

# Design for sustainability integration in education

---

*Ainur Zaireen Zainudin, Norhidayah Md Yunus,  
Siti Radiaton Adawiyah Zakaria and  
Aminah Mohsin*

Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia,  
Johor Bahru, Malaysia

## 6.1 Introduction

---

The world is facing many interrelated issues such as the impact of climate change, hunger and malnourishment, income inequality, rapid urbanization, and recurrence of financial crises. These issues have led to an understanding of the need for sustainable development (SD). The concerns over understanding SD suggest a good understanding on how to balance the linkage between social, economic, and environmental objectives or needs when making decisions today. Social, economic, and environmental are the three key pillars of the SD concept which need to be supported by proper institutional arrangements to make the SD agenda achievable. Education is among other important institutions to make the arrangement for enhancing SD understanding and applicability among communities. As a matter of fact, it becomes phenomena since it is believed that SD education has the capacity to share concerns for the future of the planet and local communities all over the world (Jucker & Mathar, 2015). This can be seen clearly with the launch of the Global Action Program by UNESCO in 2014 to promote education for sustainable development (ESD) in policy, educational institutions, local communities, and among educators and youth.

Education for sustainability forms approaches that aim to develop students and communities with the values and motivation to take action for sustainability. It thus requires the commitment of academics, especially in higher education (HE) institutions, where theories and practices are highly integrated. Academics can make a significant impact to the advancement of SD as they take on various roles and responsibilities to pioneer designs for sustainability. Embedding SD in HE is a strategy to bring about changes in society that are underpinned by an ethic of solidarity, equality, and mutual respect among people, countries, cultures, and generations; it is development in harmony with nature, meeting the needs of the present generation without compromising the ability of future generations to meet their own needs ([United Nations Economic Commission for Europe, UNECE, 2012](#)).

In addition, according to [UNESCO, 2019](#), ESD empowers learners to take informed decisions and responsible actions for environmental integrity, economic viability, and a just society for present and future generations, while respecting cultural diversity. It is about lifelong learning and is an integral part of quality education that allows students to think critically and creatively, and work collaboratively, to appreciate multiple perspectives and act constructively in a way to design for sustainability (DfS).

Nevertheless, how to make sustainability operational has become the starting point ([Dawe, Jucker, & Martin, 2005](#)). In education, it can be achieved from a variety of different orientations in teaching. UNESCO aims to improve access to quality education on SD at all levels and in all social contexts, to transform society by reorienting education, and help people develop the knowledge, skills, values, and behaviors needed for SD. It is about including SD issues, such as climate change and biodiversity, into teaching and learning.

In the digital era, education has been enhanced with the integration of technology along with raising awareness on sustainable development goals (SDGs). The delivery of a blended curriculum has been incorporating different strategies taking advantage of the recently available technology to give students and lecturers a greater variety of experiences related to teaching and learning to design for SD.

In this chapter, not only the details on the ESD concepts and challenges are presented, but a number of cases are also reported to show how teaching and learning in HE institutions has been designed and delivered using a blended-mode curriculum to execute the ESD. The first exemplary design offers forms of process to engage students and communities in community action toward SD practices or ways of life. Meanwhile, the second exemplary teaching and learning approaches allow students to develop a product to create and increase communities' awareness of environmental issues. At the end of the teaching and

learning activities, both examples have enabled students to develop products that link the balance between the social–environment–economy objectives and needs, thus helping achieve the SDGs.

## 6.2 Concept of sustainable design and sustainable development in education

---

Many researchers have using generic terminology in describing efforts made toward introducing the concept of sustainability in education, which is “sustainable development.” This may be due to the broader definition of “sustainable development,” which caters to three aspects of sustainability, which are environment, social, and economy. The broad definition therefore can be integrated into various fields in education, such as in the areas of social sciences, environmental sciences, and technology. On the other hand, the terminology of “design for sustainability” (DfS) or sustainable design has often been related to technical applications of sustainability toward developing products and processes. DfS implementation involves three aspects in product development, which are environment, people, and profit (Crul & Jan Carel Diehl, 2006). Nevertheless, both terminologies complement each other closely in the context of sustainability, whereby DfS is an approach toward achieving SD. Both terminologies are based on the whole development life cycle, starting from the birth (or design) stage to the end-of-life stage of any activities. The holistic approach is a massive improvement compared to the traditional development approach, which addresses the issue of sustainability only at certain stages in the development process. Furthermore, both sustainable development and DfS include the objective of simultaneously care of the environment as well as the well-being of living things in the same ecosystem in terms of their social and economic needs. Therefore both terminologies can be applied hand-in-hand to describe the current works into how sustainability is integrated into the education system.

Specifically, the Brundtland Report defines SD as “development that meets the needs of the present without compromising the needs of the future generation” (World Commission on Environment and Development, WCED, 1987). The key principle of SD underlying all others is the integration of environmental, social, and economic concerns into all aspects of decision-making. This definition remains valid in the sense that the international debate on the Agenda 2030 and the SDGs does not provide a new definition of sustainability or sustainable development. It reflects the UNCED (Rio) definition of the three dimensions of SD, stated as “We are committed to achieving SD in its three dimensions—economic, social and environmental—in a balanced and integrated manner” (United Nations, 2015).

Fundamental sustainability principles include (Huge, Wass, Eggermont, & Verbruggen, 2011):

- Global responsibility (in tackling global socioecological issues), which refers to international cooperation in a spirit of “shared but differentiated responsibility.”
- Integration (of ecological, social, and economic impacts and their interactions), which refers to the reconciliation and integration of environmental and developmental objectives.
- Inter and intragenerational equity, which refers to the needs and preferences of current and future generations (intergenerational equity), and also includes geographical (global North–global South) and social intragenerational equity.
- Precaution (in the face of uncertainty): the precautionary principle states that the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation.
- Participation, which refers to the involvement of all concerned stakeholders in decision-making for SD.

Realizing the 2030 Agenda under SDG 4, to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, it is essential to refer to the detailed prescription of the targets and indicators, especially of SDG 4.7 which reads: “by 2030 ensure all learners acquire knowledge and skills needed to promote SD, including among others through ESD and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture’s contribution to sustainable development” (United Nations, 2015).

To emphasize, education should play an important role in enabling people to live together in ways that contribute to SD. Especially in recent years, HE institutions have assumed a privileged position as key drivers of education for the SD of the new generation (Rowe, 2007). Education is an instrument to support the SD process and it can generally be stated that ESD covers all kinds of educational concepts, steps, and processes, which are suitable to fostering the individual and/or collective contributions toward SD.

Assessing the ESD first requires clarifying what is meant by SD in HE. The concept of SD has been around for many years. According to Lipscombe (2008), ESD used to mean learning that promotes SD. United Nations Economic Commission for Europe, UNECE (2012) says that ESD promotes sustainable thinking and acting. It enables children and adults to make decisions and at the same time understand how those decisions affect future generations and the lives of others. The interpretation of the Department for Environment Food and Rural Affairs (1999)

also reported that ESD is about the learning needed to maintain and improve our quality of life and the quality of life of generations to come without damaging the planet for the future. One Subject Center interpreted Brundtland as follows: “In terms of SD in HE we understand this to mean ‘development of curricula and pedagogy to equip students with the skills and knowledge to live and work sustainably. This recognizes the importance of sustainability literacy among students and the growing demand for sustainability skills among employers’” (Dawe et al., 2005).

