

# The Attitude towards Sustainable Development Issues among Malaysian Engineering Undergraduates

Balamuralithara Balakrishnan

**Abstract**—This paper reports the findings of the perception and attitude towards Sustainable Development among Malaysian undergraduates. The study was carried out involving 86 engineering undergraduates from three universities in Malaysia. This research was conducted based on a survey whereby the respondents were given a questionnaire to gauge their attitude towards sustainable development. The output of the analyses showed that the respondents have an appropriate attitude towards the sustainability issues expect for economic and social equality aspects. These findings suggest that the engineering educators involved in sustainable development education need to educate undergraduate students on this important issue. This investigation serves as a cornerstone to which the current paradigm of sustainable development education can be examined for further improvement by related stakeholders.

**Keywords**—Sustainable development, engineering education, Malaysia, attitude.

## I. INTRODUCTION

THIS study aimed to gauge the level of attitude towards sustainability issues among Malaysian engineering undergraduates. According to Brundtland [1], sustainable development (SD) is defined as "the development that meets the needs of the present without compromising the ability of the future generations to meet their needs" (pp.8). Practicing SD is essential to protect our world from any developments that could cause harm to human beings and the environment.

SD is comprised of three main dimensions that are related to quality of life: the social, the economic, and the environmental dimensions [2]. These are pivotal in determining humanities way of life, and should be given utmost priority regarding any activities carried out by us. SD has become an essential element in every nation's policy-making, and this is due to the rapid developmental process that we are currently witnessing which has a significant trade-off on the sustainability between the environment and natural resources.

In 2015, 193 countries came together to draft the 17 Sustainable Development Goals (SDG) that consist of 17 goals that have to be achieved by the year 2030. These goals cover all three dimensions of sustainability previously mentioned [3]. In order to reach these goals of sustainability, an individual's perception and attitude of SD needs to change, and this can be achieved through the means of education. Education plays an important role in spreading the necessary knowledge, skills, and values which are vital in contributing to

SD. Zwickle et al. [4] state that future generations—especially those pursuing studies in higher education institutions—should play a vital role in serving the well-being of humanity, and to help protect the environment. This realization among youths will help their respective countries in achieving the 17 SDG goals by 2030.

Education of Sustainable Development (ESD) is a vital strategy of disseminating the ideas and principles of SD to multiple individuals via education. It is a conducive platform for undergraduates to gain the appropriate knowledge, skills and most importantly the values of SD. These three elements that cover all the three learning domains - cognitive, psychomotor and affective - should be in place when educating and individual on SD. Al-Naqbi & Alshannag [5] mentioned that ESD is a platform in integrating the appropriate knowledge, skills, and values to infuse the fundamental concepts of SD among undergraduates. Furthermore, the researchers also mention that higher education institutions are important place to develop the necessary attitude among future professionals toward SD, which ultimately helps pave the way for humanity to achieve the goals of SD.

An individual's attitude towards SD can be developed through the affective domains of learning, in which one's attitude is determined by the affective domain [6].

Mulder [7] mentioned that one's attitude towards SD is not only determined by education, but it may also be determined by other external factors like living environment, and society.

Broadly and Ryu [8] asserted that a graduate level education in SD could influence the level of action taken by the students to be sustainable.

The ESD in Malaysian higher education institutions has progressed well, as students have been exposed to this topic through a variety of programs.

SD is one of the main components of the Malaysian Higher Education Blueprint [9] whereby every higher education institution in the country takes the initiative to move towards a more sustainable campus and most importantly, introduces ESD to undergraduates. The level of attitude toward SD among Malaysian undergraduates is not a well-researched area. Thus, this study aimed to look into this matter.

## II. ESD IN ENGINEERING EDUCATION

The ESD in higher education institutions can occur in many ways. Some institutions use a formal learning approach with organized and systematic content and a syllabus on SD. However, other universities use an informal learning approach, by incorporating experiential learning. In Malaysia,

Balamuralithara Balakrishnan is with the Sultan Idris Education University, Malaysia (phone: +605-4505947e-mail: balab@fskik.upsi.edu.my).

the Ministry of Education has put a lot of effort into introducing the issues related to SD in tertiary institutions throughout all programs regardless of disciplines either in a subject that is dedicated to SD or in a topic of subject which focuses on SD. SD issues comprising of the social, economic, and environmental dimensions have been addressed in Malaysian ESD.

