

Chapter 17

Usefulness of a Sustainability Literacy Test

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Abstract This chapter will trace the history, development, and purpose of the Sustainability Literacy Test (SLT) being promoted by several universities worldwide to ensure that they are producing sustainability literate graduates. A comparison between SLT and similar pioneering tests will be made to offer insights on lessons learned from past experiences and provide suggestions for improving SLT. In addition, this chapter will present initial feedback from Kyoto University students, who were among the first batch of students in Asia to take the global pilot version of the test in 2014, on how they found SLT and what recommendations they could share to make SLT more useful from the perspective of test-takers.

Keywords Sustainable development • Sustainability literacy test • Higher education institutions

17.1 Introduction: What Is Sustainability Literacy?

According to Kanj and Mitic (2009), “to function well in the twenty-first century a person must possess a wide range of abilities and competencies, in essence many ‘literacies’.” This smorgasbord of literacies includes but is not limited to: civic literacy, computer literacy, consumer literacy, cultural literacy, energy literacy, environmental literacy, financial literacy, geographic literacy, health literacy, historical literacy, investment literacy, legal literacy, mathematical literacy, media literacy, moral literacy, political literacy, scientific literacy, technological literacy, and

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workplace literacy. Literacy is defined as basic knowledge in a subject or field (Snively and Cooper 1997).

One of the emerging literacies is sustainability literacy. It follows in the footsteps of environmental literacy and ecological literacy (El Ansari and Stibbe 2009; Lugg 2007). The UK Government's sustainable development strategy, 'Securing the Future,' was pioneering in calling on all education sectors to "embrace sustainable development and promote the concept of sustainability literacy among their students" (HEA 2006). 'Securing the Future' stipulates the need to make sustainability literacy a core competency for professional graduates (DEFRA 2005).

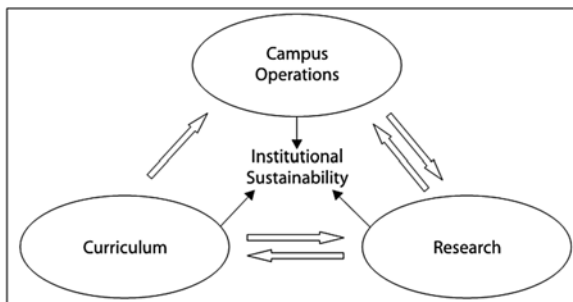
According to Stibbe and Luna (2009), building a more sustainable self, community, society and world requires more than knowledge about sustainability – it requires sustainability literacy, which refers to "the skills, attitudes, competencies, dispositions, and values that are necessary for surviving and thriving in the declining conditions of the world in ways which mitigate that decline as far as possible". Sustainability literacy helps compel individuals to become deeply committed to building a sustainable future (Carteron and Decamps 2014). A sustainable literate person recognizes the necessity for shifting to a more sustainable way of doing things, has adequate knowledge and skills to decide and act in a way that favors sustainable development, and is able to appreciate and reinforce other people's decisions and actions that favor sustainable development (Adderley 2007).

17.2 History and Development of the Sustainability Literacy Test

The last decade has witnessed a growing public awareness of sustainability and higher education institutions (HEIs) have also joined the bandwagon (Yuan and Zuo 2013). HEIs have significantly contributed in the generation of knowledge and in shaping social and scientific paradigms. Through their teaching and research activities, universities and colleges are expected to fashion a more sustainable future. The Rio+20 United Nations Conference on Sustainable Development in 2012 highlighted the role of HEIs in increasing awareness of sustainability challenges for graduates. Given the objectives of Rio+20, HEIs have a special responsibility to provide leadership on education for sustainable development (ESD) which aims at enabling every graduate student to acquire the values, competencies, skills, and knowledge for a sustainability literate society.

In the Declaration on Higher Education Sustainable Initiative launched at Rio+20, Chancellors, Presidents, Rectors, Deans, and leaders of HEIs and related organizations, acknowledged the responsibility that they bear in the international pursuit of sustainable development. They committed to (1) teach sustainable development concepts; (2) encourage research on sustainable development issues; (3) green their campuses by reducing their environmental footprint; adopting sustainable procurement practices; providing sustainable mobility options for students

Fig. 17.1 A whole-of-university approach to sustainability (Source: Mcmillin and Dyball 2009)



and faculty; adopting effective programs for waste minimization, recycling, and reuse; and encouraging more sustainable lifestyles; (4) support sustainability efforts in the communities in which they reside; and (5) engage with and share results through international frameworks.