According to UNESCO (2005), ESD:

- is based on the principles and values that underlie SD;
- deals with the well-being of all four dimensions of sustainability—environment, society, culture, and economy;
- uses a variety of pedagogical techniques that promote participatory learning and higher order thinking skills;
- promotes lifelong learning;
- is locally relevant and culturally appropriate;
- is based on local needs, perceptions, and conditions, but acknowledges that fulfilling local needs often has international effects and consequences;
- engages formal, nonformal, and informal education;
- accommodates the evolving nature of the concept of sustainability;
- addresses content, taking into account context, global issues, and local priorities;
- builds civil capacity for community-based decision-making, social tolerance, environmental stewardship, an adaptable workforce, and a good quality of life;
- is interdisciplinary. No single discipline can claim ESD for itself; all disciplines can contribute to ESD.

This means that ESD allows every human to acquire the knowledge, skills, attitudes, and values necessary to shape a sustainable future. It involves rethinking the curriculum, campus operations, organizational culture, student participation, leadership and management, community relationships, and research (UNESCO, 2014). In this way, the institution itself functions as a role model for the learners.

The implementation process of the ESD depends on a country’s needs and the needs of the local people (UNESCO, 2017). In this context, Malaysia also gives priority toward SD through, for example, the Local Agenda 21 in 2001, which was entrusted to the Ministry of Housing and Local Government (Hanifah & Shaharudin, 2016). The steps taken by Malaysia are in tandem with the opinion of researchers (see Gough, 2005; Henderson & Tilbury, 2004; Hopkins, 2013), which stressed that the theory and practice of ESD require the participation of the school community in terms of its practice and implementation.

In fact, according to [Aini and Laily \(2010\)](#), teachers at preschools should start by introducing the first steps to understanding the concept of sustainability to children.

Based on [Peter, Libunao, and Abdul Latif \(2016\)](#), there are several ways by which universities and other HEIs (community colleges and polytechnics included) can contribute to SD:

- By giving SD a place in all curricular, educational, and research programs;
- By playing an important role as local knowledge centers for SD in order to help society meet the challenges of SD at the local level;
- By making SD a leading principle in their own logistics and managerial processes ([UNESCO, 2002](#)).

For example, in Malaysia, as part of HEIs, the college community contributes to help promote the awareness of SD using their communications, services, contracts, and partnerships to their clients and stakeholders ([Peter et al., 2016](#)). To support ESD, the Treaty promotes eight principles to emphasize a holistic and transformative perspective for sustainable HE ([www.sustainabilitytreaties.org](http://www.sustainabilitytreaties.org)):

1. To be transformative, HE must transform itself;
2. Efforts across the HE system must be aligned;
3. Partnership underpins progress;
4. SD is an institutional and sector-wide learning process;
5. Facilitating access to the underprivileged;
6. Inter- and transdisciplinary learning and action;
7. Redefining the notion of quality HE;
8. SD as a whole-of-institution commitment.

In conclusion, such definitions were used creatively. However, according to [Burns \(2009\)](#), although the terms are used alternately, they reflect the same goal. Here students were encouraged to think critically, not so much about the underlying concept of sustainability, but about how it was being used in practice.

### **6.3 Sustainable design and development: teaching methods and approaches in higher education**

Different kinds of models for teaching and learning are required to meet UNESCO's challenge; the very nature of SD is very complex and is multidisciplinary at many levels ([UNESCO, 2014](#)). ESD is not easy to teach in a traditional sense, but there is a growing number of examples of new teaching orientations or approaches, which support the development of such skills as interdisciplinary thinking, problem solving, and team working.

The implementation of ESD in HE institutions would require different approaches to curriculum integration. The simplest form of integration consists of an insertion of sustainability-related topics in conventional learning settings such as a lecture series. In improvising, new learning approaches like self-directed and problem-oriented learning that support competence development should be introduced.

Research by [Dawe et al. \(2005\)](#) concluded that teaching methods and approaches are as follows:

- *Conventional methods*: ESD was delivered by conventional methods; lectures, seminars and tutorials, and Internet resources as being essential for ESD's delivery.
- *Personal*: mentioned issues around personal perspectives (e.g., tutors as role models). This orientation places an emphasis on how the tutor can act as a role model for students in order to offer a credible and authoritative perspective on the realities of putting sustainability principles into practice.
- *Reconnecting to reality*: This orientation focuses on real and practical life issues and actual experiences as learning situations. Included within this category were such items as: real-life and real-time interpretation; field trips; environmental audits; the use of role-play; a year abroad; and development of case studies. Some also mentioned assessing the performance of the HEI, in terms of its environment, or social connections, or the HEI's overall performance in relation to ESD, as having value, although they doubted that a formal connection could be made between this and their disciplinary area.
- *Holistic thinking*: this is an approach to systems thinking, stating that it explored the "big" questions about globalization, political systems, and the nature of science. Many of the skills and knowledge for SD are associated with complex, multilayered, and interconnected systems. This approach encompasses a more open-ended exploration of interdependency and transdisciplinary connections between subjects as well as including approaches to developing and honing critical thinking.

Pedagogy is defined as "the art or science of teaching" ([OED, 2007](#)). The variation in pedagogical approaches offered is also important: given the diversity of students (e.g., gender or cultural background) within a program, it is desirable and necessary that various approaches be used ([UNESCO, 2012](#)). [Rodrigo, Michelle, Kaisu, Kim, and Francisco \(2017\)](#) listed pedagogical approaches selected from those that have well-cited references in ESD literature or are known to be broadly used. The pedagogical approaches have been separated into:

- *Universal*: broadly applicable pedagogies that have been used in many disciplines and contexts (case studies, interdisciplinary team

teaching, lecturing, mind and concept maps, and project and/or problem-based learning);

- *Community and social justice*: pedagogies developed specifically for use in addressing social justice and community-building (community service learning, jigsaw/interlinked teams, participatory action research); and
- *Environmental education*: pedagogies emerging from environmental sciences and environmental education practices (eco-justice and community, place-based environmental education, supply chain/life cycle analysis, and traditional ecological knowledge).

Seatter and Ceulemans (2017) states that three of the approaches to sustainability are viewed through the lenses of the three teaching styles of Roberts and Silva (1968) as in the following table (Table 6.1).

The above discussion shows many ways to embed sustainability in education. However, based on Cottona, Ian, Martyn, and Susie (2009), learning and teaching in the context of sustainability should be based more on investigative learning rather than reproductive learning; as well as on exploring reality rather than reading books; which means it should be based on active learning rather than passive reception of information and on gaining experience rather than acquiring knowledge.

TABLE 6.1 Sustainability curriculum and pedagogy table for higher education (Seatter & Ceulemans, 2017).

