

# The Implementation of Green Technology among Polytechnic Students



Norsyafatin Salim, Mohd Khata Jabor, Aede Hatib Musta'amal

**Abstract:** Education is one of the most suitable platform for exposing to public about knowledge and awareness of Green Technology. Green Technology is a technology designed to simplify the work in addition to improving the product development progress and to minimize the use of energy resources and the environment in its construction. Energy innovation is one of the green technologies that makes it easier for people to do their work without neglecting environmental sustainability while using it. This study focuses on research questions involving aspects of the level of innovation in the implementation of Green Technology among polytechnic students. This study is descriptive using questionnaire form in the data collection process which was presented to polytechnic students in the final year of engineering department. This study involved 231 students who carry out of the Final Year Project from the Department of Electrical Engineering and the Department of Mechanical Engineering at the Polytechnic Ibrahim Sultan, Johor. The results of this study were analyzed using software Statistical Package for Social Science (SPSS) version 25.0 to obtain frequency and percentage values. Overall, the study found that the level of innovation in the implementation of Green Technology among students was high..

**Keywords :** Green Technology, Awareness, Practices, Final Year Project, Engineering Students, Polytechnic

## I. INTRODUCTION

The phenomenon of global warming and environmental pollution is not a small matter dealt with today. Lots of news lately about the issues of natural disasters have hit our country and this has been invite concern to the entire population in Malaysia. Pollution, climate change and disasters are serious environmental issues [1]. Accordingly, there is a new field of green technology is believed to be a platform for environmental sustainability. Green Technology means a form of applications, appliances and systems with eco-friendly features. Energy innovation is one of the green technologies that makes it easier for people to do their work without neglecting environmental sustainability while using it [2]. Today's technology has been revolutionized to save energy and energy consumption. In addition, Green Technology was introduced with the aim to control the use of

non-renewable resources, preserve and conserve the environment from used widely without focusing effect in the future.

Green technology is a key driver of environmental sustainability [2]. Various steps have been taken in polytechnics to practice Green Technology such as holding energy-saving campaigns, collecting used oil waste, final year project contests and Green Technology-based innovation contests. Various forms of teaching and learning by teachers in enhancing students' thinking skills such as conducting group discussions, encouraging applications to problem solving can be done in an experimentally focused experiment that can develop creative and critical thinking skills. [3]. Thus, through various activities such as these can be gouging Higher Order of Thinking Skills (HOTS) polytechnic students to produce innovative products that are potentially applicable to reduce the use of materials and energy sources.

Annual Report of the Department of Polytechnic (2011) reported a number of initiatives have been undertaken by the Center for Research and Development Institutes to encourage innovation in polytechnics and 40 products were showcased in the Innovation Conference 2011. This is a huge figure and very encouraging for the execution of the first year. Through innovative products that have been built can promote the importance of green technology besides can increase the love for the environment. In addition, the government also conducted numerous product exhibitions and conferences on environmental and green technologies to promote and enhance activities to raise awareness and raise the level of green technology knowledge to the public [4].

Implementation of green skills in Technical Vocational Education and Training (TVET) aimed at achieving sustainable development by providing employment opportunities while identifying dividend yields, agendas and strategies to support the community and the green economy [5]. The concept of sustainable development is a universal development concept that leads to the well-being of human life while preserving and maintaining environmental harmony [6]. This concept is best practiced by the polytechnic students on campus as a comfortable and conducive to ensuring environmental preservation. According Yapin in his study indicated that public awareness of green technology is still at a satisfactory level [5]. To produce Malaysians who are sensitive, ethically and responsibly about the environment should be fostered love for the environment through environmental education in depth in order to create a society on the environment [7].

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There are also studies showing reluctance engineering students, especially students studying current issues in science, which means that the sustainable production of natural resources is also one of the challenges that must be overcome in implementing sustainable curriculum [8]. In addition, there are researchers who believe that green skills should be a part of both generic and occupational skills, so that enhanced work skills can help solve environmental problems with the implementation of green skills through curriculum activities among TVET students towards green industry development [5].

