

Chapter 28

Education for Sustainable Development

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Abstract Education is to play an essential role for sustainable development (SD). The chapter dedicated to “Education for Sustainable Development” (ESD) explains why and how this can be done.

First of all, a distinction is made between several levels of organizational change within a university, varying between minor changes and all-out transformation processes, leading to a state of “System Integration of Sustainable Development” (SISD). In such a process, not only the main aspects and activities of a university are transformed but even the very identity of the institution. In order to achieve this, a university has to act as a “learning organization,” as is described using the concrete example of a Dutch university for applied sciences.

The key role of a university toward sustainable development is its education, as is argued. In order to describe which elements the transformation of the education consists of, the so-called Tree Model is used.

The “roots” of this tree represent the educational goals, i.e., a description of the type of professional the university wishes to deliver to the society and the professional fields. For this purpose, a tool is available called “RESFIA+D,” which offers a method to develop or improve the professional competences of study programs, making use of a description of a number of levels of competence.

Another set of tools is described to develop the “trunk of the tree,” i.e., a general introduction to sustainable development for all academic disciplines, consisting of a textbook and a website offering accessories, e.g., exercises, serious games, video clips, etc.

Other elements of a tree are used to describe more aspects of ESD, such as the branches, which represent the disciplinary integration of SD within modules and topics throughout the curriculum.

Finally, the chapter describes a way to raise the expertise of the teaching staff, which is quintessential to achieve the desired ESD transformation. Together with an integration of this development with the quality management, making use of ESD assessment tools such as STARS (Sustainability Tracking, Assessment & Rating

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System) or AISHE (Assessment Instrument for Sustainability in Higher Education), the goal of SISD can be reached.

Keywords Education • System integration • Transformation • Competences • Assessment

1 Levels of Change: From Minor Additions to System Integration of SD

Education is an essential contributor to sustainable development (SD). This is expressed in many sources, e.g.:

Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues. [...] Education [is] indispensable to changing people's attitudes so that they have the capacity to assess and address their sustainable development concerns. It is also critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making. (UNCED 1992: Agenda 21, §36.3)

In order to contribute to SD, education will have to change drastically. The science that investigates this change process is "Education for Sustainable Development" (ESD).

When educational institutions start ESD activities, this usually initially leads to minor changes, in which SD elements are added, "bolted-on," to the education without deeply changing the existing. In an ESD assessment instrument, AISHE (Roorda 2001; Roorda et al. 2009), this development stage is described as "stage 1: activity oriented." As the development proceeds, the institution may enter stage 2, "process oriented," in which SD becomes more and more integrated into the curriculum and in the institutional vision, policy, and operations.

A crucial next stage is "system oriented." If a university or school reaches this stage on a wide range of criteria, it realizes a state of "SISD": *System Integration of Sustainable Development*. This stage is described as:

SISD not only means a systematic integration of sustainable development into an educational organization (or a functional unit within it, e.g. a faculty, a school, or a study program), but also, and even primarily, at integration at a systems level. The latter implies that sustainable development has become a part of the fundamental characteristics of the organization, of its very identity. If this is the case, it will be observed that sustainability has become a part of all or most activities, or at least of the thoughts and philosophies behind those activities. (Roorda 2010, p. 138)

Question

Consider your own university, or a university that you are familiar with. If you were to express the present state of this university as a percentage of a full SISD, what percentage would you choose? Do you think that everybody would roughly agree with your estimate?

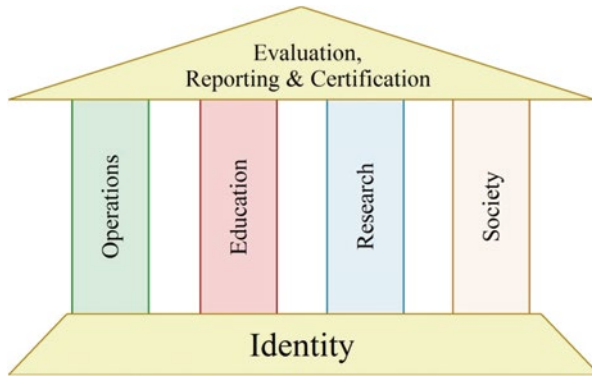


Fig. 28.1 The main functions of an educational institution

The development stages of AISHE show resemblance to the levels of change defined by Sterling (2004). A comparison can be found in Roorda (2010, p. 139).