Three approaches to sustainability	Three basic teaching styles
1. Emphasis on sustainability as a discourse— A contested discourse that is spoken and claimed by competing groups and cultures, rather than a concept that can be pinned down and identified in the real world	<i>Dialogue teaching style</i> <ul style="list-style-type: none"> <li>– Constructivist learning</li> <li>– Inquiry methodology</li> <li>– Authentic “field” excursions</li> <li>– Case study</li> <li>– Community service learning</li> <li>– Active learning</li> </ul> Critical thinking, creativity, and transformative learning are fostered
2. Emphasis on <i>sustainability implementations</i> — What is unsustainable, how to make practices more sustainable, and how to evaluate sustainable outcomes	<i>Imposition teaching style</i> <ul style="list-style-type: none"> <li>– Lecture</li> <li>– “As if” situation problem solving.</li> </ul> Little critical thinking, creativity, or transformative learning are fostered
3. Emphasis on <i>definitions of sustainability</i> — Where they have emerged from, what they attempt to achieve, and how they can be compared	<i>Imposition teaching style</i> <ul style="list-style-type: none"> <li>– Lecture</li> <li>– Traditional lab exercises</li> <li>– Question and answer</li> <li>– Assessment: exam and/or essay.</li> </ul> Neither critical thinking, creativity, nor transformative learning are fostered



Teaching methods and approaches including pedagogical teaching styles can be utilized as a starting point in HE. However, the improvements in the future HE for Sustainable Development (HESD) program should be aware of the emphases and teaching styles regarding sustainability.

## **6.4 Embedding the design for sustainability concept into education: example of practices in a higher education institution**

---

“Sustainability” has become a global focus, particularly after the reconciliation of the social, economic, and ecological dimensions of change in the Brundtland Report 1987. Since then, various initiatives have been put forward by local as well as international communities committing themselves to the movement for a better quality of life. To support a SD process, social actors are engaged in many programs associated with sustainability agendas and education is seen to be among the most important policy instruments that could build up better engagement or community action of the social actors. Consequently, the SD field of study has been included into the curriculum at schools and HE institutions. In the remaining sections of this chapter, examples of teaching and learning designs embedding both DfS and the SD concept are presented based on the activities undertaken by the lecturers and students in Universiti Teknologi Malaysia (UTM).

### **6.4.1 Experiential learning of design for sustainability: design of a floating wetland product for the Riverdale Project**

Experiential learning through a practical design and development project is a very beneficial method of giving hands-on experience to students about DfS and SD concepts in general. Furthermore, the approach also created a better understanding to students about the real practical challenges in implementing DfS solutions to solve daily problems, especially related to environmental issues. Transferring students’ knowledge from a classroom setting to a practical setting which involved community members within the same project could also enhance their interpersonal skills, so that they can encourage better acceptance by communities in adopting their solution toward gaining the intended environmental improvement.

HE institutions are also increasingly required to introduce elements of sustainability into their curricular activities. Therefore the search for an approach capable of assisting educators to embed the sustainability context into their syllabus becomes highly relevant. In teaching sustainability to HE learners, the delivery of the sustainability context requires the “reconnecting

to reality” teaching approach for effective learning. In order to create a “reconnecting to reality” teaching approach in sustainability-related academic courses, educators should undertake a real-life project. Through this kind of project, the teaching and learning methods not only emphasize students’ achievements in cognitive aspects but also in developing their soft skills. In this context, soft skills are seen to be useful to integrate and thus enable students to live together in ways that contribute to SD.

Basically, soft skills refer to the personalities, attributes, qualities, and personal behaviors of individuals (Majid, Liming, Tong, & Raihana, 2012). In 2006, the Ministry of Higher Education, Malaysia launched Modules of Soft Skills Development for Malaysian HE Institutions which aims at producing quality human capital in term of skills and competitiveness at an international level (Mohd Shafie & Ahmad, 2015). The Module has been implemented by many HE institutions, including by UTM. It has been embedded in various in-class learning activities, out-of-class activities, as well as curriculum activities (Rozlin et al., 2018).

As an example, at UTM, SD is one of the elective academic courses offered to undergraduate students of the Land Administration and Development Program. This academic course is offered in the final semester of the undergraduate study, in which, besides knowledge, there is a focus on developing students’ practical, critical thinking and problem solving as well as life-long learning skills. In the context of knowledge, students are not only provided with the principles of SD, but most importantly they are taught to better understand the importance of this model to be adopted in developing every nation in the world. As previously mentioned, sustainability needs community action to be successfully achieved (Diesendorf, 2000). It is thus very important for this community action context to be included into the syllabus of an SD course.

It is believed that community action is best delivered to students not only through conventional lectures but also by engaging students in experiential learning activities. Experiential learning is “the process whereby knowledge is created through the transformation of experience” (Kolb & Kolb, 2005). For this SD course, the transformation of experience has been executed through an innovative experiential learning methodology that integrates two teaching and learning methods, namely the role-playing and service-learning methods. In addition, the service learning was set up through a synergy made with the campus community and industry in order to minimize the financial implications to the students of this course. It is believed that, by executing these strategies, experiential education could be enriched and better achieve the targeted learning outcomes of the course.

The main objective of these experiential learning activities is to achieve the first learning outcome of this SD course, which is to enhance

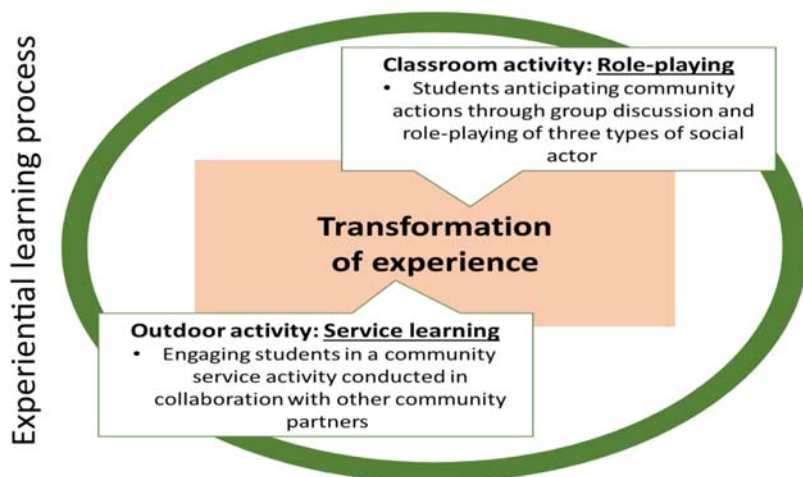


FIGURE 6.1 Experiential learning process framework.

students' understanding on the importance of SD. Considering the broad area of sustainability literature, "community action" was opted to be the focus area for achieving this learning outcome, thus being the theme for the entire experiential learning process. This process has been designed to have two main phases in order to better execute the transformation of experience during the learning process. The first phase was conducted as a classroom learning activity and the latter phase was then carried out by students outside the classroom by engaging them in an actual community service program. The framework of this experiential learning process is demonstrated in Fig. 6.1.

As a classroom learning activity, the community action is intended to be learnt by students using the role-playing method. Role-playing was utilized to allow students to select, organize, and integrate information (Mayer, 1989) by themselves from acting activities. For diverse experiences on community action, students were divided into three social actor groups, namely the government, the service provider agency, and the society. Before the acting began, students were instructed to conduct a short brainstorming session to anticipate the (community) actions of the social actor that they would represent toward the Solid Waste Separation Program as enforced by the government. For this purpose, students were guided with the given issues to keep students' focus on the chosen theme of the learning content. Upon the brainstorming session, the role-playing activity was conducted in a sequence starting with the society group, followed by the service provider agency group, and finally the government group. Fig. 6.2 shows one of the groups acting like having a meeting session for their role-playing. In this role-playing activity, each group was required to act



FIGURE 6.2 Role-playing by a group of students.

on community action based on the role of the social actor they represented. They were also required to follow closely the community actions performed by other groups before them as they need to show their response to those actions through their actions when it was their turn.