In engineering programs in Malaysia, sustainability issues are usually discussed in the Engineering Ethics course whereby the topic on SD will be exposed to the future engineers in the context of engineering professions [10]. The undergraduates will be educated on the effect of engineering activities - science and technological development - on society and environment. At the same time, the undergraduates will be instilled with the appropriate mindset and action when dealing with sustainability issues. The sustainability issues that are usually covered in ethics classrooms are within the scope of environment and society.

In engineering education, SD is not only limited to a specific subject but to the values of sustainability that have been instilled among Malaysian future engineers, to be well prepared to face any sustainability issues in engineering professions. For example, Universiti Tunku Abdul Rahman (UTAR), a leading private university, named its engineering department as the Faculty of Engineering and Green Technology, concentrating on green engineering that is in-line with the sustainability goals.

These commitments by higher education institutions in Malaysia clearly shows that majority of institutions that engineering programme have emphasized on the current trend of engineering that trying to sustain the world development via proper engineering and technology ways have put effort into addressing the issues of SD, and emphasize the importance of ESD to students.

### III. METHODOLOGY

The following research issues were studied in this investigation:

- R1: The level of attitude towards SD among Malaysian undergraduates.

The study focused on the attitude towards SD among Malaysian engineering undergraduates who underwent education on SD in their respective engineering program. The researcher recruited a group of respondents consisting of 86 undergraduates, who were randomly selected from two different universities in Malaysia. All the participants have learned the subject or a topic on SD. The recruitment of the participants of this study was facilitated by the commitment and co-operation given by respective lecturers of the selected universities that offers engineering programme.

Table I summarizes the information of the respondents' university and number of students for each program. Fig. 1 shows the research model of this study. The study referred the Theory of Instruction by Gagne and Dick [15] who explains that, attitude influenced by the acquired internal states that affect the choice of personal action towards some class of things, persons or events.

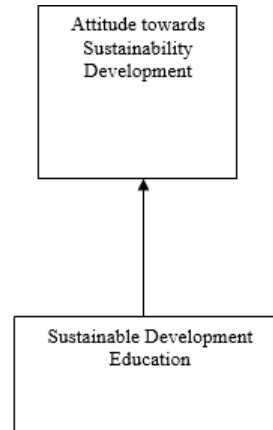


Fig. 1 Research Model

TABLE I  
RESPONDENTS' UNIVERSITY AND NUMBER OF STUDENTS FOR EACH PROGRAM

University	Number of Students
University A	Electrical -14
	Mechanical -14
	Civil-15
University B	Electrical-13
	Mechanical-15
	Civil-15

The students were surveyed via an online questionnaire containing the issues being studied. The questionnaire - refer to Table II- gauging the level of attitude. Each item of the questionnaire uses a 4 point Likert-type scale ranging from 1 (Strongly Disagree) to 4 (Strongly Agree). The scale is used to rank the level of agreement for each statement.

The questionnaire gauges the attitude towards sustainability issues that includes three key dimension of sustainability; (i) social, (ii) economy and (iii) environment.

The items of the questionnaire were formulated according to [11]. The items focused on assessing the attitude on the issues comprising all three dimensions of sustainability.

### IV. RESULTS & DISCUSSION

Data were analyzed using SPSS. The reliability co-efficient (Alpha Value) of the collected data were 0.770 which are deemed reliable [12]. In addition to that, a Shapiro-Wilk test was conducted and it indicates the data were normally distributed.

For the respondents' attitude on SD, as shown in Table II, the mean scores for 12 items ranged from 1.15 (Standard Deviation = 0.15) to 3.87 (Standard Deviation = 0.11).