Since the UN Decade of Education for Sustainable Development was established by UNESCO in 2004, HEIs have advanced sustainability principles on their campuses through a variety of activities in all dimensions in a whole-of-university approach (Fig. 17.1), including in governance, campus operations, education, research, and outreach (Mcmillin and Dyball 2009; Yarime and Tanaka 2012; Savelyeva and McKenna 2011).

After a certain period, HEIs developed the Sustainability Assessment Tool (SAT) to identify obstacles to the current approaches towards sustainability. A question is raised on how HEIs can assess and report on their global performance? In this context, the Sustainability Literacy Test (SLT) was suggested as “a tool for the various initiatives on sustainability lead by HEIs to assess and verify the sustainability literacy of their students when they graduate” (<http://www.sustainabilitytest.org>). SLT “assesses the minimum level knowledge in economic, social, and environmental responsibility for higher education students, applicable all over the world, in any kind of HEI, in any country, studying any kind of tertiary-level course (Bachelors, Masters, MBAs, PhD).” The objectives of SLT are to: (1) get feedback to teach and enhance the quality of students’ knowledge on sustainability; (2) enhance sustainability literacy worldwide; (3) create a benchmark for ESD (with statistics and worldwide survey); and (4) serve as a potential recruitment tool for employers (NGOs, government institutions, private companies).

In October 2013 a draft version of the Sustainability Literacy Test (version 0) was launched in France and between January and October 2014 a pilot version (version 1) was launched worldwide (Carteron and Decamps 2014). More than 24,500 students from 30 countries had taken the Sustainability Literacy Test versions 0 and 1 combined (Carteron and Decamps 2014).

The scope of SLT focuses on two key areas: (1) questions about the current challenges facing society and the planet, e.g., general knowledge on social, environmental, and economic issues; basic understanding of the Earth system, e.g., water and carbon cycles, greenhouse effect, etc. and (2) questions on an organization’s

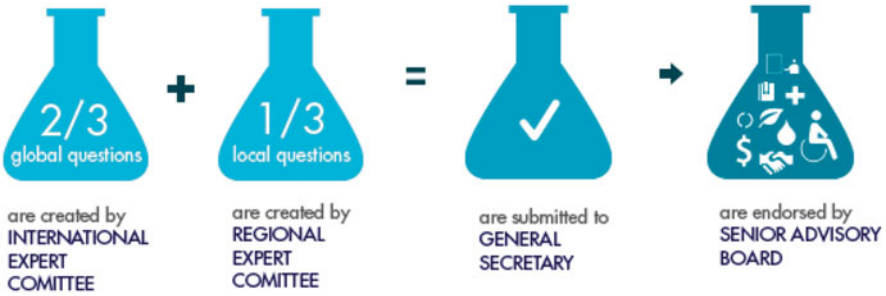


Fig. 17.2 Structure of the sustainability literacy test (Source: <http://www.sustainabilitytest.org>)

responsibility, e.g., questions about organizational practices for integrating social responsibility in their activities and questions on the responsibility of individuals as employees and citizens.

A Multiple Choice Question (MCQ) format was chosen to make the test easier to use and implement worldwide. Fifty MCQs are randomly selected among a wide range of questions from a question bank. Out of these 50 questions, 30 are related to supra/international level issues (e.g., global warming) and 20 are linked to national/regional issues (e.g., local regulations and laws, culture, and practices) (Fig. 17.2). Completing this web-based test usually takes 30 min.

The supra/international level questions are used to be able to compare knowledge from one region of the globe to another and to allow institutions/students to benchmark at a worldwide level. The national/regional level questions are used to ensure that SLT remains relevant. Questions in the Sustainability Literacy Test were suggested by the Regional/National Expert Committee (RNEC) and International Expert Committee (IEC) members, in most cases after consulting the broader community of educators. The questions were reviewed and revised by a reviewing committee (part of the General Secretariat), and then, after a series of revisions, questions were posted on a secure platform for comments and validation by members of the Senior Advisory Board.

Carteron and Decamps (2014) presented a 1-year report on the implementation of the Sustainability Literacy Test on the occasion of the World Conference on Education for Sustainable Development in Nagoya, Japan in November 2014. They shared the achievements of SLT and its next steps going forward.