The outcomes of the role-playing activity were then discussed by focusing on the different community actions shown by each social actor. In the discussion, the lecturer led the students to compare the anticipated actions of students gathered in the brainstorming session with the actual outcomes of their acting when the students played the roles themselves. Eventually, it can be seen that the activity has allowed students to relate the community actions with the importance of SD initiative according to different social actors not only through critical thinking skills they acquired during the brainstorming session, but they were also able to experience them through their own acting activities.

In the second phase of the experiential learning process, students were intended to further experience the community action context using a service-learning method. Service learning is one of the many experiential education approaches that allows students to learn from real experiences (Furco, 1996; Sigmon, 1979). At UTM, service learning has been identified as one of the New Academia Learning Initiatives that is highly recommended as part of student-centric learning modes. By using service learning, students' experience which was once simulated in the classroom through the role-playing activity was then transformed to a real project. Nevertheless, using the service-learning method is not without challenges. The common main barriers of service learning are time constraints, other commitments, inadequate funding, and lack of

institutional support (Kolenko, Porter, Wheatley, & Colby, 1996). To avoid service-learning failure, the synergy concept has been adopted. Literally, synergy is the combined power of a group of things when they are working together that is greater than the total power achieved by each working separately. Synergy can be achieved by determining activities with minimal fund and resources and exploring existing resources that can be used effectively for greater project efficiency. In order to minimize the financial implications to students of this sustainability course, synergized service learning has been designed in collaboration with the organizer of the Riverdale Project.

The Riverdale Project was a community service project organized by the Rahman Putra College Student Committee (KRP) in collaboration with UTM Centre of Sustainability (UTMCS), Center for Environmental Sustainability and Water Security (IPASA), and Iskandar Puteri City Council (MBIP). It was aimed to raise the awareness and concern of the UTM campus community to river cleanliness and water resources, besides fostering a volunteerism spirit among the campus community. This project involved four phases of activities, namely the Plastic Water Bottle Recycling Campaign, Floating Wetland Design Competition (Fig. 6.3), Floating Wetland Production (Fig. 6.4), and Launching of Riverdale Project (Fig. 6.5).

The Plastic Water Bottle Recycling Campaign aimed to get 2000 plastic water bottles to be recycled as one of the materials for the floating wetland production. This was where the synergy between the Riverdale Project and SD Course was formed. The students of the SD Course were engaged with the Riverdale Project as volunteers to assist the Riverdale's organizer to collect the targeted number of plastic water bottles (Fig. 6.6).

Fig. 6.7 shows that after the bottles were collected, the bottles will be cut in the middle and at its bottom so that a tree could easily be put into the bottle. In addition, each student was required to interview two participants of the Riverdale Project, which had also contributed water bottles. The interview was aimed at gathering participants' feedback on their participation in this community service project and the importance of the Riverdale Project in the pursuit of SD. The results of the interview were then submitted as an individual assignment report for SD Course assessment purposes.

The Riverdale project also received national media coverage such as Astro Awani, Sinar Harian, Kampus Uols, and News UTM. Iskandar Puteri City Council also included the Riverdale Project in the Sungai Skudai Rejuvenation Plan, which involves behavior change through community awareness and a participation campaign. The Riverdale Project was also exhibited in the Sustainable Campus Convention at Universiti Kebangsaan Malaysia (23 April, 2019 to 25 April, 2019), Coast Exhibition at Desaru Johor (5 July, 2019 to 7 July, 2019) and Good Earth Exhibition 2019 at Sutera Mall, Johor Bahru (13 September, 2019 to 29 September, 2019).



**KOLEJ RAHMAN PUTRA**  
**RIVERDALE**  
**4.0 KEMPEN**  
FLOATING WETLAND  
& PENGUMPULAN  
BOTOL PLASTIK

**UTM**  
UNIVERSITI TEKNOLOGI MALAYSIA

**SKETCH AND DESIGN  
FLOATING WETLAND COMPETITION**

**PRIZE:**  
**RM100**  
ONE BEST DESIGN ONLY

**MUST INCLUDE:**

1. SKETCH AND DESIGN OF YOUR OWN FLOATING WETLAND.
2. COSTING OF YOUR DESIGN.
3. FULL NAME, MATRIC NUMBER AND CONTACT NUMBER.
4. EMAIL TO [jkmkrputm@gmail.com](mailto:jkmkrputm@gmail.com)

**DUE DATE : 24 MARCH 2019**

**SHOW US THAT YOU CARE  
COME AND JOIN US!  
MERIT IS PROVIDED.**

#UTMLIVINGLAB  
#KOLEJRAHMANPUTRAUTM  
RAHMANPUTRA\_UTM  
KOLEJ RAHMAN PUTRA

Lestari  
UTM IPASA  
UNIVERSITI TEKNOLOGI MALAYSIA

SCAN HERE FOR MORE INFO:  
SCAN HERE FOR EXAMPLE OF FLOATING WETLAND DESIGN:

FIGURE 6.3 Floating Wetland Design Competition.



FIGURE 6.4 Floating Wetland Production.



FIGURE 6.5 Launching of Riverdale Project.



FIGURE 6.6 Used plastic water bottles collected by students.



FIGURE 6.7 Used plastic water bottles cutting and production phase.

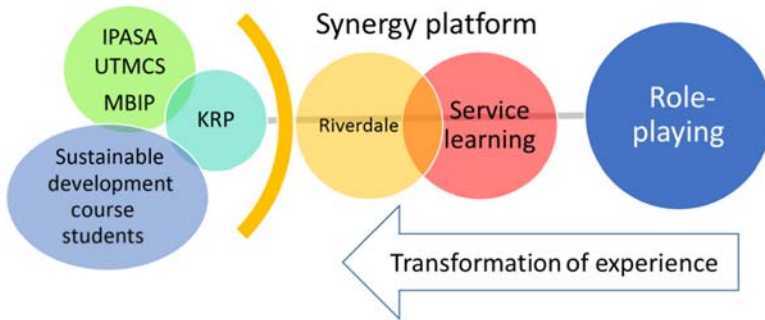


FIGURE 6.8 Strategies in executing the designed teaching and learning modes.

Fig. 6.8 shows clearly the whole idea of innovation made throughout this experiential learning process. This innovation was designed to enrich the experiential education by combining classroom learning activities through role-playing, and the learning process was then strengthened by a real service-learning project on a volunteerism basis. The novelty of this whole idea was on the use of a synergy concept to overcome service-learning barriers. This approach is important to ensure the students' experience in the simulated learning outcome could be well transformed into a real experience through a real community service project with minimal financial implications.