Thorough ESD integration will have consequences for all four main functions of a university (Velazquez et al. 2006), as Fig. 28.1 shows, i.e., on its operations (Clugston and Calder 2000), its education, its research, and its community outreach (Megerle and Megerle 2000). More fundamentally, realizing SISD has consequences for the identity of a university and on its quality management and public reporting.

Some aspects of SISD are (Roorda 2001; Roorda et al. 2009):

The organization visions itself as a key player for sustainable development [...]. Staff and students are actively involved in the continuous development and improvement of the vision and policy on sustainable development. The organization can be characterized as a *learning organization*. (AISHE 2.0, criterion I1: *Vision and policy*, stage 3)

SD is implemented systematically in the entire curriculum, in accordance with the graduate profile. (AISHE 1.0, criterion 4.1: *Curriculum*, stage 3)

All environmentally related topics are part of an integrated environmental management system (EMS). This EMS is fully functional within all parts of the organization. The environmental reporting is an integrated part of the annual reporting of the organization. (AISHE 2.0, criterion O4: *Ecological sustainability*: stage 3)

Details about the application of AISHE are described below.

Avans University hosts 27,000 students, over 100 study programs, and 2200 employees. Its ambitions regarding sustainability can be summarized in two statements:

Avans post-graduates contribute actively to sustainable development by combining entrepreneurial spirit with sustainable awareness and engagement.

Supported by its knowledge of and engagement with society, Avans participates in solving major societal issues.

(continued)

In order to realize this, the university board has formulated its vision, mission, and goals regarding ESD in a vision document. The main targets are also agreed with the Dutch Ministry of Education as a legal contract.

In 2012 Avans took off to meet its ambitions by installing several multidisciplinary groups of lecturers to enhance and sustain the process.

One group received targets to develop educational materials for SD to be used in all study programs: basic materials to be used as an introduction to SD in the first year and building blocks covering specific SD issues, e.g., C2C, circular economy, sustainable finance, bio-based energy, and scenario thinking.

Another group was trained in using assessment instruments (described below), such as RESFIA+D for the educational goals, the C-scan for the curriculum contents, and AISHE for the overall ESD strategy. In these assessments all stakeholders of Avans are represented: students, lecturers, management, and the professional field.

In 2013, the various initiatives are integrated into an all-encompassing program to implement SD, both in the curricula and the organization. The aim is to evoke awareness and build commitment for SD, with clear goals and quality indicators for competences of staff, students, and organization.

If all ambitions prove to be successful, around 2018 Avans will have realized SISD in all aspects: its education, operations, research, community outreach, and – last but not least – its identity.

2 The Learning Organization

The organization development of a university toward SISD can hardly be described as a project or a program, as the final goals cannot be described and planned conclusively right from the beginning. A better qualification is an explorative journey, or an adventure, in which the goals and the strategy are redefined continuously, in an iterative process. Therefore, in order to realize SISD, an institution has to behave like a *learning organization* in which the SISD development process is performed as action research, with the institution itself as its object of study. This implies

... a participatory, democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory worldview which we believe is emerging at this historical moment. It seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities. (Reason and Bradbury 2001)

The complexity of the SD concept and of an educational institution, as well as the fact that ESD is not value-free but has the ambition to achieve societal improvements, requires a new scientific paradigm for this kind of action research. One such paradigm is “transdisciplinary science” (Roorda and Rachelson 2016).

The birth of science is based on a strict dissociation of scientific knowledge from the various aspects of practical knowledge. The ideal of scientific knowledge as it was shaped in antiquity is still influential today, although the conception of science and the relationship between science and the life-world has undergone major changes. (...) Transdisciplinary research is challenged by the following requirements:

- To grasp the complexity of the problems,
 - to take into account the diversity of scientific and societal views of the problems,
 - to link abstract and case specific knowledge, and
 - to constitute knowledge with a focus on problem-solving for what is perceived to be the common good.
- (Hirsch Hadorn et al. 2008)

Other related scientific approaches are “mode-2 science” (Gibbons et al. 1994), case-based research (Yin 2009), and post-normal science (Funtowicz and Ravetz 1993; Martens 2006). Together, they form a “cluster concept” for a new, society-oriented scientific paradigm (Roorda 2010, pp. 22–23).

