint cause and effect within it to identify leverage points and strategies for systemic change. The Tbilisi Declaration, for instance, stated that both individuals and communities must "understand the complex nature of the natural and the built environments resulting from the interaction of their biological, physical, social, economic and cultural aspects."[24] The Declaration of Barcelona also cited holistic thinking as a major goal of education, and stated that future professionals "should be able to use their expertise not only in a scientific or technological context, but equally for broader social, political and environmental needs," and that they should be able to "move beyond the tradition of breaking reality down into disconnected parts."[25]

Related to systems thinking is the importance of obtaining an *inter- or multidisciplinary perspective*, another of the common outcomes specified by these diverse constituencies. The Tbilisi Declaration stated that "environmental education should be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective." Likewise, the Barcelona Declaration specified that "today's engineers must be able to work in multidisciplinary teams," and that social sciences and humanities should be incorporated in teaching for engineers. Gaining an interdisciplinary perspective also requires being aware of time and space. The importance of spatial perspective appears in the Tbilisi Declaration when it suggests that learners ought to possess "insights into environmental conditions in other geographical areas," and should "understand the necessity of local, national and international cooperation." The Declaration of Barcelona suggests that engineers "must be able to understand how their work interacts with society and the environment, locally and globally." The importance of time, of a proper historical perspective, appears when the Tbilisi declaration talks about a "focus on current and potential environmental situations while taking into account the historical perspective" and when the Declaration of Barcelona mentions a "long-term approach to decision-making." These are important correctives to societies that tend to make decisions which maximize short-term benefits and discount the needs of future generations.

Each academic discipline has unique and important contributions to make to a sustainable future, but those contributions will be more grounded in reality and of higher quality when generated from a multidisciplinary understanding.

To be credible change agents, however, learners need more than merely technical know-how and awareness of historical context. They also need skill sets related to forming and sustaining interpersonal relationships as well as effective leadership training.

Some of the most commonly cited change agent skill sets include creative problem-solving, critical thinking and reflection, the importance of self-motivated learning, persistence and resilience, and effective interpersonal skills, including conflict resolution and teamwork. Interestingly, the development of these skills also depends on awareness of personal attitudes and values and those of other people, and the ability to accurately articulate them in sensitive situations. For instance, the Declaration of Barcelona suggested that education should include an "*integrated approach* to knowledge, attitudes, skills and values," and argued that we need to address "the whole educational process in a more holistic way." Addressing attitudes and values is normally seen as a means to create commitment and concern that motivates active participation to achieve lifelong learning and self-discipline with the aim of changing behaviour. In addition, the Declaration of Barcelona specifically called on engineers to "help redirect society" toward a more responsible and sustainable direction, and suggested that they "must be able to apply professional knowledge according to deontological principles and universal values and ethics." Going far beyond the traditional boundaries of engineering education, the Declaration further suggested that engineers should promote *participatory decision-making* based on *democratic principles,* they "must be able to listen closely to the demands of citizens and other stakeholders and let them have a say in the development of new technologies and infrastructures." The Tbilisi Declaration articulated the importance of "a set of values and feelings of concern for the environment," and mentioned a "sense of responsibility and solidarity among countries and regions." Moreover, it advanced the claim that "environmental education should encourage those ethical, economic and aesthetic values which will further the development of conduct compatible with the preservation and improvement of the environment." These are decidedly normative claims and aims. But they are not overly prescriptive. In fact, as the preceding discussion has shown, these goals and desired outcomes have cross-cultural relevance, and if anything represent a convergence on visions of desired learning outcomes, even if the associations, nations and institutions discussed are widely divergent in context and focus. Although this analysis focused only on a few examples, the similarities to other sets of LOs found in the literature are clear, regardless of level and type of education.

Once the outcomes of sustainability education have been agreed upon, to be attainable teachers must also be provided with the appropriate resources and incentives, which may challenge traditional educational structures and reward systems. Curricula, syllabi, and teaching and learning activities have to be shared to facilitate the attainment of the LOs. Along with the commonalities among the LOs reviewed above, there are also common pedagogical strategies designed to

emphasize active learning, real-world and problem-based learning, and the creation of reflective learning communities. Teaching methodologies must move beyond content to help construct the self-concept of a student as a lifelong learner and change agent for sustainable development. As the Tbilisi Declaration described it, the most desirable educational approaches exemplify "diversity in learning environments and educational approaches," "stress on practical activities and first-hand experience," a "closer link between educational processes and real life," and a focus on "problems that are faced by particular communities."