Although the contribution made by the students in the Riverdale Project seems small, the benefits of the overall learning process were tremendous in the following ways:

1. Role-playing activity enables students to gain knowledge not through conventional lectures but through a student-centric learning process which includes critical thinking and response-based activities.
2. The synergy concept adopted in this experiential education teaches students the importance of social networks as one of the success factors for SD initiatives.
3. The transformation of experience occurs in the learning process from a classroom environment to the real-world environment and has enriched students' learning on civic responsibility that may foster their civic engagement to further contribute to the community in which they live.
4. The instruction for the students to work together with the Riverdale's organizer has benefited all partners of the project and its targeted beneficiaries.
5. The students have the opportunity to learn to design and produce products for environmental sustainability.
6. The instruction for students to gather other participants' views on the Riverdale Project enables students not only learn the importance of SD initiative from their own experience after participating in the program but also from the experience of others.



### 6.4.2 Creating awareness of a sustainable design solution through social media video development: plastic recycling and solid waste segregation

In-line with a 21st-century teaching and learning approach, the sustainable design concept in education can be promoted and delivered using the internet medium, in particular, through social media platforms such as YouTube, Facebook, and Instagram. As many people have better access to the internet through various gadgets, especially cell phones, the use of these social media platforms is one of the most effective methods to spread awareness about the sustainable design concept to educate students as well as communities. The awareness can be communicated in the form of a creative poster and an interactive video presentation (combining visual and audio). Through this method, information about sustainable design can be delivered, for example, in terms of reducing waste material, reuse and recycling of waste materials, and using biodegradable alternative materials made from renewable resources.

Learning based on video development plays a role in promoting student-centered learning strategies (Sidek & Hashim, 2016). Using video can facilitate learning activities while making it fun for students to learn. Student-centered learning enables students to be more active in gaining knowledge. Also, video can be a very powerful educational tool for this purpose. However, much of its power lies not in the video itself but in the way it is used. The video itself is not a goal or an end in itself, but a way of achieving learning objectives and goals (Embi, 2011). Effective educational videos are not television-based teaching for students but lecturers teaching students using video as a tool for disclosure (Duffy, 2008).

YouTube is increasingly being used by educators as a source of pedagogy. Its use includes educational videos to online spaces and student-written content sharing. Some general guidelines by Clark and Mayer (2002) in considering appropriate use of any media to improve teaching suggest that the media should be in line with the desired learning outcomes or performance, reduce cognitive load, contain meaningful text or graphics, according to the literacy level of student learning and students find that video facilitates the learning process. The methodology used in the project is the video recording method during the project and needs to be uploaded on YouTube. There are two exemplary projects of video development to create awareness for SD during teaching and learning activity which are the UTM Skudai toward Sustainable Campus and the Save the Earth program.

The UTM Sustainable Campus project aimed to achieve awareness to reduce the use of plastic bags among UTM students. In order to support



FIGURE 6.9 Distribution of questionnaire forms among UTM students.

the project, the undergraduate students of the Land Administration and Development Program who enrolled in the SD Course have to develop a video about UTM Skudai toward Sustainable Campus using the “Reduce Plastic Bag” theme and upload it on YouTube. Fig. 6.9 shows, before the video development, the students distributing questionnaire forms in several areas within UTM such as at the Meranti Arcade, Cengal Arcade, Space Arcade, Azah Grocery Store, and Mak Ngah Café. Each student played a role in distributing questionnaires at the targeted areas.

Before video development, students were required to search articles using various keywords through Google Scholar, news sources, and others. Fig. 6.10 shows one of the groups acting as a student buying things without plastic bags but using recycled bags. They were also needed to act in ways such as giving advice to other students to reduce the use of plastic bags. After that, the video was uploaded on YouTube (as Fig. 6.11).

The second example is the Save The Earth project. In this project, students were required to develop a video through the Save The Earth project using the “We Care We Clean” slogan and to subsequently upload it on YouTube. The Save The Earth project is designed to provide students with the opportunity to better understand SD. The program also exposes students to development related to environmental preservation and conservation in line with the concept of SD. This program is one of the steps for students to better understand and practice what has been taught in the classroom.

This project is a community service program conducting solid waste segregation activities in Kampung Pulau Semut, Malacca, Malaysia. The program is a collaboration between lecturers and final year students of Bachelor of Science (Land Administration and Development) UTM with Solid Waste Corporation (SWCorp) Alor Gajah Branch, Alor Gajah



FIGURE 6.10 Reduce the use of plastic bags.



FIGURE 6.11 Video uploaded to YouTube about the “UTM Skudai toward Sustainable Campus.”

Municipal Council, and residents of Kampung Pulau Semut, Malacca. In this project, students were divided into four groups to collect solid wastes in the village. During the collection, each group explained to the villagers about the 3R practice (reduce, reuse, recycle) in managing their solid wastes. Fig. 6.12 shows the video about the Save The Earth project. During the project, the villagers gave good cooperation in carrying out solid waste segregation activities and appreciated how the community service program benefited them.



FIGURE 6.12 Video in YouTube for “Save The Earth.”

YouTube invites users to enjoy the video and experience engaging in video content as a reviewer and creator, an activity that improves student visual literacy, as an important skill in the current electronic culture. This application encourages experimentation using new media among students. Most educators believe that the effort of content building is a useful learning exercise, which helps to improve understanding of study materials and equipment used to build the video content. In addition, it has the potential to expose students to new skills at the same time as connecting them to different communities online. As a social software application, YouTube has become part of the trend among Net Generation students to replace passive learning with active participation, where all students can voice their views, anyone can make a contribution, and the value is not in the content itself, but rather to a network of students working together to form content and support each other in achieving their learning goals (Embi, 2011).

### 6.4.3 Student-community-based activities on the product end-of-life stage: solid waste separation and recycling campaign

As another example of current practices in HE institution in embedding Dfs and sustainable design approach in their curriculum design, this section presents a real-life project executed by an academic course in the Faculty of Geoinformation and Real Estate, UTM, in 2015.

Basically, the real-life project was conducted to achieve one of the academic course learning outcomes which is to create awareness on practicing sustainable design and developments, especially to cater for the end-of-life stages of product use. In general, sustainable design caters for the whole product and process life cycle stages, starting from raw material extraction, production, produce use, transportation, until disposal. There are many methods of product disposal, such as landfilling, recycling, and composting. Hence, knowledge and experience in choosing and applying a sustainable disposal method is critical to educating students in handling product end-of-life stages. Furthermore, applying the knowledge about an appropriate strategy in product disposal and sharing the knowledge to product users especially in the local community is also important toward successful implementation of DfS and SD. The project also included the participation of other stakeholders involved in product end-of-life processing such as the local authority and waste management industries.

For this purpose, the students chose to conduct a community service program called "Save the Earth" with the theme "We Care We Clean" to help the government to promote the solid waste separation program in the country. The solid waste separation program is also one of the agendas promoted by the Ministry of Urban Wellbeing, Housing, and Local Government in Malaysia. Starting from 1 September, 2015 all premises in selected states in the country are required to separate solid waste at the source. This implementation is pursuant to regulations under Solid Waste and Public Cleansing Management Act 2007 (Act 672) enforced in several states and territories in Malaysia, that is, in Johor, Melaka, Negeri Sembilan, Pahang, Kedah, Perlis, Kuala Lumpur, and Putrajaya. According to [Mohammad Arshad, Zainudin, Zakaria, Mansor, and Md Yunus \(2017\)](#), solid waste separation at source is the practice of separating or setting aside goods and post-consumer materials produced by households to prevent them from entering mixed-waste streams. These wastes are stored in designated containers or bins in order to facilitate recycling and disposal. This particular program was chosen by the students due to the result of the Solid Waste Separation at Source Program that was disappointing ever since its implementation in the country due to the low participation and involvement of Malaysian society. Therefore the students saw that their involvement was vital in order to help the government.