The current era of globalization has seen intense competition among students or students of higher education institutions for job opportunities. Students need to be provided with knowledge in order to secure a place in the workplace. According to [2], if in the green technology sector, hiring of skilled and trusted workers can contribute in terms of increased efficiency, more green technology innovations, expanding into the global market, improving the economy, improving environmental quality and technology quality. In the hiring process, employers will increasingly look for competent and skilled candidates especially in innovation to gain a competitive edge globally. Green technology is called energy innovation because it is from green energy it is developed into an application of equipment, products and systems that enable people to use it without neglecting environmental sustainability [2]. The application of the Green Technology concept to the Polytechnic Students' Final Year Project can further enhance the level of innovation during the production of a product without neglecting environmental sustainability. The innovation model began with the study of innovation as a process and it began in the 1940s that rural sociologists began to develop theories about the dissemination of new practices in agriculture [9]. The innovation diffusion model describes the process by which an innovation is delivered through specific channels over time to a group of members of the social system. Here are five stages of the Diffusion Model that Everett Rogers has introduced in innovation:

- The level of knowledge is the first step in which an individual is directed to understand the existence and benefits / benefits and how an innovation works.
- In the next phase of persuasion, individuals will find out more about the new innovation and the benefits of using it.
- The third stage is the decision, the decision of the individual to engage in the activity which leads to whether or not the innovation is involved.
- The fourth stage is implementation, there will be if in the earlier stages, individuals choose to engage in the new innovation. At this stage, the individual will use the innovation. If the previous stage process that occurs over the mental exercise of thinking and deciding, padatahap this implementation process is going more towards a change in behavior as a form of use of these new ideas.

Higher Education Level are innovating in curriculum content as new courses are introduced that are adapted to the current changes and needs [10]. Curriculum in polytechnics was developed in line with industry demand and emphasized the use of Green Technology in every product for the Final

Year Project. The implementation of Outcome-Based Education (OBE) or polytechnic-based Education in the polytechnic learning system, indirectly facilitates the process of integrating Green Technology and sustainable development into the curriculum (POLYGreen Blueprint, 2015). This creativity can produce creative, innovative and imaginative individuals [11]. The ability to solve the problem of scarcity of renewable energy resources can contribute to the production of better quality projects that appreciate the enthusiasm and creative ideas of students in creating new creations and innovations.

Beside that's, the success of the student project reflects the effectiveness of the teaching and learning process [12]. Through this kind of involvement students can also apply the knowledge learned in the teaching and learning process. Moral support is very important in the process of realizing the outcome of a project to maintain confidence, commitment, interest, determination and identity [12]. The innovation competition also provides cash rewards, certificates and medals to serve as a catalyst for students to create new and more competitive products.

Green Technology awareness can be inculcated through education such as at school or higher education institutions to ensure environmental development and preservation as well as reduce pollution [13]. In addition, the dissemination of information on Green Technology awareness and issues is also available through social media, print and mass media [14]. According to Zuhair also, students with high environmental awareness are individuals who are positive about the environment. There are also effective ways to raise awareness of the environment by working with the school community [15]. However, without realizing it in everyday life as a student there are many things that can be done directly that can contribute to the pollution and waste of resources. Therefore, polytechnic students should be aware of issues and issues related to the environment. It is an individual responsibility for all students to love the environment.

## II. RESEARCH OBJECTIVE

Based on the discussion highlights of the above study, it shows the importance of generating Green Technology innovation among TVET students. Therefore, the objective of this study is to identify the level of innovation in the implementation of green technology in students polytechnic.

## III. METHODOLOGY

Based The research conducted by the researcher is a descriptive study. Quantitative methods using the questionnaire form as a means of collecting information and data were analyzed using descriptive statistics by using the mean value and percentage. Descriptive studies are suitable for use in research aimed at explaining a problem or phenomenon that is happening [16]. The population of this study consists of final semester students of engineering at Polytechnic Ibrahim Sultan. The population of this study is 560 students. 336 students from the Department of Mechanical Engineering and 224 students from the Department of Electrical Engineering.

Accordingly, the sample size of the study was 225 students based on Krejcie and Morgan (1970).

**IV. FINDING**

The findings are the result of analysis of the findings obtained from the questionnaire to final year students of engineering at Ibrahim Sultan Polytechnic, Johor Bahru. To

answer the research questions regarding the level of innovation in the implementation of green technology in students polytechnic, a total of 7 items were provided to get feedback from respondents. Average percentages and mean values were used to answer this research question. The findings of the study are as shown in Table 1 below: .

