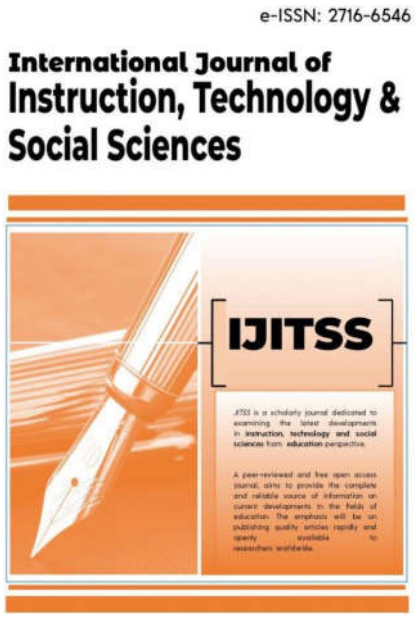

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Green Technology Awareness and Motivation among Primary School Teachers

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Abstract

The purpose of this paper is to present a comprehensive look on the awareness and motivation of primary school teachers in the practice of green technology. Emphasis on green technology practices is considered important as it is an appropriate solution to climate change and environmental degradation concerns. Green technology is the development of systems and applications of equipment to conserve the environment and natural resources. As such, the Malaysian government is proposing the application of green technology to the community through comprehensive education and program activities. Therefore, every teacher must first be aware and motivated to recognize and practice the green technology in their daily lives. However, based on an extensive literature review researchers have found that teachers' awareness and motivation for green technology practices are still low. In fact, although almost 13 years have passed since the launch of the green school program in Malaysia, the goal has not been fully realized. Therefore, this study is considered important to address the gaps inherent in the adoption of green technology practices among primary school teachers. Overall, the literature review of this study shows that teachers' awareness and motivation for green practices depends on the knowledge and understanding of green technology acquired by teachers. Therefore, the element of green knowledge needs to be developed among teachers to implement effective green teaching.

Introduction

Global warming, climate change and many other natural disasters are global issues that have been the talk of the scientists lately. The results of the Fifth Assessment Report from the Intergovernmental Panel on Climate Change (IPCC) show that these phenomena occur due to human activity since the pre-industrial era. Furthermore, this study concluded that there's more than 95% percent probability that human activities over the past 50 years have warmed our planet (IPCC, 2014).

In fact, a space study conducted by NASA's Goddard Institute for Space studies (GISS) also states that human activity releases about 37 billion metric tons of carbon dioxide (CO_2) into the atmosphere each year, equivalent to 57% of the total carbon dioxide in atmosphere. With this, global temperatures are expected to rise from 2.5 to 10 degrees Fahrenheit in the coming century (National Aeronautics and Space Administration [NASA], 2015).

Accordingly, the application of green technology practices should be used as an alternative method to tackle the problem of global warming (Eleventh Malaysia Plan 2016-2020, 2015). This fact is further supported by the study of Kamaruddin et al. (2011) which states the introduction to the green technology is the right solution to control the problem of environmental degradation. Green Technology is the development and application of tools, products and systems to protect the environment and natural resources in order to minimize the negative impact of human activities. Green technology also has low

or zero Green House Gas emission to provide a healthier and better environment for all life (Ministry of Energy, Green Technology and Water [KeTTHA], 2009). Therefore, the application of green technology can be seen as an effective solution to address environmental issues (Saibani et al., 2012).

Problem Statement

The Malaysian government is also struggling with the challenges of extreme weather change (Eleventh Malaysia Plan 2016-2020, 2015). According to Abdul Rashid (2018), rapid modernization has negatively affected the country's landscape. Particularly the development of the industrial sector, the agricultural sector, the deforestation and many other human activities have contributed to the phenomenon of climate change and natural disasters in Malaysia.

Thus, concerns over the issue of climate change in the country have triggered the Malaysian government's shift towards green technology development. As such, the National Green Technology Policy (DTHN) was launched on 24 July 2009 at the Malaysian Energy Center, Bangi. The policy focuses on sustainable development that meets the needs of today's society without ignoring the needs of future generations. In order to succeed DTHN, the government has developed five main strategies (National Library of Malaysia, 2012).