The mean scores for Item 1, Item 2, Item 3, Item 4 and Item 5 recorded the high mean scores (more than 3.5) compared to other items. Those mentioned items assessed the attitude in the context of environment and social sustainability which clearly indicates that the respondents have a positive attitude towards the protection of environment, conservation of bio-diversity and social equality. Exposure to environmental and social sustainability issues via ESD in their respective institutions has developed the engineering students to focus consideration on these issues, and especially these contexts within their

work as engineer in future. As the environment become trade-off in engineering and technological development, it is vital for the engineering undergraduates to possess these values. This could help me to protect the environment or put the environment first in any of their engineering design or decision making in future. They can play a big role in protecting the environment as well. On the other hand, Item 10 and Item 12 recorded the lowest mean scores compared to other items in the questionnaire (referring to Table II), in which both items measure the attitude of the respondents on economic and social equality issues. This outcome is consistent with the findings of Saiz & Donald [13], who mentioned that the aspect of social and economic equality in SD has not been given priority. Thus, there should be firm efforts from engineering educators to bring these issues to the undergraduates and educate them on these aspects in order to fulfill the agenda of SDG 2030.

TABLE II

MEAN AND STANDARD DEVIATION FOR EACH ITEMS IN THE QUESTIONNAIRE

No	Item	Mean Value	Standard Deviation
1	Society should promote equal opportunities for males and females	3.56	0.16
2	The contact between different cultures is stimulating and enriching	3.55	0.11
3	The government should provide proper healthcare services to the people.	3.68	0.25
4	When people interfere with the environment, they often produce disastrous consequences	3.87	0.11
5	Environmental protection and people's quality of life are directly interlinked.	3.68	0.22
6	Industrial development is less important than environmental and biodiversity protection	3.48	0.17
7	Biodiversity should be protected at the expense of industrial agricultural production.	3.08	0.12
8	Government economic policies should increase sustainable production, even if it means spending more money.	3.25	0.20
9	Government economic policies should increase sustainable production, even if it means spending more money.	3.22	0.18
10	People Should Make More Sacrifices To Reduce The Economic Differences Between Populations.	1.25	0.25
11	Government economic policies should act if a country is wasting its natural resources.	3.35	0.16
12	Reducing poverty is more important than increasing the economic wellbeing of the people.	1.15	0.15

Overall, the items have recorded positive mean scores which indicate that Malaysian undergraduates have an appropriate attitude towards SD. These findings not in-line with the finding from [14] who found that the awareness on SD among Malaysian undergraduates was not promising due to lack of exposure and emphasis on SD in Malaysian higher education institutions.

The output of this study shows good attitude towards SD

among the Malaysian engineering undergraduates especially in the context of environmental and social issues expect for certain the sustainability aspects that focuses on economic and social equality. In a nutshell, referring to the results of this investigation, it clearly shows that SD education in Malaysian higher education institutions has played its role effectively in educating undergraduates on sustainability issues. However, in order to achieve the vision of SDG 2030, all the dimensions of SD need to be exposed to the undergraduates in higher education institutions.

Therefore, related stakeholders who design and implement ESD should give equal focus to all elements and issues of sustainability. As mentioned by Al-Naqbi & Alshannag [5], relevant knowledge and skills that cover the environment, social and economic dimensions of SD are the base for undergraduates to acquire the fundamental concept of SD. Environmental, social and economic dimensions are the pillar of SD, and none of these elements can be ignored.

With appropriate knowledge, skills and values on SD, future generations, especially the current undergraduates, could deal with sustainability issues with greater responsibility. ESD plays a pivotal role in bringing proper perception and attitude towards SD that drive the undergraduates to make a significant action and achievement in SD. Hence, a holistic approach and action need to be in place in every higher education institutions to build an undergraduate who has a sense of responsibility towards sustainability issues.

## V.CONCLUSION

This study shows that the attitude towards SD among Malaysian engineering undergraduates is positive. The dimension related with economic and social bound issue recorded a low mean score which indicates that the educators of ESD need to take action in exposing engineering students to the related issues in ESD classrooms. The proper knowledge, skills and values that are gained via ESD are pivotal in developing the attitude towards SD among Malaysian undergraduates that ultimately contributes towards achieving the vision of SDG 2030.