3 Focus on Education: The Tree Model

Of the four roles of a university toward ESD, shown in Fig. 28.1, education is by far the most important. This is due to the fact that, through its education, a university creates a strong multiplier effect: if, over the years, hundreds of thousands of its graduates possess the knowledge, insights, skills, and attitudes to involve sustainability aspects into their profession, the effect on society is immense.

Question

Consider your own university, or a university that you are familiar with. Which of the four roles gets the highest attention there? Why do you think this was decided? Is this all right, in your opinion, or would you shift focuses if you could?

The main educational aspects of ESD can be understood with the “Tree Model”; see Fig. 28.2. An overview of the elements of this model is shown in Table 28.1.

3.1 *The Roots: The Sustainably Competent Professional*

The roots of the tree symbolize the “roots” of a study program, i.e., the educational goals, answering the question: “What kind of professionals do we want to deliver to society?” In other words, what exactly defines a “sustainably competent professional”?

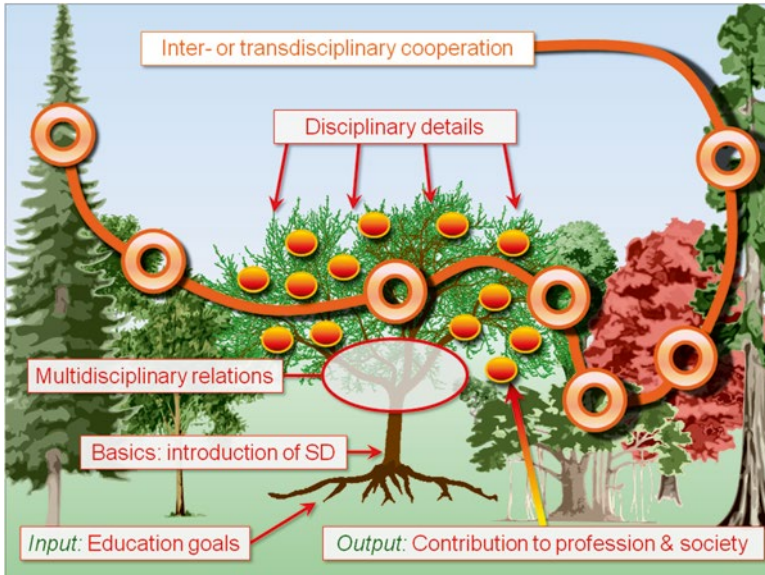


Fig. 28.2 The tree model

Table 28.1 The tree model: defining the sustainability strategy

Tree element	Topic
The <i>genotype</i>	The university mission and identity
The <i>roots</i>	The graduate profile, i.e., the education goals, e.g., the competence profile
The <i>trunk</i>	The basics: what <i>every</i> student should learn
The <i>branches</i>	The disciplinary details of SD in the curriculum
The <i>biochemistry</i>	Didactics: methodologies for the learning process
The <i>ecosystem</i>	Inter- and transdisciplinary cooperation
<i>Sprouting and growing</i>	ESD strategy and assessment
<i>Reaching maturity</i>	System Integration of Sustainable Development (SISD)
The <i>fruits</i>	Sustainably competent professionals

For this purpose, an assessment tool was developed called RESFIA+D (Roorda 2012). The model consists of seven SD competences, shown in Table 28.2: six generic competences – each subdivided into three more detailed competences – plus an unlimited set of more specific, discipline-dependent competences. The RESFIA+D model is a synthesis of a wide range of earlier sets of competences for sustainable development as described in Roorda (2016). An ample series of case studies (in the Netherlands and Belgium) further defining and illustrating the RESFIA+D model is available in Roorda (2015) another series of such case studies (in the USA and Canada) is in Roorda and Rachelson (2016).