The program that organized by the students was conducted in collaboration with Alor Gajah City Council and the villagers of Kampung Pulau Semut, Melaka, Malaysia. Basically, this program was designed to enable students to create awareness on the importance of solid waste separation and recycling among the villagers. [Fig. 6.13](#) shows the villagers of Kampung Pulau Semut that were involved in the Save the Earth program.





FIGURE 6.13 Villagers of Kampung Pulau Semut who participated in the Save the Earth program.



FIGURE 6.14 Activities conducted during the Save the Earth program.

In addition, through this program, the villagers were taught and assisted by the students on how to properly manage their solid waste, particularly for separation and recycling purposes (Fig. 6.14). Therefore, SWCorp, the waste collection service provider, was also invited to be involved in the program to support the waste separation activities, particularly to buy the recyclable wastes from the villagers. This collaboration was indirectly able to show to the villagers how solid waste segregation would benefit them economically.

Through this program, students and villagers were not only trained to contribute to environmental sustainability, but the students especially were able to enhance their soft skills in practicing good values in society. Here, the volunteerism spirit was indirectly developed. The spirit of volunteerism is a core value that must exist in modern society, especially among the young generation (Wilson, 2000). Through a volunteerism program like the Save the Earth, good values can be applied to produce quality graduates. The learning outcome from this activity was also designed in such a way as to enhance the students' soft skills. The targeted soft skill was the ability to practice good ethics and positive values in society which are crucial in the sustainability movement.

## 6.5 Challenges of integrating the sustainable design concept in higher education

In the face of the 21st millennium and with the advent of Industrial Revolution 4.0 technology, the field of education should be able to move along as education becomes more relevant to today's generation. The traditional education design may no longer be effective in this century. With the need to provide sustainable education there are several challenges to be faced, as shown in Fig. 6.15.

Fig. 6.15 shows that there are five main challenges to be considered for designing sustainable education, which are policy, educator, environment, economy, and classroom activity. The details are described in the following subsections.

### 6.5.1 Policy

Antonio, Teresa, and Carlos (2006) explained that an education policy comprises the standards and government arrangements in the instructive circle just as the gathering of laws and principles that administer the activity of education frameworks. Education occurs in numerous structures for various reasons through numerous institutions. This includes early youth education, kindergarten, multiyear schools or colleges, graduate, and professional education. In this manner, education policy should be straightforwardly influencing education at all ages.

The education policy has to cover all aspects, including explicitly from the field of schools, including school size, class size, safe and healthy environment in school, educator's requirement, educator's payment, teaching techniques, curricular substance, graduation necessities, school foundation venture, and the qualities that schools are relied upon to maintain and demonstrate (Bush et al., 2019). In fact, the implementation of the policy indirectly may change the structure of an institution and administration in



FIGURE 6.15 The challenges for designing sustainability in education.

order to align with the standards of supportable improvement. These must be changed to ensure a coordinated way to deal with sustainable education development. Sustainable education will enable educators and students to take educational challenges with a comprehensive methodology, going past the conventional perspectives on learning and connections to reach an agreeable structure, arranging, and generation of information. Therefore education policy needs to be revised to achieve quality education that is universally accessible.

### 6.5.2 Educator

The country's largest challenge in the education system is to provide quality and knowledgeable educators to produce outstanding students in line with the vision of 2020 that seeks to enhance fully developed industries by 2020. The role of educators is significant in nation building. The major role of the educator is to engage teachers and leaders to decipher and adapt policy rather than simply enforce it. Some countries have educator affirmation necessities and others have educator training program prerequisites. In Malaysia, for instance at UTM, new educators are obliged to attend a program called "Sijil Pengajaran Pengajian Tinggi" and now recognized as "Baseline Competencies for Differentiated Career Pathway" (BC4DCP). This program is aimed at exposing various teaching skills to lecturers to convey more holistic approaches and stresses the significance of comprehension of the underlying causes of the unsustainability of current trends.

The characteristics of the younger generation are rich in information (including science and technology), mind power (creative and proactive), high and pure values (including caring), self-esteem, entrepreneurship, and skills. In order to determine the requirements of these human qualities to be produced, educators must also be equipped with the following features such as mastering the subject (curriculum content), skilled in pedagogy (teaching and learning), understanding the students' progress and caring about them, understanding cognitive psychology, have counseling skills, use the latest technology, be able to refine the findings of recent research and research, can work with colleagues and others, and have confidence in the role and contribution of educators (Baharom et al., 2013).

The staff development program must be implemented by institutions of higher learning that want to grow progressively and dynamically. For example, institutions of higher learning should inculcate and strengthen the value of integrity among academics, administrative officers, support staff, and students because institutions of higher learning are centers of knowledge development that will produce a generation of smart people. In addition, the institutions of higher learning should provide relevant technology to the educators, so that they are able to choose the



appropriate use of technology to create interactive and collaborative learning without time and place constraints. This can be achieved with the Internet which allows online and blended learning. The supportive learning environment provided by an institution of higher learning can support educators in their journey toward transformational teaching capability and learning engagement (Leal Filho et al., 2018).

In fact, the times have changed. Consequently, the old style of lectures may not be applicable to the current generation. Subsequently, the great educator cannot simply pass on knowledge and content, but needs to always expound them critically, creating enthusiasm, so as to create ever-new information and culture that can cope with the new millennium in the 21st century.

### 6.5.3 Learning environment

The learning environment alludes to the physical area, context, and culture in which students learn. It makes sense that students will improve when they are learning in a positive environment. In fact, students are highly influenced by the learning environment, and educators play a significant role in controlling the setting. To make a positive environment, an important aspect is the set up of the classroom. This is an important component of the learning environment as it is an integral part of classroom management to support teaching and learning.

For example, Fig. 6.16 shows an unsupportive classroom setting which shows the students' seats and desks fixed to the floor in rows. This setting makes discussion among students in the classroom difficult. In addition, small classrooms also cause limited activity.

The physical atmosphere of the classroom should help prevent behavior issues as well as promote and improve learning among students. Furthermore, a supportive environment encourages and enhances the social, scholarly, physical, and passionate development of students. Therefore the classroom setting should support a learning environment that encourages educators and students to share the focus in the classroom. A supportive



FIGURE 6.16 Unsupportive learning environment.

learning environment is more than the physical classroom and assets, but also about the qualities and connections among the students.

The learning environment is different from class to class. Generally, there are two main types of learning environment, which are teaching-centered learning and student-centered learning. Teaching-centered learning is a strategy whereby the educators are effectively in class conveying all the topics and once in a while allow the students to communicate in the classroom. In this scenario, the students are in a latent, receptive mode listening to the educator's instructions. Meanwhile, the student-centered learning approach is where educator and student discourses are exceptionally empowered in the class. Table 6.2 demonstrates the contrasts between teaching-centered and student-centered learning.