Higher education institutions and especially engineering educators, play a critical role in promoting SD and developing a future engineering workforce with the sense of responsibility towards SD that will ensure the next generations will be able to live a quality life in a conducive environment with comfort and secure.

## REFERENCES

- [1] Brundtland, G.H. (1987), *Our Common Future: World Commission on Environment and Development*, Oxford University Press, New York, NY.
- [2] Leal Filho, W., Azeiteiro, U., Alves, F., Pace, P., Mifsud, M., Brandli, L., & Disterheft, A. (2018). Reinventing the sustainable development research agenda: the role of the sustainable development goals (SDG). *International Journal of Sustainable Development & World Ecology*, 25(2), 131-142.
- [3] Saner, R., Yiu, L., & Kingombe, C. (2019). The 2030 Agenda compared with six related international agreements: valuable resources for SDG implementation. *Sustainability Science*, 1-32.

- [4] Zwickle, A., M. Koontz, T., M. Slagle, K., & T. Bruskotter, J. (2014). Assessing sustainability knowledge of a student population: Developing a tool to measure knowledge in the environmental, economic and social domains. *International Journal of Sustainability in Higher Education*, 15(4), 375-389.
- [5] Al-Naqbi, A. K., & Alshannag, Q. (2018). The status of education for sustainable development and sustainability knowledge, attitudes, and behaviors of UAE University students. *International Journal of Sustainability in Higher Education*, 19(3), 566-588.
- [6] Chaiken, S., & Baldwin, M. W. (1981). Affective-cognitive consistency and the effect of salient behavioral information on the self-perception of attitudes. *Journal of Personality and Social Psychology*, 41(1), 1.
- [7] Mulder, K. F. (2017). Strategic competences for concrete action towards sustainability: An oxymoron? *Engineering education for a sustainable future. Renewable and Sustainable Energy Reviews*, 68, 1106-1111.
- [8] Brody, S. D., & Ryu, H. C. (2006). Measuring the educational impacts of a graduate course on sustainable development. *Environmental Education Research*, 12(2), 179-199.
- [9] Sivapalan, S. (2016). Engineering education for sustainable development in Malaysia: student stakeholders perspectives on the integration of holistic sustainability competences within undergraduate engineering programmes. In *Engaging Stakeholders in Education for Sustainable Development at University Level* (pp. 263-285). Springer, Cham.
- [10] Balakrishnan, Balamuralithara, Fumihiko Tochinai, and Hidekazu Kanemitsu. "Engineering ethics education: A comparative study of Japan and Malaysia." *Science and engineering ethics* 25.4 (2019): 1069-1083.
- [11] Biasutti, M., & Frate, S. (2017). A validity and reliability study of the attitudes toward sustainable development scale. *Environmental Education Research*, 23(2), 214-230.
- [12] Creswell, J. W. (2013). *Educational research: Planning, conducting, and evaluating*. W. Ross MacDonald School Resource Services Library.
- [13] Saiz, I., & Donald, K. (2017). Tackling inequality through the Sustainable Development Goals: human rights in practice. *The International Journal of Human Rights*, 21(8), 1029-1049.
- [14] Zainordin, N., Wahid, W., Petrus, M., & Koh, C. T. (2017). Sustainable Development Attitude: A Study On Perception Among Private & Public Higher Learning Institutions Student In Malaysia. *MATTER: International Journal of Science and Technology*, 3(2), 514-524.
- [15] Gagne, Robert M., and Walter Dick. "Instructional psychology". *Annual review of psychology* 34.1 (1983): 261-295.

**Balamuralithara Balakrishnan** was born in Ipoh, Perak, Malaysia. He graduated with the Bachelor of Engineering in Electrical-Telecommunications from Universiti Teknologi Malaysia while he obtained his Master and PhD from Multimedia University, Malaysia. He is currently attached with Sultan Idris Education University, Malaysia as an Associate Professor. His research interest mainly focused on Engineering Education, STEM Education and Creativity in Teaching and Learning.