To each of these competences, a set of four competence levels was added: varying from “apply” (implying that a student or a professional is able to do what he/she

Table 28.2 RESFIA+D: Professional competences for sustainable development

<i>Competence R: responsibility</i>	<i>Competence E: emotional intelligence</i>
A sustainably competent professional bears responsibility for his or her own work	A sustainably competent professional empathizes with the values and emotions of others
<i>That is, the sustainable professional can...</i>	<i>That is, the sustainable professional can...</i>
R1. Create a stakeholder analysis on the basis of the consequence scope and the consequence period	E1. Recognize and respect his or her own values and those of other people and cultures
R2. Take personal responsibility	E2. Distinguish between facts, assumptions, and opinions
R3. Be held personally accountable with respect to society (transparency)	E3. Cooperate on an interdisciplinary and transdisciplinary basis
<i>Competence S: system orientation</i>	<i>Competence F: future orientation</i>
A sustainably competent professional thinks and acts from a systemic perspective	A sustainably competent professional works and thinks on the basis of a perspective of the future
<i>That is, the sustainable professional can...</i>	<i>That is, the sustainable professional can...</i>
S1. Think from systems: flexibly zoom in and out on issues, i.e., thinking analytically and holistically in turn	F1. Think on different time scales – flexibly zoom in and out on short- and long-term approaches
S2. Recognize flaws in the fabric and sources of vigor in systems; have the ability to use the sources of vigor	F2. Recognize and utilize nonlinear processes
S3. Think integrally and chain oriented	F3. Think innovatively, creatively, and out of the box
<i>Competence I: personal involvement</i>	<i>Competence A: action skills</i>
A sustainably competent professional has a personal involvement in sustainable development	A sustainably competent professional is decisive and capable of acting
<i>That is, the sustainable professional can...</i>	<i>That is, the sustainable professional can...</i>
I1. Consistently involve sustainable development in the own work as a professional (sustainable attitude)	A1. Weigh up the unweighable and make decisions
I2. Passionately work toward dreams and ideals	A2. Deal with uncertainties
I3. Employ his or her conscience as the ultimate yardstick	A3. Act when the time is right, and not go against the current: “action without action”
<i>Plus: Disciplinary competences for sustainable development (differing for each course, discipline, or profession)</i>	

has learned – nothing less, nothing more) to “innovate.” In RESFIA+D, a set of “competences cards” was created, of which an example is shown in Table 28.3.

When RESFIA+D is used as an assessment tool for an individual study program, a heterogeneous group is composed, in which the professional field, the education management, the teaching staff, and the students are represented. During a group meeting, for each of the 6 × 3 competences, they answer three questions:

Table 28.3 An example of a competence card

Competence F: future orientation. <i>a sustainably competent professional works and thinks on the basis of a perspective of the future</i>			
F1. Think on different time scales – flexibly zoom in and out on short- and long-term approaches			
<i>Apply</i>	<i>Integrate</i>	<i>Improve</i>	<i>Innovate</i>
In concrete working situations, you recognize and describe operational methods for the performance and improvement of your work	In the case of concrete work-related problems, you recognize and describe the differences between short-term methods aiming at reducing the symptoms and long-term methods aiming at eliminating causes	In the case of work-related problems, you contribute to the design of a solution strategy based on a carefully selected combination of short- and long-term methods	You contribute to the (re)definition and the application of the mission and of the strategic policy of the organization you belong to
You contribute to the application of these methods, and thus contribute to short-term improvements	You contribute to the application of symptom reducing methods based on the operational policy of the organization or team you belong to	You contribute to the design of symptom reducing methods based on the tactical policy of the organization or team you belong to	You involve present and expected future trends in your working field and in society

1. What – in your opinion – should the *minimum competence level* be for each student at the moment of graduation?
2. Which level is presently described or demanded in the *current competence profile* of the study program?
3. Which level is actually reached in the *current curriculum*?

In all cases in which the model was used, significant differences were found between the answers to these three questions. As the conclusions are based on consensus, the support for the resulting desire for improvement is strong, setting a development task for the next 1-2 years.

Question

RESFIA+D can also be used to define the competence level of individual professionals and students. Please, download the RESFIA+D documents (see the end of this chapter). Score your own competence levels. Based on the outcomes, define a personal development plan to reach higher levels according to your own ambitions.