The fifth strategy of DTHN is to enhance efforts to promote and raise public awareness of green technology through the implementation of comprehensive educational activities and programs. Therefore, the development of an affective syllabus system has been suggested to foster a culture of appreciation for Green Technology Practice among students at every level (National Library of Malaysia, 2012). However, education planning, which is a green education strategy for students, would not have been possible without the sacrifice of the teachers themselves. The study of Tomayess Issa et al. (2014) explains that teachers as academics have a high responsibility in raising awareness of green technology practices among students who are considering future leaders. Therefore, every teacher must first be aware and motivated to recognize green technology and practice it in everyday life in line with the goals and direction of the government.

However, based on various reviews of the literature the researchers found that teachers' awareness and motivation for green technology practices are still low. This is evidenced by the findings of a study conducted by Azuar Arifin (2015) involving 43 teachers of the Northern Zone Engineering Technology showing that the level of awareness and practice of teachers in green technology is moderate.

Besides, a study by Farshad (2016) that investigated the level of awareness, attitudes and behaviour of 337 students and 12 teachers showed that most teachers lacked personal awareness of the environment and misunderstood green concepts such as, thinning of the layer ozone, acid rain and greenhouse effects. They also lack the understanding of the environment and the concept of sustainable development. Therefore, the teachers stated that they could not provide productive teaching of the environment.

In addition, based on the study of Arasinah et al. (2017); Yang et al. (2016) found that although the elements of green skills were encouraged by the Ministry of Education through the *publication* of teaching modules, but teachers still did not use them fully. This issue was also raised by the Center for Curriculum Development (as cited in Ramli et al., 2019) in which the study conducted showed that *teachers in* focus only on completing the syllabus content and the content of textbooks due to time constraints. This has led to the neglect of green teaching in schools (Ramli et al., 2019). In fact, although nearly 13 years have passed since the launch of the green school program in Malaysia, its effectiveness among students has not been fully *achieved* (Yapin et al., 2017). Therefore, this study is considered to be important in addressing the gaps inherent in the adoption of green technology among teachers through awareness and motivation variables.

Green Technology Awareness and Motivation among Primary School Teachers

According to Kerlin et al. (2015) in their study involving high school teachers stated that green awareness gained by teachers determines their involvement in the green field. The teachers in her study collectively called for additional professional development to develop their awareness of green features. Some teachers admit that the lack of a complete understanding of green infrastructure and how it is used also influences teacher teaching in the classroom. While knowledge is an issue for many teachers, there are also a number of teachers who have conveyed extensive knowledge of green features. The researchers found that the comments were voiced by science teachers only. While other teachers acknowledged that they would not be confident and comfortable in the practice of green teaching as long as professional development activities were conducted among teachers.

Further, the study by Kimaryo (2011) suggests that teachers need to be aware of green technology in order to integrate the green curriculum in education. For this reason, the integration of environmental education or green technology relies heavily on teachers' awareness of connecting environmental education in the content of teaching. The teachers involved in the Kimaryo's study also argued that most of the subjects taught were now related to environmental education. So, teachers need to be aware and knowledgeable about it so that green topics are integrated into the content of all subjects. However, if teachers who teach are less knowledgeable on green topics then they are less confident and have problems integrating environmental education into their teaching.

Borg et al. (2014) also argued that a lack of knowledge and awareness of teachers is a significant barrier to conducting environmental learning for students. For example, if the green awareness and knowledge that teachers acquire is at a low level, they are more likely to pass on the wrong information about the green topic in their classroom.

According to Maharjan (2013), teachers' motivation towards green technology depends on their concern about the changing environment that is taking place today. This is because, the source of green information is the key to teachers' initiative to conduct learning. The knowledge gained by the teachers will pave the way for them to attract students to the lessons. Therefore, current issues regarding environmental issues in the country also need to be known by teachers in order to present the most current and effective content in the classroom. Teachers who are well-informed on current green topics will be more motivated to practice green teaching in the classroom.

Additionally, Zacharioua et al. (2017) also stated that teachers' positive exploration of green education applied is related to teachers' understanding and knowledge of the environment. Teachers' perceptions and knowledge are influenced by family, social and pollution issues that exist in their environment. These factors determine teachers' motivation to apply green education in schools.

