Learning outcomes for sustainable development in higher education

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Abstract

Purpose – This paper sets out to discuss the commonalities that can be found in learning outcomes (LOs) for education for sustainable development in the context of the Tbilisi and Barcelona declarations. The commonalities include systemic or holistic thinking, the integration of different perspectives, skills such as critical thinking, change agent abilities and communication, and finally different attitudes and values.

Design/methodology/approach – An analysis of LOs that are proposed in the Tbilisi and Barcelona declarations is conducted, showing specific issues for the commonalities presented. Examples of LOs from Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM) in Mexico, as well as various associations from the USA is shown. A brief discussion is done on the means to achieve these LOs and learning evaluation.

Findings – In the example sets of LOs shown, the commonalities presented in the paper's first section appear in the LOs proposed by the institutions. Based on current knowledge and perception, sustainability is properly addressed in the examples.

Practical implications – The paper can be used to foster a wider discussion and analysis of LOs for sustainability education, also further work on teachers' capacity building for sustainability, as well as the assessment needed for future professionals in higher education institutions.

Originality/value – The paper presents the onset of discussing and comparing commonalities among higher education institutions regarding sustainability LOs.

Keywords Sustainable development, Education, Agreements

Paper type Conceptual paper

Introduction

The world is changing. Societies have chosen in many instances unsustainable paths of resource extraction and consumption. Never before has it been more obvious that humanity is facing enormous challenges. Humans must face the challenge recognizing this unsustainable journey and creating solutions accordingly. In this sense we can quote Diamond's (2005) book title: *Collapse. How Societies Choose to Fail or Survive*. It is societies that make the choice to act and reverse trends. We should consider a positive view in order not to surrender to a meagre future outlook. Changes can be made and unsustainable actions in our communities can be reversed. We are now trying to understand where we should go and how we can get there. It is clear that the

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changes that have to be made involve all parts and levels of society. Education will play a crucial role in this adaptation towards sustainable development (SD). Our duty towards education of future professionals is to make it possible for them to participate in the necessary transformation. In higher education, we educate people that will shape the future society. They will develop the societal and technical systems, they will likely be the most influential decisions-makers and they will educate citizens and professionals on all levels. This involves an opportunity as well as an obligation to make a difference, and implies rethinking and reorganizing higher education institutions (HEIs) to become effective change agents. It is urgent to define new appropriate goals of higher education in terms of learning outcomes (LOs) for students, as well as generating the proper assessment criteria to check if the learning sought has occurred and create continuous improvement. And once we have done that, we must make sure that our organizational structures, program curricula, course syllabi, and teaching and learning methods effectively address the LOs as well as other goals in HEIs. Efforts have been made at universities, in organizations, in governmental educational bodies, at international conferences etc. to address these issues and define sets of LOs for students in higher education. This paper contains the results of an analysis of commonalities in different sets of LOs for SD in higher education and examples that can be useful for HEIs that are trying to decide on appropriate LOs for SD. By no means is this a comprehensive discussion or pretends to impose the authors' point of view, but rather to encourage discussion and looking forward, enriching a much needed aspect of sustainability education.

When student LOs are discussed or addressed there is a need to clarify or define the concept. LOs are statements of what it is expected that a student will be able to do as a result of a learning activity. According to UCE-Birmingham, LOs are:

> . . . the specific intentions of a programme or module, written in specific terms. They describe what a student should know, understand, or be able to do at the end of that programme or module (www.ssdd.uce.ac.uk/outcomes).

Furthermore, 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 (www.chea.org).

Hence nowadays HEIs should seek that their graduates attain a set of LOs for their professional and personal life. In that sense, whenever SD is infused in HEIs, there is a need to address a way to assess the sustainability learning issue. For this a set of LOs are necessary. Today, it is often recognized that the existence of and communication of LOs for a specific educational effort improves learning for the students, and it is advocated that teaching and learning activities as well as student assessment are set up to make sure that and to test if LOs are achieved. This is referred to as "constructive alignment" (Biggs, 1999). In this paper, LOs for education for SD are discussed.