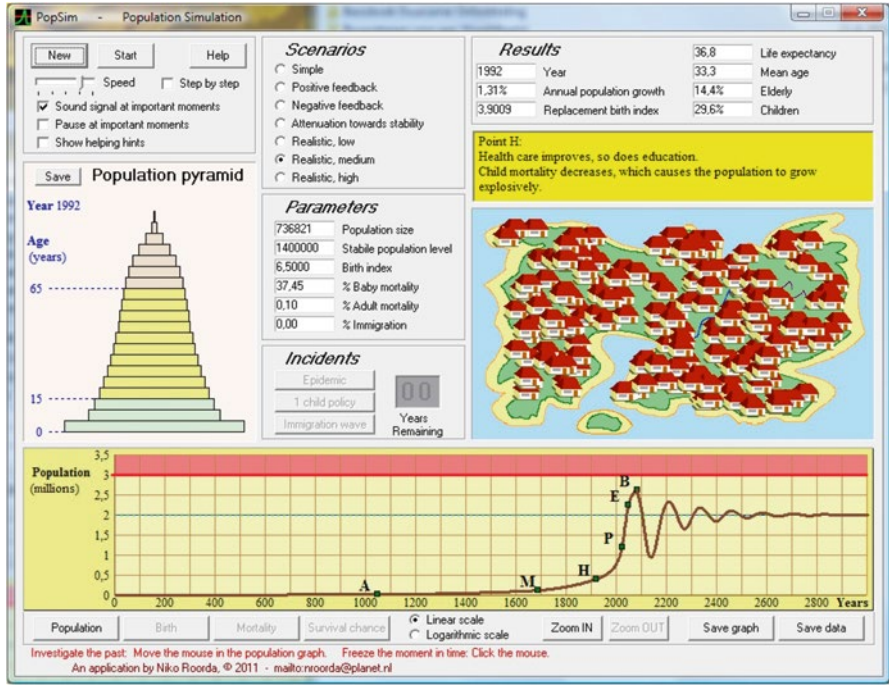


Fig. 28.3 A serious game: a simulation of population growth

3.2 The Trunk: Fundamentals of Sustainable Development

If a university wishes to educate all of its students in SD, it is essential that both the lecturers and the students speak the same language. So a general introduction to SD is needed, preferably in the first year of all study programs.

Several such introductions exist. Examples are Rogers et al. (2008) and Blewitt (2008). They offer many details and are mainly appropriate for students who want to become real SD experts.

For a more general introduction, to be used in every academic discipline at an undergraduate level, Roorda (2012) is suitable. The book comes with a website containing a lot of extra materials, e.g., hundreds of exercises, video clips, informational spreadsheets, serious games (Fig. 28.3), overviews of learning goals per chapter, etc.

3.3 The Branches: SD in the Curriculum

Apart from an SD introduction early in the curriculum, SD should ideally not be treated in separate education modules newly inserted throughout the curriculum. Rather, it should be integrated as a range of aspects and topics into existing modules, in such a way that the complexity and the multidisciplinary increase in the course of the study program.

Most, perhaps even all programs of every university, do contain such elements, although in many cases not recognized as such. For this purpose, a “C-scan” (curriculum scan) was developed, which renders a kind of “SD map” of a curriculum, including focus points, connections, and blank spots.

The study programs of Avans University all have started the implementation of SD into their curricula, based on the outcomes of assessments. Some program teams have decided to start “bottom-up” with the C-scan, which gave them an overview of the present SD elements within the curriculum and a series of recommendations for improvement. Other program teams started with the RESFIA+D assessment, because they wanted first to have clarification of the educational goals. Yet other teams started top-down, using AISHE, an assessment tool which enables them to define an overall ESD strategy before making any operational plans.

Which approach is the better? This appears to depend on the specific structure and culture of the university department. Whenever the approach is selected that – according to the team – suits best in their organization, the approach is effective, whether it starts with the curriculum details, the educational goals, or the overall strategy. In other words: *the best approach is the one that those who are going to do the work believe in.*

Question

Please think of a university program that you are familiar with. Which approach would you recommend? Why?

4 Raising the Expertise

A crucial factor in any ESD strategy is the required level of expertise of the teaching staff, who are not only to instruct and guide the students but also to develop the education.

Avans University has decided to use a staff development plan on SD consisting of three circles (see Fig. 28.4). The first or “inner” circle will in some years reach the level of genuine experts on ESD (broad but not deep expertise); they will be the task force that “teaches the teachers.” The second circle consists of those who possess or acquire expertise in various specific SD topics (deep but not necessarily broad expertise). The remainder will, in some years, have at least basic knowledge about SD and about its relations to their discipline and study program.