17.3 Experiences of Similar Tests by Pioneering Universities

The idea behind sustainability literacy testing is not new. Sustainability literacy is a topic of increasing interest among a growing number of higher education sustainability faculty and staff. Several groups have been working on sustainability literacy tests for quite some time. In the early stage of DESD, tests were utilized for assessing the sustainability knowledge of students before and after one course, frequently

in the manner of pre-, sometimes mid-, and post-test checks on content (Erdogan and Tuncer 2009). Hence the number of students tested was limited to the size of the class taking a course. Since the adoption of the Sustainability Tracking Assessment and Rating System (STARS) by over 200 HEIs, there had been attempts to evaluate the understanding of basic knowledge on sustainability among the student population (AASHE 2014). In this chapter, several case studies which will be analyzed based on these two main approaches: course-based sustainability literacy tests and university-scale sustainability literacy tests. Here we are briefly presenting the experiences of Middle East Technical University Ankara (Turkey), Liverpool John Moores University (UK), University of Maryland (USA), and Ohio State University (USA).

The convergence of a number of trends and events in recent years led to the emerging transformation in university curriculum to develop a responsible citizenry capable of applying ecological, economic, and socio-cultural knowledge to solve current and future global problems. Sustainability topics are now included in formal or non-formal education in the form of short-term courses, lectures, or even training programs which are related to specific topics connected to the specialization of the students. This new educational shift leads to research on how to evaluate the efficiency of lecture design, contents, pedagogical approaches, and other dimensions of sustainability education at each university (Erdogan and Tuncer 2009; Connell et al. 2012; Cotgrave and Kokkarinen 2011).

A set of questions is frequently used to assess the improvements in the sustainability literacy of participating students. In the Middle East Technical University Ankara (Turkey) for instance, a set of seven open-ended questions was utilized to evaluate the change in sustainability outlook of 68 university students from the Faculty of Education, after taking a course titled “Education and Awareness for Sustainability” (Erdogan and Tuncer 2009). The questions focused on future employment, consumption decisions, lifestyle choices of the students, and how they contribute to the improvement of communities in which they live. The students’ response on the whole presented the positive change in their sustainable ways of living.

Liverpool John Moores University (UK) similarly designed a course to promote sustainability literacy among undergraduate construction students (Cotgrave and Kokkarinen 2011). In order to test the efficiency of the new course, questions were provided to students via email pre-, mid-, and post-course. Majority of questions asked the students to use a rating scale to compare the motivation of students during the course via their knowledge, awareness, attitudes, and learning styles as well as to identify the difference in terms of mode of study, program of study, and student age. Additionally, each student was required to write an essay after finishing the course. The results showed that 216 final-year students’ attitudes consistently increased at every stage of the course, particularly students from a construction management major. Although students did not claim that their knowledge was higher than before, the results from the test and essays implied their holistic thinking in the selection of construction materials, which was not only based on the quality and price but also on health, safety, and environmental considerations.

As can be seen from the two case studies above, sustainability themes with strong linkage to the students' future employment were designed to nurture an autonomous citizenry for diverse fields. Testing the sustainability literacy of students at all stages of the education process has been pondered as an effective tool to evaluate and modify ESD courses. Using open-ended questions or essays allow professional educators to deeply understand to what extent students perceive and improve their competencies to construct a sustainable future. Nonetheless, to confirm the change in sustainability literacy requires researchers to follow the students over the long term, at least for several semesters.

When HEIs have become incrementally more aware of ESD, there is a demand to ensure a certain level of sustainability understanding among university students regardless of their majors. The University of Maryland (USA) was the first HEI to conduct a university-wide sustainability literacy test, named "Sustainability Quick Quiz" (Horvath et al. 2013). The test which included 15 close-ended questions and 1 open-ended question was hosted on the Survey Monkey website. The main contents of the test included: (i) the meaning of sustainability; (ii) how to live sustainably; and (iii) the relationship between humans and Nature. There were 1,442 students who took the test, out of a random sample of 9,170 students registered in the 2011 spring semester (one-fourth of student population): 68 % of those who took the test were undergraduate students and 32 % were graduate students.