State-of-the-art: analysis of existing sets of learning outcomes

Starting with the first intergovernmental conference on environmental education in Tbilisi, Georgia, in 1977 (portal.Unesco.org/education/en/ev.php-URL_ID = 38477&URL_DO = DO_TOPIC&URL_SECTION = 201.html), efforts to describe goals for education that address environmental and sustainability challenges have been documented. The Tbilisi declaration addresses education at all levels, even

outside the formal school system. The declaration is seen as the first attempt to formulate LOs of this kind. At the time, the concept of SD had only begun to develop and efforts in education to reach a more holistic view were normally discussed in terms of environmental education. Still, societal and economic aspects were emphasized as well as the interconnectedness between the different dimensions. The insight into the educational challenges indicated by the text in the Tbilisi declaration is remarkable and it is discomforting to notice how slowly progress has been made in education. Still, few educational efforts have managed to properly address these goals that were formulated already 30 years ago.

The United Nations has announced the period of 2005-2014 to be their Decade of Education for Sustainable Development (DESD – portal.Unesco.org/education/en/ev.php-URL_ID = 38477&URL_DO = DO_TOPIC&URL_SECTION = 201.html) with the goal to integrate the principles, values, and practices of SD into all aspects of education and learning. Unesco is the lead agency in this work that intends to 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.

The Tbilisi and DESD initiatives address educational efforts in society as a whole, but there are also many initiatives that target higher education, sometimes directed towards specific professions. One example is the Declaration of Barcelona that was formulated during the Engineering Education for Sustainable Development conference in 2004, specifically dealing with higher education for engineers (Barcelona declaration). For the last 15 years, a set of concerned businesses have addressed sustainability issues that have become relevant for their future in what is known as the World Business Council for Sustainable Development (WBCSD – www.wbcsd.org). The Council is particularly expressing a concern for providing future professionals with adequate learning for their future professional decision making and has been laying a strong foundation to foster SD learning.

In the goals that are described in the above mentioned initiatives as well as in other sets of LOs for education for SD that can be found in literature, there are large commonalities, even when the educational level and intended target group differ greatly. Some commonalities that apply to many sets of LOs will be discussed below using texts from the Tbilisi declaration and the Declaration of Barcelona to exemplify how this is expressed. The commonalities will be described as the type of learning that is emphasized in learning outcomes for sustainability. Note that the Tbilisi declaration applies to all levels and all types of education and that the Declaration of Barcelona applies to higher education for engineers, but the commonalities are still very large. The areas that will be discussed are:

- systemic or holistic thinking;
- integration of different perspectives;
- skills that are emphasized; and
- how attitudes and values appear in the sets of LOs.

Systemic or holistic thinking is often mentioned in sets of LOs for students in higher education as a means to cope with complexity and finding balance between different dimensions. Both concepts relate to the idea that everything interacts with the things around it and that the world therefore consists of a complex web of relationships. The system exhibits properties that cannot be found only in the parts that form it.

Analytical thinking is about breaking the things apart while synthetic thinking is about putting things together. Systemic thinking, on the other hand, is about combining these two skills to discern the patterns in a larger system and be able to understand cause-effect chains, understand conceptual models of a system, and create changes within and across systems. In the Tbilisi declaration this is a major goal which is expressed in different ways several times. It is, for example, stated that individuals and communities need to "understand the complex nature of the natural and the built environments resulting from the interaction of their biological, physical, social, economic and cultural aspects". In the Declaration of Barcelona, this is also a major goal of education, and it is, for example, stated that the 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 part". Words like "interdependence", "interact", "dimensions", "comprehensive" and "complex relations" also appear in this context.