Conclusions

Our aim here has been to explore and compare the importance of learning outcomes for education for sustainability. Certainly, further and more in-depth work on clarifying the desired outcomes for specific geographical and cultural contexts is needed. But this discussion has illustrated that there already exist significant and potentially productive commonalities across countries and cultures. The convergence among these learning outcomes includes knowledge about ecosystems, basic understandings of social scientific analyses of human cultures, systemic thinking, inter- and intrapersonal skills, and the development of change agent skills, strategies and self-concepts. Of course, each association or institution must take further steps to integrate these broad learning outcomes into their own contexts, but it is clear that this type of transformative education must go beyond consideration of the triple bottom line, to actually educate students in ways that move them from thinking to effective action. It will require shifting away from the traditionally siloed disciplines of most higher education institutions to create what David Orr once called the next generation of renaissance men and women – learners who are effective professionals and leaders in their own disciplines, but who also have an awareness of deeper connections and obligations to others in the broader society. In short, it requires the development of a sort of careful empathy combined with enlightened self-interest that can aid in the education of well-rounded and pragmatic problem-solvers who have a desire, both personally and professionally, to help create a more sustainable world.

Notes

1 See http://www.gdrc.org/uem/ee/tbilisi.html for the full text (accessed 19 October 2011). All of the quotes attributed to the Tbilisi Declaration are drawn from this online document.
2 See http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/about-us/ (accessed 17 October 2011).
3 Link to the PDF available at http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/about-us/ (accessed 17 October 2011).

4 For the full text of the declaration, see http://www.esd-world-conference-2009.org/en/whats-new/news-detail/item/conference-proceedings-published.html (accessed 16 November 2011).
5 See http://www.esd-world-conference-2009.org/ (accessed 19 October 2011).
6 The ITESM 2005, Vision and Mission is available at http://www.itesm.mx/2015/english/index.html (accessed 19 October 2011).
7 See DANS (Disciplinary Association Network for Sustainability), at http://www.aashe.org/dans (accessed 19 October 2011).
8 For the US Partnership for Education for Sustainable Development, see http://www.uspartnership.org (accessed 21 October 2011).
9 See http://www.aashe.org/heasc (accessed 21 October 2011).
10 See https://stars.aashe.org/ (accessed 16 November 2011).
11 See http://www.myacpa.org/task-force/sustainability/docs/Learning_Outcomes_Sustainability_Map.pdf (accessed 21 October 2011).
12 See http://www.myacpa.org/task-force/sustainability/docs/Change_Agent_Skills_and_Resources.pdf (accessed 21 October 2011).
13 See also a reprint from the National Science Council for Science and Environment at http://www.ncseonline.org/EFS/DebraRowe.pdf (accessed 21 October 2011).
14 Education for Climate Neutrality and Sustainability, see http://www.presidentsclimatecommitment.org/resources/publications#guidance (accessed 21 October 2011).
15 http://www.aacu.org/pkal/disciplinarysocietypartnerships/mobilizing/index.cfm (accessed 21 October 2011).
16 See http://www.evergreen.edu/washcenter/resources/upload/Sustainability_Learning_Outcomes_2008.doc (accessed 21 October 2011).
17 See http://www.lsf-lst.ca/en/teachers/learning_outcomes.php (accessed 21 October 2011).
18 See http://www.edu.gov.mb.ca/k12/esd/correlations/index.html (accessed 21 October 2011).
19 See http://www.uspartnership.org/main/show_passage/33 (accessed 16 November 2011).
20 See http://www.hu2.se/nlhu2.htm (accessed 21 October 2011).
21 See http://www.chalmers.se/gmv/EN/ (accessed 21 October 2011).
22 See http://www.upc.edu/eesd-observatory/who/declaration-of-barcelona for the full text (accessed 21 October 2011).
23 See http://www.wbcsd.org (accessed 21 October 2011).
24 See http://www.gdrc.org/uem/ee/tbilisi.html. All quotes from the Tbilisi Declaration in this and the following paragraphs are from this website unless otherwise noted.
25 See http://www.upc.edu/eesd-observatory/who/declaration-of-barcelona. All quotes from the Barcelona Declaration in this and the following paragraphs are from this website unless otherwise noted.

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