The mean raw score for all assessment respondents was 23 points or a mean sustainability score of 74.9 %; the mode for all respondents was 83.8 %; the median sustainability score was 77.4 %; the range was between 16 % and 100 %, with a standard deviation of 15.66. The data showed that graduate students (master and doctoral levels) scored significantly higher (mean sustainability score = 77 %) than undergraduate students (mean sustainability score = 74 %). Another meaningful finding was that the students who took three or more sustainability-themed courses had more sustainability knowledge than students who took zero, one, or two courses. There were several challenges identified after conducting the Sustainability Quick Quiz such as the low rate of participation (only 16 %) via online survey and lack of participation of key members (administrators, faculty members, and campus sustainability staff). Only those who were interested in sustainability took the test so the survey could not capture the whole picture of the sustainability literacy of all the students. Moreover, the questions were not able to assess students' awareness, sensitivity, knowledge, level of concern, and level of responsibility.

In Ohio State University (USA), their Sustainability Literacy Test included 16 multiple choice questions across three domains of sustainability knowledge: six environmental sustainability questions, five social sustainability questions, and five economic sustainability questions. The test was sent through email to over 10,000 enrolled undergraduate students and about 1,930 responded (Zwickle et al. 2014). The results are shown in Table 17.1:

The overall average score was 11.08 out of 16. For the three separate domains, there was no remarkable difference between environmental and social domains but the students obtained the lowest score in the economic domain. In terms of academic level, students at higher levels achieved higher scores (Fig. 17.3).

Table 17.1 Results of the sustainability literacy test of Ohio State University

Result	Environmental	Social	Economic	Total
Mean raw score	4.39/6	3.55/5	3.03/5	11.08/16
Mean sustainability score	73 %	71 %	61 %	69 %
Standard deviation	1.48	1.23	1.27	3.21

Source: Zwickle et al. (2014)

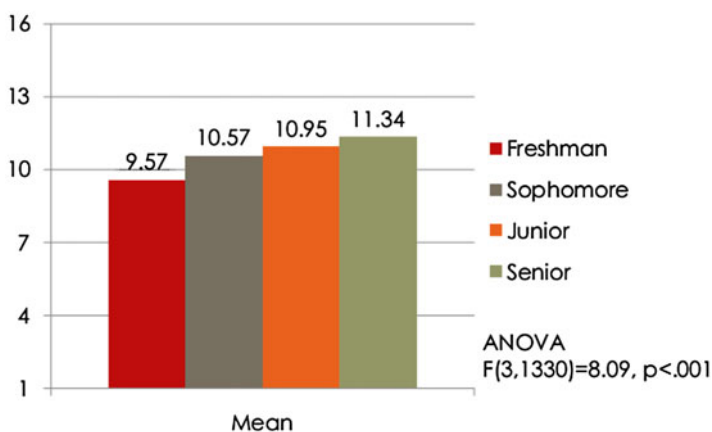


Fig. 17.3 Sustainability literacy test results by academic level (Source: Zwickle et al. 2014)

Based on their experience, Ohio State University came to the realization that developing an assessment and methodology that provides meaningful results can be difficult; analyzing and interpreting the results can be time-consuming; buy-in from administration may not be there; students may already be experiencing survey fatigue; and no central assessment tool currently exists.

Table 17.2 summarizes the comparison among the sustainability literacy tests of pioneering universities and the international SLT launched in 2014.

17.4 Students’ Early Reactions to the Sustainability Literacy Test

Since the global pilot version of SLT was launched in 2014, 261 HEIs had registered to join the network and conducted the test (Carteron and Decamps 2014) (Table 17.3).

Kyoto University was the first HEI in Japan to join the network and conduct the pilot SLT in July 2014. In order to understand the reaction of the students after taking the test, a survey was conducted. A total of 43 students from 7 faculties (more than half of all the test-takers from Japan) voluntarily joined the survey: 16 of them were Japanese and the rest came from ten different countries. Most of survey