Related to systemic and holistic thinking is the integration of different perspectives into education. Inter- and multidisciplinarity is often mentioned. In the Tbilisi declaration it is, e.g. mentioned 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". In the Declaration of Barcelona it is stated 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; at this point it is relevant to quote J.D. Bernal's point of view regarding the latter "In the great creative periods of science the artists and the scientists worked very closely together and were in many cases the same people. . .Leonardo da Vinci,. . . The result of this separation [i.e. science and art] has been the most incredible mutual ignorance." (Brown, 2005). Our challenge as educators is to achieve a certain degree of success to foster and consolidate this holistic approach to learning, promoting the mutual recognition that will render a stronger body of human knowledge. Perspectives related to space and time also commonly appear in the LOs. The spatial perspective appears, e.g. in The Tbilisi declaration as "insights into environmental conditions in other geographical areas" and "understand necessity of local, national and international cooperation" and the Declaration of Barcelona reads that "Today's engineers must be able to understand how their work interacts with society and the environment, locally and globally, . . . ". The temporal 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". Other shifts in perspectives that are mentioned are cultural, social and political shifts. The Declaration of Barcelona for examples states that "Today's engineers must be able to understand the contribution of their work in different cultural, social and political contexts . . . ". A prerequisite for the ability to understand other perspectives is to have a strong enough identity in the own profession, culture etc. The education should therefore give a depth in the disciplinary knowledge while also providing opportunities for interdisciplinary thinking and action.

Skills that are often mentioned are problem-solving, critical thinking, creative thinking, self-learning and skills related to communication, teamwork and becoming an effective change agent to shift policies, practices and societal norms. But LOs do not refer only to knowledge and skills but also to awareness, attitudes and values. The

Declaration of Barcelona suggests that the education in itself should have an "integrated approach to knowledge, attitudes, skills and values" and 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 and to change behaviour. The Declaration of Barcelona wants engineers to "help redirect society" and want to train engineers who are motivated to participate and who are able to take responsible decisions. The Tbilisi declaration talks about "a set of values and feelings of concern for the environment and the motivation for actively participating . . . ". It also mentions a "sense of responsibility and solidarity among countries and regions". When it comes to values, the Declaration of Barcelona is even a bit prescriptive when it says that "Today's engineers must be able to apply professional knowledge according to deontological principles and universal values and ethics". The Tbilisi declaration is, wisely, more careful and states 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". The Declaration of Barcelona suggests that engineers should be prepared for participatory decision-making based on democratic principles when they state that "Today's engineers 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".

There are large commonalities between the Tbilisi declaration and the Declaration of Barcelona even if the intended target group of the Declaration of Barcelona is only a subset of that of the Tbilisi declaration. The similarities to other sets of LOs that can be found in literature are also very large, regardless of level and type of education. It is of course possible that the Tbilisi declaration has had a great influence on subsequent efforts to formulate goals for environmental education or education for SD. The Tbilisi declaration was written over 30 years ago, before SD became an accepted concept and therefore addresses environmental education, but the LOs that are described are in most respects just as valid when it comes to learning for SD.

The type of learning that is normally described in sets of LOs for education for SD can in many important respects be described by the term "transformative learning". Wals and Blaze Corcoran (Wals and Blaze Corcoran, 2006) has described the outcomes of transformative learning as the competence to integrate, connect, confront, and reconcile multiple ways of looking at the world and the need for students to be able to cope with uncertainty, poorly defined situations, and conflicting or at least diverging norms, values, interests and reality constructions. They emphasize the students' dynamic qualities or competencies. They talk about the need to be able to change or shift perspectives related to cultures, disciplines, geographical conditions and time frames. This includes the ability to go from local to global considerations, from short-term to long-term, and to realize that the world has been, is, and will be changing over time, which changes the conditions for people of different generations. The indicated transformation is achieved when you go beyond factual and instrumental learning and are changed by what you learn. In order to achieve transformational learning you must critically reflect on your knowledge and experiences, continuously question your assumptions, beliefs and values, and act accordingly in your personal life, professional life and community life.

Right now, there are many different universities, professional organizations and national authorities around the world that are trying to define appropriate LOs for

higher education. The next section of this paper contains a few examples that the authors to this paper believe are particularly useful in that they address the LOs that are generally seen as important, and also have an innovative approach. They are also the result of efforts that include several different entities, and also provide different geographical perspectives. Note that the commonalities expressed above are also included in these examples below.