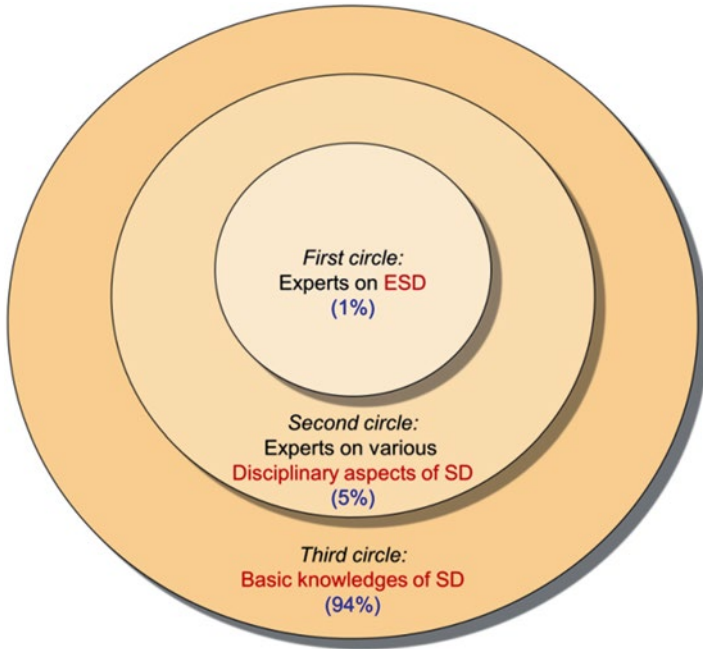


Fig. 28.4 The three circles of SD expertise

5 System Integration: Assessment and Quality Management

In order to assess the results of ESD projects in universities, several instruments have been developed, such as the STARS system in the USA, the LiFE system in the UK, the Plan Vert (Green Plan) in France, and AISHE (2nd version) by an international European group. AISHE, as already mentioned, makes use of a series of levels of organizational change, e.g., “activity oriented” and “system oriented.” The latter level defines SISD.

Question

Please think of a university program that you are familiar with –not necessarily your own, rather one that does not focus specifically on SD. Download the AISHE 2.0 document (see the end of this chapter). Imagine that AISHE was to be applied to this program. What effects do you expect it would have?

Most of these assessment instruments are derived from or inspired by well-known models for quality management, such as ISO or EFQM (European Foundation for Quality Management, see: EFQM 2009). The application of such instruments enables a university to integrate ESD into the general quality management and thus to enter a cycle of continuous improvement: plan–do–check–act, the famous “Deming Cycle” (Deming 1986). This is an essential step, without which SISD will never be fully realized.

Question

Could you imagine the concept of “SISD” to be applied to organizations that are very different from universities, e.g., industrial companies, banks, and governmental departments? Do you know any such organization that is near or even has arrived at SISD?

Recommendations and References

Recommended Books

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- Roorda N (2010) Sailing on the winds of change. The Odyssey to sustainability of the universities of applied sciences in the Netherlands. PhD dissertation, Maastricht University. To be retrieved from <https://www.box.net/shared/nz75typdk5>
- Roorda N (2012) Fundamentals of sustainable development. Routledge, London/New York. Online accessories: to be retrieved from <http://www.routledge.com/cw/roorda-9781849713863>

Journals (Fully or Partly) Dedicated to ESD

- International Journal of Sustainability in Higher Education, ISSN 1467–6370: www.emeraldinsight.com/products/journals/journals.htm?id=ijshe
- Journal of Cleaner Production, ISSN 0959–6526: www.journals.elsevier.com/journal-of-cleaner-production
- Journal of Education for Sustainable Development, online ISSN 0973–4074; print ISSN 0973–4082: <http://jsd.sagepub.com>

More Weblinks

- AISHE 2.0 manual: to be retrieved from <https://www.box.net/s/0dglhugzyzta4kkfb83>

Avans University: www.avans.nl/international

RESFIA+D model: to be retrieved from <https://www.box.com/s/04xy2xss5mpz5i0vk13u> (the model) and <https://www.box.com/s/c3amfguepxh0t0l0oav7> (the tables)

The Platform for Sustainability Performance in Education: www.eauc.org.uk/theplatform. ESD assessment tools: www.eauc.org.uk/theplatform/the_tools. This page contains not just the internationally available tools, such as AISHE, LiFE and STARS, but also links to (international) national ESD organizations, such as AASHE and EAUC

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