Table 17.2 Comparison among different sustainability literacy tests

	Middle East Technical University Ankara	Liverpool John Moores University	University of Maryland	Ohio State University	International SLT
Year	2004–2005 academic year	2010	2011	2013	2014
Time	–	–	–	–	30 min
No. of items	7	16	16	16	50
Maximum score	–	31 points	16 points	16 points	50 points
Languages	Turkish	English only	English only	English only	Six languages
Mode	Survey	E-mail	Survey monkey	E-mail	Online
Types of questions	Open-ended	Open ended + Essay	15 close ended, one open ended	Multiple choice	Multiple choice
Target students	Faculty of Education students who took the “Education and Awareness for Sustainability” course	Undergraduate construction students	9,170 undergraduate and graduate students	10,478 undergraduate students	All higher education students
No. of students tested	85	216	1,442 (68 % undergraduate, 32 % graduate)	1,930	24,555 students from 30 countries (as of 2014)

Table 17.3 Universities registered and tests completed as of October 24, 2014

Countries where the test is already customized	Registered universities (V1)	Students who have completed the test
Argentina	1	176
Brazil	20	2229
Canada - Quebec	3	348
China	2	132
China (Hong Kong)	8	824
Costa Rica	9	75
Egypt	1	88
France	86	8776
India	7	38
Ireland	1	91
Italy	6	675
Japan	3	76
Peru	1	600
South Africa	4	73
Spain	7	56
United Kingdom	19	1926
USA	58	1553
	236	17736
Countries without customized questions		
Australia	2	4
Belgium	2	77
Burkina Faso	1	
Canada	5	
Ecuador	1	
Finland	1	
Germany	2	
Haiti	1	
Israel	1	
Kenya	4	
Malaysia	1	708
New Zealand	1	
Sweden	1	20
Switzerland	1	7
Taiwan	1	1
Dominican republic	0	
Senegal	0	
	25	817
TOTAL	261	18553

Source: Carteron and Decamps (2014)

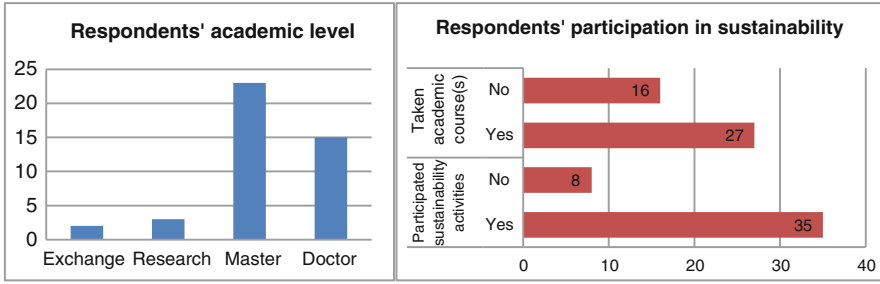


Fig. 17.4 Survey respondents' background information

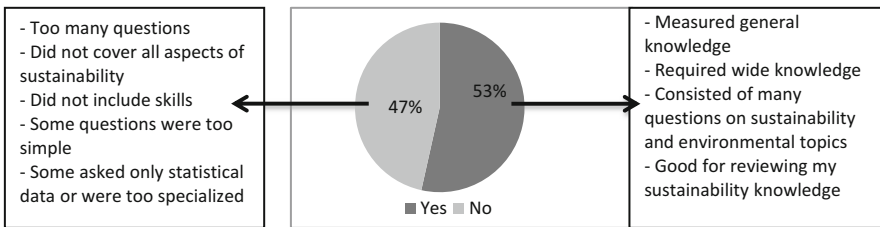


Fig. 17.5 Students' reactions to the questions in SLT

respondents had experienced involvement in sustainability activities by taking academic courses or joining outdoor events such as the Green Festival, planting trees, recycling wastes, or participating in the Sustainability Day in campus (there were a total of 21 diverse activities listed by the survey respondents) (Fig. 17.4). Indeed, sustainability extra-curricular activities have become more popular among higher education students. It was expected that with students' sustainability experiences, they would be able to provide relevant feedback after finishing the SLT.

When asked if this test accurately measured their knowledge on sustainability and environmental topics, the students' answers are presented in Fig. 17.5:

The number of respondents who agreed and disagreed with the claim that SLT accurately measured their knowledge on sustainability is not significantly different (53 % agreed and 47 % disagreed). The reasons for their arguments are indicated in Fig. 17.5. These reasons can somehow be initially considered as the weaknesses and strengths of the SLT.

Despite the disagreement of the respondents on whether SLT measure their sustainability knowledge or not, the replies reflect some positive effects of the SLT on the student, as shown in Fig. 17.6. Only five students said that the test was not useful at all while the rest concluded that the test helped them to improve their knowledge and encouraged them to learn more and get involved in sustainability activities more often.