Example sets of learning outcomes

This first example was developed for Instituto Tecnológico y de Estudios Superiores de Monterrey, Monterrey Institute of Technology and Higher Education, Monterrey campus (ITESM) and is the result of efforts done first, at the Monterrey founding campus, and presently for the 33 different campuses. In 2001, ITESM, Monterrey Campus, which is the founding one, embarked on the sustainability journey, while the 32 remaining campuses started in the academic realm during the second half of 2006. The inception was carried out through the Sustainable Campus Programme (SCP) in Monterrey campus that addresses six main actions, looking into sustainability from a systems perspective, not only the academic part in the day to day activities in a HEI (Lozano *et al.*, 2006). Among the six main actions for SCP, the following one is relevant to this paper: "Weave SD concepts, as the 'Golden Thread', throughout courses and curricula". For this an effort in Educators' capacity building for sustainability has been implemented with various actions, and educators have also been encouraged to incorporate SD concepts in their own courses.

In 2005 the 2015 Vision and Mission statements (www.itesm.mx/2015/english/index.html) for the 33 campuses was announced, providing a clear mandate towards sustainability and allowing planning and implementing its incorporation on a wide basis for most curricula in the institution. In 2005 and 2006 preparations were carried out to generate the new courses for all curricula. With this opportunity specific courses were selected where SD concepts can be incorporated, without distorting the course's learning intention, but rather reinforcing the SD "weaving" action.

It is in this context that steps to generate LOs for sustainability appeared, reinforced by the Institution's intent to search external accreditation from national and international bodies. Due to this accreditation effort, LO for sustainability were generated in two levels, for "Broad education and learning" providing the systems perspective, and for "Discipline education and learning" providing deeper disciplinary perspective. The following list provides the LOs that are being considered and tested in the institution.

ITESM learning outcomes
Broad education and learning:

(1) An understanding of the ethical responsibility, towards present and future generations.

(2) A knowledge of contemporary issues (taken from ABET[1]).

(3) An understanding of the carrying capacity of ecosystems, in order to provide services to humankind.

(4) An understanding of the social responsibility as a future professional, and as a citizen.

(5) An understanding of the impact that human activities have on the Planet, regarding sustainable and unsustainable resources appropriation.

(6) Knowledge of global trends that impact the life quality of present and future generations.

Discipline education and learning:

(1) An ability to establish the connections to the triple bottom line (TBL) and other sustainable development (SD) dimensions that influence their own knowledge discipline.

(2) An ability to apply assessment criteria or sets of principles or available tools related to sustainability in their own discipline.

(3) The systemic education needed to understand the impact of their discipline solutions or actions in a TBL context.

(4) 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.

(5) 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.

(6) An ability to implement the needed actions to foster sustainability in their professional and personal life.

ITESM started reviewing courses during 2005 and 2006, and a set of mandatory courses were designed to complete and foster the 2015 Vision and Mission. The courses were named "Humanistic and Citizenship Formation" having two courses on Ethics, "Ethics – person and society" and "Ethics – profession and citizenship" but also there is a set of courses in the "Socio-political perspective"; in their specific goals the above mentioned LOs are considered.

As can be seen in the list of learning outcomes above, LOs for ITESM show the commonalities mentioned in the "state-of-the-art" section, providing a strong foundation for sustainability learning and education. The authors would like to add the following two LOs to complement the learning outcomes in the list above:

(1) An understanding of the impact that human activities have on other humans, regarding human suffering.

(2) An understanding of systems thinking and the acquisition of change agent skills to impact change

The authors would also like to comment on that SD should be considered with its multiple dimensions, not only the triple bottom line, but also other relevant dimensions like ethics, policy, law, future generations, etc.