**Table- I: Analysis of Data on the Awareness Level of Green Technology Implementation Among Polytechnic Students.**

| Item                    | Statement                                                                                                       |   | Dis agree | Not sure | Agree | Mean        |
|-------------------------|-----------------------------------------------------------------------------------------------------------------|---|-----------|----------|-------|-------------|
| 1.                      | Creating an invention product can enhance critical and creative thinking.                                       | F | 4         | 18       | 209   | 4.37        |
|                         |                                                                                                                 | % | 1.7       | 7.8      | 90.5  |             |
| 2.                      | Encourage students to get ideas and information from a variety of sources to produce energy efficient products. | F | 1         | 15       | 215   | 4.45        |
|                         |                                                                                                                 | % | 0.4       | 6.5      | 93.1  |             |
| 3.                      | Producing invention products using recycled materials can save you the use of natural resources.                | F | 3         | 19       | 209   | 4.38        |
|                         |                                                                                                                 | % | 1.3       | 8.2      | 90.5  |             |
| 4.                      | Implementing the Green Technology concept as a key idea in final year project development.                      | F | 3         | 24       | 204   | 4.37        |
|                         |                                                                                                                 | % | 1.3       | 10.1     | 88.3  |             |
| 5.                      | Creating a final year project in the Green Technology concept can be added value for polytechnic students.      | F | 6         | 21       | 204   | 4.31        |
|                         |                                                                                                                 | % | 2.6       | 9.1      | 88.4  |             |
| 6.                      | Producing Green Technology concept products can enhance sustainable development and conserve the environment.   | F | 4         | 21       | 206   | 4.35        |
|                         |                                                                                                                 | % | 1.7       | 9.1      | 89.2  |             |
| 7.                      | Creating an invention product can improve your problem solving skills.                                          | F | 4         | 14       | 213   | 4.42        |
|                         |                                                                                                                 | % | 1.7       | 6.1      | 92.2  |             |
| <b>Total percentage</b> |                                                                                                                 | % | 1.55      | 8.16     | 90.29 |             |
| <b>Overall mean</b>     |                                                                                                                 |   |           |          |       | <b>4.38</b> |

For items with the highest mean value is item 2 (Encourage students to get ideas and information from a variety of sources to produce energy efficient products) has a mean value of 4.45. The overall mean for the level of innovation in the implementation of green technology in students polytechnic was 4.38. The average value of the respondents agree was 90.29 percent, not sure 8.16 percent and disagree with 1.55 percent. The researchers conducted a cross tab analysis to identify the comparison of the mean for the research questions the level of innovation among students of the Department of Electrical Engineering and Department of Mechanical Engineering. The results show that Mechanical Engineering students have a mean of 4.44 are higher than Electrical Engineering students have a mean of 4.32.

The findings of this study are supported by a study that creativity and innovation cannot be taught, but they can be applied indirectly through well-planned teaching and learning activities. Encouraging students to think outside the box in their final year projects can further enhance their creative, critical and innovative thinking skills. The findings of this study are supported by [17], whose purpose is not just to educate students by imparting knowledge but to equip them with the skills and skills to become responsible and productive members of society. Polytechnic professors should seize the opportunity as students produce final year projects by applying green technology concepts. The production of a green technology product requires critical thinking and creative skills while minimizing the negative impact on the environment. Although the final year project seminars are under the sponsorship of their respective polytechnics, at the polytechnic national level there have been numerous innovation competitions to attract students to

become product creators who maintain environmental sustainability. The findings of this study are supported by [17], who are encouraged to think outside the box and become knowledge creators and not just knowledge users. According to [18], the country needs a generation with high innovation skills, confidence, leadership and vision to generate new ideas in national development. Therefore, innovation concept of Green Technology products can reduce the risk of air pollution.

**V. CONCLUSION**

The The results of the data analysis show that the level of innovation in the implementation of Green Technology in polytechnic students is high. The realization that applying the creativity and innovation aspects of building Green Technology products cannot be taught but it can be applied indirectly through well-planned teaching and learning activities. A variety of interesting teaching methods can be used to stimulate the development of high-level thinking with the creation of new products that save resources and reduce the risk of wasting. The findings of this study are supported by a study that aims to not only educate students by passing on knowledge but to equip them with the skills and skills to become responsible and productive members of society [17]. The application of the Green Technology concept to the Engineering Technology curriculum is expected to realize the goal of providing awareness on the importance of protecting the environment from pollution resulting from human activities [13].



Polytechnic lecturers should seize the opportunity as students produce final year projects by applying green technology concepts. In addition, the application of green technology is seen as one of the most effective solutions to address energy and environmental issues simultaneously [19]. Besides that, energy savings and pollution reduction have become two major challenges worldwide [20]. Additionally, students are encouraged to think outside the box and become knowledge creators and not just knowledge users [17]. The country needs a generation with high innovation skills, confidence, leadership and vision to generate new ideas in national development [18]. Therefore, it is important for students in the field of TVET to master Green Technology as an added value in putting themselves in the real world of work. Graduates who are able to think in an innovative, critical and creative can contribute to national development while preserving the environment for future generations to come.

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