As indicated in Table 6.2, there are differences between teaching-centered and student-centered learning. The teaching-centered learning method is a traditional method used in teaching, in other words traditional ways where teachers play a more active role in the classroom.

TABLE 6.2 The differences between teaching-centered and student-centered learning (Essays, 2018; Hamdi, 2018).

Differences	Teaching-centered learning	Student-centered learning
Concept	Students put the majority of their emphasis on the educator. The educator talks, while the students only listen in. During exercises, students work alone, collaboration is discouraged	Educator and students share the core interest. Rather than listening to the educator solely, students and educator collaborate similarly. Group work is encouraged and students figure out how to team up and speak with each other
Advantages	The classroom remains deliberate. Students are quiet, and the educator holds full control of the classroom and its exercise. Additionally, since students learn alone, they figure out how to be autonomous and settle on their choices	Students learn significant communicative and community-oriented abilities through group work. Indeed, students are increasingly keen on learning activities when they can interface with each other and participate actively
Disadvantages	When students work alone, they do not figure out how to team up with other students and communication skills may suffer. Additionally, this approach can be exhausting for students. Their brains may wander, and they may miss significant facts	Since students are talking, classrooms are regularly busy, noisy, and disordered. Educators must endeavor to deal with each students' activities at once, which can be troublesome when students are at various phases of a similar project. Additionally, a few students like to work alone, so group work can end up being problematic

However, in order to realize sustainable education, student-centered learning methods are more suitable because they not only educate students in academic matters, but also develop students' skills such as collaboration and communication. However, to create a student-centered learning environment, it is a major challenge for teachers in particular, as they need to change their teaching methods to fit the 21st-century student. In addition, it presents a challenge for HE providers to provide a proactive learning environment for today's learning.

#### 6.5.4 Economy

The economy is a great challenge to realizing sustainable education. This is because every change that is made has a certain cost to keep it running smoothly, for example, the cost of providing a proactive learning environment and the cost of sending teachers to 21st-century teaching and learning courses. This is not to mention, today's student-centered learning approach may increase the cost of providing interactive activities in the classroom. Therefore the economy of an institution must be stable in order to implement sustainable education.

#### 6.5.5 Classroom activities

Activities in the classroom are important for getting students to interact and converse with each other. The purpose of interactive classroom activities is to prevent students from becoming exhausted/bored and losing focus on their learning. Therefore, the role of teachers is significant in giving intelligent activities such as learning experiences, learning questions, solving community problems, and playing games. Fig. 6.17 shows examples of interactive activities in the classroom, so that students enjoy learning and can engage until the end of the lecture.

To sum up, there are five challenges that need to be faced in designing sustainable education including challenges to policies, educators,



FIGURE 6.17 Interactive classroom activities.

learning environments, economics, and classroom activities. All of these challenges need to be addressed so that changes in the training paradigm, which are institutional changes, educational programs, and training processes, enable them to better respond to the requirements of current and future generations.

## 6.6 Conclusions

Education has a tremendous impact on the various opportunities in obtaining and maintaining quality of life. Quality education is very effective in combating poverty, building democracy, and building prosperous communities. Through education individuals are able to build their confidence in the face of a challenging world. Quality education is a concept that is dynamic, changing, and evolving over time and changing in social, economic, and local contexts. Therefore, to produce quality education in schools, colleges, and universities, sustainable education is required. Sustainable education is an emphasis on both the knowledge and the soft skills to shape a sustainable future. In realizing sustainable education, educators play a very important role. This is because educators are the people closest to educating students. To date, various methods have been used in teaching and learning to ensure sustainable education such as experience learning, community engagement, and problem solving. These examples show that current teaching is more about student-centered learning, which means that students and educators are actively discussing specific topics. This approach not only means that students gain knowledge but also develop many soft skills such as communication skills, collaboration, and leadership as well as enabling them to develop designs of processes and products that will benefit the wider communities toward achieving SDGs. As a result, the educational institution has become a prominent producer of pioneering designs for sustainability. Nevertheless, in order to implement sustainable education, there are some challenges that need to be addressed such as policy transformation, the availability of educators to improve or change their teaching approaches, budgets, and the extent to which the current learning environment supports sustainable education. However, all these challenges need to be overcome to provide quality teaching and learning and directly produce highly competitive students, who are self-reliant and able to adapt to this challenging world.

## Acknowledgment

The authors thank the Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, for providing valuable support throughout the writing of this chapter.

## References

- Aini, M., & Laily, P. (2010). Preparedness of Malaysian pre-school educators for environmental education. *Pertanika Journal of Social Sciences & Humanities*, 18(2), 271–283.
- Antonio, A. M., Teresa, M. M., & Carlos, A. V. C. (2006). Education for sustainable: Challenges and trends. *Clean Technology and Environment Policy Journal*, 8(1), 31–37.
- Baharom, M., Roslee, T., Muhammad, S. T., Abdul, S. A., Shukri, Z., & Mohd Yusof, A. (2013). Cabaran Transformasi Agenda Pendidikan Negara [Challenges of Transformation of National Education Agenda]. Utusan Borneo, 4.
- Burns, H. (2009). *Education as sustainability: An action research study of the Burns model of sustainability pedagogy*. Portland State University.
- Bush, T., Ng, Y. M., Wei, K. T., Chay, J., Glover, D., & Lei, M. T. (2019). *Educational policy in Malaysia: Implementation challenges and policy proposal*. Singapore: The HEAD Foundation.
- Clark, R. C., & Mayer, R. E. (2002). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning*. San Francisco: Wiley.
- Cottona, D., Ian, B., Martyn, W., & Susie, B. (2009). Revolutions and second-best solutions: education for sustainable development in higher education. *Studies in Higher Education*, 34(7), 719–733.
- Crul, M., & Jan Carel Diehl, J. C. (2006). *Design for sustainability: A practical approach for developing economies*. UNEP/Earthprint accessed online from. Available from <http://www.d4s-de.org/manual/d4stotalmanual.pdf>.
- Dawe, G., Jucker, R. & Martin, S. (2005). *Sustainable development in higher education: Current practice and future developments*. A report for The Higher Education Academy, York.
- Department for Environment Food and Rural Affairs (1999). *Sustainable development education panel: First annual report 1998*. Retrieved from <<https://webarchive.nationalarchives.gov.uk/20080306221400/>> <<http://www.defra.gov.uk/environment/sustainable/educpanel/1998ar/ann4.htm>> Accessed 14.10. 2019.
- Diesendorf, M. (2000). Sustainability and sustainable development. In D. Dunphy, J. Benveniste, A. Griffiths, & P. Sutton (Eds.), *Sustainability: The corporate challenge of the 21st century* (pp. 19–37). Sydney: Allen & Unwin, chap. 2.
- Duffy, P. (2008). Engaging the YouTube Google-eyed generation: Strategies for using Web 2.0 in teaching and learning. *The Electronic Journal of e-Learning*, 6(2), 119–130.
- Embi, M.A. (2011). e-Learning in Malaysian institutions of higher learning: status, trends and challenges. Keynote address presented at the International Lifelong Learning Conference (ICLLL 2011), November 14–15, Kuala Lumpur: Seri Pacific Hotel.
- Essays, U. K. (2018). Difference between teacher and learner centered approach. Retrieved from <<https://www.ukessays.com/essays/education/teacher-centered-and-student-centered-learning-education-essay.php?vref=1>>.
- Furco, A. (1996). Service-learning: A balanced approach to experiential education. Retrieved from <[digitalcommons.unomaha.edu](http://digitalcommons.unomaha.edu)>. Accessed 27.06. 2019.
- Gough, A. (2005). Education for sustainable development: Challenges for schools, curriculum and instruction. In *JPPG Education Conference*, 28–30 August, The Shangri-La Hotel, Penang.
- Hamdi, S. (2018). A comparison of teacher-centered and student-centered approaches in educational settings. *International Journal of Social Sciences and Educational Studies*, 5(1), 164–167.
- Hanifah, M., & Shaharudin, I. (2016). Education for sustainable development in Malaysia: A study of teacher and student awareness. *Malaysian Journal of Society and Space*, 12(6), 77–88, ISSN 2180-2491.
- Henderson, K. & Tilbury, D. (2004) Whole-school approaches to sustainability: An international review of sustainable school programs. *Report Prepared by the Australian Research Institute in Education for Sustainability (ARIES) for The Department of the Environment and Heritage*, Australian Government.