The second example gives a US perspective. In the USA, the Disciplinary Associations Network for Sustainability (or DANS – www.aashe.org/dans) was formed after the US Partnership for Education for Sustainable Development (www.uspartnership.org) convened the leaders of over 20 academic disciplinary associations to discuss each discipline's potential contributions to a more sustainable future. These meetings included national associations for psychology, sociology, philosophy, religion, biology, chemistry, engineering, anthropology, political science, math,

broadcasting, architecture, women's studies, and more. DANS focuses on infusing sustainability into curricula in all academic disciplines, professional development for faculty, standards (including tenure, promotion, and accreditation criteria that value sustainability research and action), cross-disciplinary projects, legislative briefings, and ways to educate the public about how to help create a sustainable future. A second national network, the Higher Education Associations Sustainability Consortium or HEASC (www.heasc.net) was formed to catalyze education for a sustainable future in the programs and operations of mainstream higher education associations and their members. The associations in HEASC are the professional organizations for over half of the approximately 4,000 US college and university presidents; about half of all of the boards of trustees, and many if not most facilities directors, business officers, college and university planners, purchasers, and residential and student affairs staffs. These associations recognize that LOs are valuable for both academic and co-curricular experiences on campus, and are helping HEIs develop academic assignments that focus on real world sustainability challenges on campus, in the surrounding communities, nationally and globally.

HEASC and DANS members have worked together to share drafts of LOs. ACPA (College Students Educators International – www.myacpa.org/) has created a list of LOs being used by both networks. Their LOs, in order to develop and maintain sustainable communities, are:

- Each student will be able to define sustainability.
- Each student will be able to explain how sustainability relates to their lives and their values, and how their actions impact issues of sustainability.
- Each student will be able to utilize their knowledge of sustainability to change their daily habits and consumer mentality.
- Each student will be able to explain how systems are interrelated.
- Each student will learn change agent skills.
- 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.
- 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.

Notice how these learning outcomes move from understanding of our sustainability challenges to engagement in the solutions. Also note how students are encouraged to understand the impacts of their personal choices on the living systems around them and to understanding the need for and catalyzing effective systemic changes.

ACPA recognizes that these LOs can be promoted outside as well as inside the classroom and has published competencies and possible development strategies to attain these LOs in the co-curricular context (www.myacpa.org/task-force/sustainability/docs/Learning_Outcomes_Sustainability_Map.pdf).

Within the USA, there is increasing recognition of the need to move beyond critical thinking to be able to be effective at creating systemic change. Accordingly, ACPA has delineated the skills required to be an effective change agent.

Change agent abilities required to help create a sustainable future

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

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

Change agents are:

- resilient;
- optimistic;
- tenacious;
- committed;
- passionate;
- patient;
- emotionally intelligent;
- assertive;
- persuasive;
- empathetic;
- authentic;
- ethical;
- self-aware;
- competent; and
- 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 task list 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.

For useful theoretical models and references see [2].

Hundreds of colleges and universities in the USA have instituted initiatives to include part of all of the sustainability learning outcomes into the general education core requirements for all degrees and/or have infused these learning outcomes throughout the institution's curricula and co-curricular activities (see National Council for Science and the Environment – www.ncseonline.org/EFS/DebraRowe.pdf). There is no single discipline that is solely responsible for the teaching of change skills. Faculty in many disciplines are recognizing the importance of change agent skills, but comprehensive integration of these skills into all degrees is yet to be accomplished.

Some other sets of LOs that are available in English and somewhat generic and that may give additional input to HEIs that are in the process of formulating or developing their student sustainability LOs are listed here. Most of these sets exhibit the same commonalities as discussed in the beginning of this paper, and these and other sets have also provided input to the analysis. The Washington Center for Improving the Quality of Undergraduate Education in the USA has listed useful sustainability LOs for their "Curriculum for the Bioregion" initiative (www.evergreen.edu/washcenter/

resources/upload/Sustainability_Learning_Outcomes_2008.doc). The organization Learning for a Sustainable Future was created to integrate education for SD into the curricula at all grade levels in Canada and have a nice set of LOs listed on the internet (www.lsf-lst.ca/en/teachers/learning_outcomes.php). An education for SD initiative in Manitoba, Canada, connected to the Unesco DESD, lists LOs from kindergarten to grade 10 for three areas: social studies, science, and physical/health education, to assist teachers to integrate sustainability topics into their classroom activities (www.edu.gov.mb.ca/k12/esd/correlations/index.html). There are many other initiatives in the world that are presently described only in other languages than English, e.g. within the network Higher Education for Sustainable Development (HU2) in Sweden (www.hu2.se/nlhu2.htm). At Chalmers university of technology in Göteborg, Sweden, LOs for education for SD are under development in a process involving teachers, program directors, students and other actors in the educational system. The workshop discussions that are part of this work are seen as an important part of a learning process for the HEI. The work is described in Swedish on the internet (www.chalmers.se/gmv/EN/projects/esd_chalmers).