Obviously to create a test relevant worldwide is not an easy task. The pilot version of SLT is certainly not perfect. The test also does not claim to be able to evaluate the ability of students and graduates to contribute to a sustainable world, which

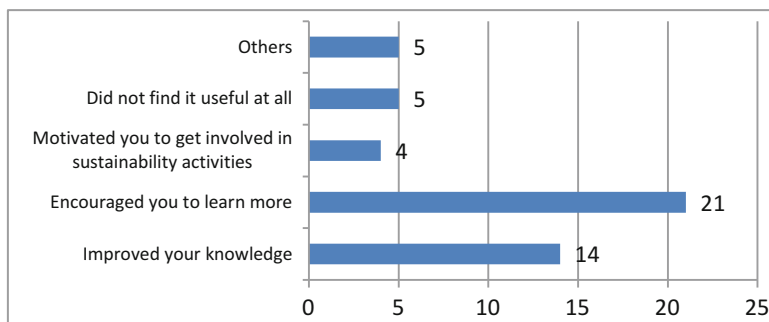


Fig. 17.6 The usefulness of the SLT to the students

is more important than their sustainability knowledge. The survey respondents provided several suggestions on how to improve the SLT. In terms of contents, most of the respondents recommended that the questions should be qualitative rather than quantitative. Quantitative, trivia-like questions should not form the majority of the test questions. According to the survey respondents, application of the concept of sustainability and skills were more important than memorizing statistics and dates hence questions involving practical problem-solving should be added. In order to inspire students to learn about sustainability, the SLT should be conducted regularly and the website should enable students to learn through the process at their own pace and not during a certain period only (which may conflict with other school activities). The format of the test should be improved to facilitate learning. At the end of each question, there should be an explanation related to the answer of the respondents, why it is correct or not. Furthermore, at the end of the test, it is necessary to interpret what the final score of the students mean.

Improving the quality of SLT will require testing and updating over a long term. SLT should also be complemented with other assessment tools on values and competencies necessary to create systemic changes for a sustainable future. This is because to be truly sustainability literate, students must be able to combine knowledge from the environmental, economic, and social domains and put this knowledge into practice.

17.5 Lessons Learned and Suggestions for Improvement

Jackson (2014) has also noted that one of the limitations of SLT is that it only tests students' knowledge. Nevertheless, SLT has a great potential because it provides visibility to sustainability in higher education communities and reveals the gap between "minimal knowledge" and what students are learning, which should prompts educators to reflect on when and where the missing information should be taught, whether in formal or in nonformal education (Jackson 2014). SLT's transnational nature is its great advantage: sustainable development implies a notion of

global vision (Jolly et al. 2014). With SLT, the test is open to anyone anywhere in the world and will allow a comparison between countries. If we want to collectively find solutions to different sustainability issues, we need at the very least a shared core of basic knowledge (Carteron and Decamps 2014).

But due to its inherent limitations, SLT must not be used as the single means to assess sustainability literacy. Students' educational backgrounds and interests vary widely. Answering questions randomly taken from a pool of questions sounds like a lottery. Students will likely get a wide range of scores if they have the opportunity to take the test several times. SLT should be complemented with other assessment tools on values and competencies necessary to create systemic changes for a sustainable future (Carteron and Decamps 2014). In conjunction with evaluation of the sustainability literacy, HEIs should promote campus sustainability initiative in several categories such as education and research, operations, planning, administration, and innovation. Under the combination of this hard soft approach, students are expected to reach more visual experiences towards sustainability (Nakamura et al. 2014).

The team behind SLT is aware that the test will never guarantee that students will behave responsibly (Carteron and Decamps 2014). Anyone can have good knowledge about crucial social and environmental issues but still decide not to act. Without a sense of personal connection to sustainability issues, the knowledge and skill sets gained by students may not lead to positive actions either in the workplace or in private life (Murray et al. 2007). Sustainability literacy requires practical skills for transitioning away from consumerist societies to communities capable of fulfilling human needs with minimal use of energy and resources (Stibbe and Luna 2009). But exploration and assessment of sustainability literacy is something that may never be complete since the changing conditions of the world will continuously require new and different skills, i.e., an evolving sustainability literacy (El Ansari and Stibbe 2009).

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