On the other hand, a study conducted by Catling and Morley (2013) shows that teachers' motivation or confidence in green subjects is related to teachers' knowledge of teaching content. If the teacher is knowledgeable in the subject of the environment then his teaching is more effective, updated and accurate. This is because, knowing the content of the subject matter is important for designing quality teaching, to provide the right feedback to the students, to convey the teaching and to produce appropriate questions for the students. In other words, if teachers have a strong knowledge of pedagogical content then their effectiveness in teaching will be higher.

In conclusion, based on extensive literature review, it is shown that awareness and motivation is an important element to consider in the field of green pedagogy as it influences the teaching delivered by

the teachers. On the other hand, variables of awareness and motivation for green technology also have a significant relationship with the green knowledge and understanding gained by teachers.

Adoption of Green Technology in the Education System

Recent global problems related to natural resource degradation and pollution have created natural resource conservation activities. Thus, formal and informal green education has been formulated to raise awareness among citizens of a country. Professionals and world-class researchers have argued that any solution to environmental problems requires knowledge and a deep-rooted understanding of the education system (Khan, 2013; Deka & Rabha, 2013; Lateh & Raman, 2005). Therefore, the main goal of the green curriculum is to raise students' awareness of the environment and engage them directly in sustainable activities. This is because, green technology education will ensure awareness to the community, especially future generations in preserving the environment and natural resources (Wright et al., 2015).

Moreover, green technology education in schools enables students to acquire knowledge, skills, values and commitment to work and act individually or collectively to solve environmental issues. The inclusion of all these elements in the early stages of education is important because students are a decisive factor in future environmental-friendly practices (Abdul Razak, 2017). So that, the Organization of United Nations (UN) has also declared green education or sustainable education in primary schools since 2005. European countries and the United States have adopted various measures to green technology-based curriculum. For example, topics such as sustainable development, weather and climate, green transportation systems, organic farming, green economy, green tourism and the green environment have been inserted in the education system from the very beginning (Louw, 2013).

Besides, to emphasize further focus on green technology, a Green School based on formal education has been introduced and developed by most countries around the world (Campbell et al., 2010). According to Stephanie Kay Barr et al. (2011) green schools are able to create a healthy, conducive learning environment and education that involves conservation of energy and resources. In the view of Hanifah Mahat et al. (2018) the approaches used in green schools are different according to the program, but the objective remains to increase the element of loving the environment among the students and school community.

According to Mohd Yusop & Sidek (2010) the concepts and knowledge of green can be taught more in green schools. This is because, green schools are built with less expensive buildings and construction compared to ordinary schools. For example, green school design contains several specialized methods such as natural plant preservation, natural resource preservation, indoor ventilation, efficient use of water and energy, natural lighting and extensive recycling facilities. These aspects are intended to improve the health, performance of students and to produce students who are more sensitive to environmental issues.

Therefore, globally with the participation of 67 countries, a total of 51,000 green schools have been started and are underway. Malaysia joined the green school community in 2011 with the establishment of 188 green schools involving 3,734 teachers and 50,780 students (Foundation for Environmental Education, 2014).

So, it can be concluded that the Malaysian government has begun to focus on the importance of green education in order to stand in line with the development of global education. As such, teachers also need to have sufficient green technology knowledge and skills to fulfil the government's aspirations and to further enhance the country's education standards to the world.

Conclusion

As such, teachers as class leaders play a vital role in promoting green practice among students. Furthermore, all educational planning will not succeed if teachers themselves do not have the awareness and motivation for green technology (Arifin, 2015).

The application of green technology in the curriculum through educators is a paradigm shift in ensuring that communities are aware of environmental sustainability. Changing the behaviour of individuals in caring for the environment should be a shared responsibility. The more people respond positively to the use of green technology, the higher the environmental wealth will be for future generations.

In addition, the application of the green technology concept in the educational curriculum is also an important step in realizing the fundamental goals of the national technology policy. This is because increasing public awareness of green technology through education is the right approach in creating a society that is aware of environmental sustainability (Arifin, 2015).

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