It is sometimes difficult to distinguish between LOs for sustainability and other LOs, and many HEIs have added new LOs that address sustainability to their already existing sets of LOs. Then, LOs for education for SD are not specifically pointed out. It also varies widely what is considered to be LOs for sustainability. In some countries, democracy and gender equality, for example, has been on the agenda for a longer time than the concept of SD, and the issues are handled by other groups than the groups handling the SD issues, and then LOs for sustainability may not emphasize these issues.

Means to achieve learning outcomes and evaluate learning

The main focus of this paper is on LOs for SD in higher education. Means to achieve the desired learning and methods to evaluate the learning will not be addressed in detail. Nevertheless, for context, a few remarks will be given here.

Once the outcomes of learning for SD have been agreed on, the strategies for teaching and assessing these outcomes must also be chosen. Curricula, syllabi, and teaching and learning activities have to be formed so as to reach the LOs. Along with the commonalities we have seen among declarations and lists of LOs, there also seem to be commonalities among pedagogy that emphasizes active learning, real world and problem based learning that focus on engaging in sustainability solutions, and the use of learning communities and reflection. There is a recognition that the teaching methodologies have to move beyond content to also help construct the self concept of the student as a life long learner and agent of change for SD. The Tbilisi declaration describes desirable educational approaches as having "diversity in learning environments and educational approaches", "stress on practical activities and first-hand experience", "closer link between educational processes and real life" and a focus on "problems that are faced by particular communities".

It must not be forgotten the need to provide capacity building for the educators. They need to be knowledgeable in sustainability and in education for SD, otherwise they will not weave SD into their courses with the appropriate teaching methodologies. In order for this to happen, teachers must also be given the appropriate resources as well as other incentives, which may challenge traditional educational structures and reward systems.

HEIs will embark on educating future professionals in sustainability, facing the challenge to assess if the LOs have been achieved at the end of the students' careers, as well as in their professional life. For this, methods and tools to carry on the assessment need to be developed, tested and validated, taking into account the specific circumstances of each HEI and their cultural context. It seems easier to do the assessment during students' attendance at the institution, and a more difficult task to do it once people have graduated, but the latter is of utmost relevance, because it will provide this long-term learning, much needed to reverse the several unsustainable paths that our societies have chosen.

The DESD offers an opportunity for HEIs to redirect or reorient their activities to become effective change agents themselves and to educate effective change agents. This paper aims at encouraging and facilitating discussions on LOs for students, which represent the goals of learning. An active discussion on this topic will stimulate not only an improvement of quality in education for sustainable development but also learning for sustainable development within the organization.

Conclusions

This paper attempts to conduct an exploratory comparison of some sets of learning outcomes and declarations on education for sustainable development. While more comparisons in the future will be valuable, the analysis to date points to commonalities across countries and cultures. In addition to gaining the knowledge about ecosystems and the human condition, the learning outcomes all include systemic thinking, interpersonal and intrapersonal skills development and a strong emphasis on change agent skills. It should be stated that addressing sustainability will imply that HEIs to provide the proper foundation to consider the concept within their multiple interconnected dimensions. There will be a need to go far beyond the Triple Bottom Line, which poses a challenge, but also an opportunity to educate future professionals with this encompassing vision of the world, transforming our education from the isolated pigeon-hole style towards this sort of renaissance outlook. Of course the professionals should be knowledgeable and skilful in their disciplines, but also they should resonate with the systemic and complex frame of reference of sustainability.

Notes

1. ABET: recognized accreditor for college and university programs in applied science, computing, engineering, and technology in the USA. [online]. Available from: http://www.abet.org/
2. College Students Educators International [online]. Available from: http://www.myacpa.org/task-force/sustainability/docs/Change_Agent_Skills.pdf

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