- Hopkins, C. (2013). Educating for sustainability an emerging purpose of education. *Kappa Delta Pi Record*, 49(3), 122–125.
- Huge, J., Wass, T., Eggermont, G., & Verbruggen, A. (2011). Impact assessment for sustainable energy future—Reflections and practical experiences. *Energy Policy*, 39(10), 6243–6253.
- Jucker, R., & Mathar, R. (2015). Introduction: from a single project to a systemic approach to sustainability—An overview of developments in Europe. In R. Jucker, & R. Mathar (Eds.), *Schooling for sustainable development in Europe* (pp. 3–14). Springer International Publishing.
- Kolb, A. Y., & Kolb, D. A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of Management Learning & Education*, 4(2), 193–212.
- Kolenko, T. A., Porter, G., Wheatley, W., & Colby, M. (1996). A critique of service learning projects in management education: Pedagogical foundations, barriers, and guidelines. *Journal of Business Ethics*, 15(133), 142.
- Leal Filho, W., Raath, S., Lazzarini, B., Vargas, V. R., De Souza, L., Anholon, R., ... Orlovic, V. L. (2018). The role of transformation in learning and education for sustainability. *Journal of Cleaner Production*, 199, 286–295.
- Lipscombe, B. P. (2008). Exploring the role of the extra-curricular sphere in higher education for sustainable development in the United Kingdom. *Environmental Education Research*, 14(4), 455–468.
- Majid, S., Liming, Z., Tong, S., & Raihana, S. (2012). Importance of soft skills for education and career success. *International Journal for Cross-Disciplinary Subjects in Education*, 2(2), 1036–1042.
- Mayer, R. E. (1989). Models for understanding. *Review of Educational Research*, 59(1), 43–64.
- Mohammad Arshad, N. A., Zainudin A. Z., Zakaria, S. R. A., Mansor, M. R. & Md Yunus, N. (2017) A review of barriers that hinder households to separate solid waste at source. In *Proceedings of Social Sciences Postgraduate International Seminar*, 29 November, Penang, Malaysia.
- Mohd Shafie, M. S. A., & Ahmad, N. (2015). In S. Che Lah, & N. Esa (Eds.), *Ilmu, Tradisi dan Kelestarian Dalam Kearifan Tempatan*. Pulau Pinang: Penerbit Universiti Sains Malaysia.
- OED. (2007). *Shorter Oxford English Dictionary* (6th ed.). New York: Oxford University Press Inc.
- Peter, C. J., Libunao, W. H., & Abdul Latif, A. (2016). Extent of education for sustainable development (ESD) integration in Malaysian community colleges. *Journal of Technical Education and Training (JTET)*, 8(1).
- Roberts, D., & Silva, D. (1968). Curriculum design, teaching styles and consequences for students. *Samplings*, 1(4), 16–28.
- Rodrigo, L., Michelle, Y. M., Kaisu, S., Kim, C., & Francisco, J. L. (2017). Connecting competences and pedagogical approaches for sustainable development in higher education: A literature review and framework proposal. *Journal Sustainability*, 9(10).
- Rowe, D. (2007). Education for a sustainable future. *Science*, 317, 323–324.
- Rozlin, R., Ismail, F., Idris, N., Mustafa, N., Mohamed Saat, M., Mohd. Jamal, N., & Ramakrishnan, S. (2018). Generic skills of the undergraduates: A case study of Faculty of Built Environment in Universiti Teknologi Malaysia. *International Journal of Engineering & Technology*, 7(2.29), 297–302.
- Seatter, C. S., & Ceulemans, K. (2017). Teaching sustainability in higher education: Pedagogical styles that make a difference. *Canadian Journal of Higher Education*, 47(2), 47–70.
- Sidek, S., & dan Hashim, M. (2016). Pengajaran Berasaskan Video dalam Pembelajaran Berpusatkan Pelajar: Analisis dan Kajian Kritikal. *Journal of ICT Education (JICTIE)*, 3, 24–33.

- Sigmon, R. L. (1979). Service-learning: Three principles. *ACTION*, 8(1), 1–9.
- UNESCO (2002). Higher education for sustainable development. Retrieved from <[http://portal.unesco.org/pv\\_obj\\_cache/pv\\_obj\\_id\\_654B8DCFEE8A0875B86F293C20CA405DD9C70200/filename/21a5450c515bab552176c98215fffaf8brief + Higher + Education.pdf](http://portal.unesco.org/pv_obj_cache/pv_obj_id_654B8DCFEE8A0875B86F293C20CA405DD9C70200/filename/21a5450c515bab552176c98215fffaf8brief+Higher+Education.pdf)> Accessed 14.10.2019.
- UNESCO (2005). Education for sustainable development. Retrieved from <<https://en.unesco.org/themes/education-sustainable-development>> Accessed 14.10.2019.
- UNESCO (2012). *Education for sustainable development sourcebook. Education for sustainable development in action. Learning training tools*. Paris, France: United Nations Educational, Scientific and Cultural Organization.
- UNESCO (2014). Shaping the future we want. UN decade of education for sustainable development (2005-2014). Final report. <<http://unesdoc.unesco.org/images/0023/002301/230171e.pdf>> Accessed 18.05.2020.
- UNESCO (2017). *Education for sustainable development goals learning objectives*. Paris: United Nations Educational, Scientific and Cultural Organization. Available from <https://unesdoc.unesco.org/ark:/48223/pf0000247444>. (Accessed 14.10.2019).
- UNESCO (2019). What is education for sustainable development? Retrieved from <<https://en.unesco.org/themes/education-sustainable-development/what-is-esd>> Accessed 14.10.2019.
- United Nations (2015). 2030 Agenda for sustainable development. <<https://sustainabledevelopment.un.org/post2015/transformingourworld>> Accessed 14.10.2019.
- United Nations Economic Commission for Europe, UNECE. (2012). *Learning for the future: Competences in education for sustainable development*. Switzerland: United Nations Economic Commission for Europe.
- Wilson, J. (2000). Volunteering. *Annual Review of Sociology*, 26, 215–240.
- World Commission on Environment and Development, WCED. (1987). *Report of the world commission on environment and development: Our common future*. England: Oxford University Press.