Greening the Information and Communication Technology in the Education Sector: Malaysian Teachers' Perspective

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Abstract

Dawning of the digital era has brought about tremendous change in humans livelihood and the way we interact with one another. Information and communication technology (ICT) has become a part of our lives that we are not willing to forgo for any matter. Whilst we are racing in the digital world, researchers found that ICT can be huge problem to the environment if mismanaged. ICT infrastructures can be huge burden to the electricity grid and not to miss the accumulation of e-waste with the rate of obsolescence of the technology. Malaysia is still far lagging in creating awareness among the citizens even though we have a well decorated policy on green technology. This research was conducted to determine the level of awareness on green ICT practices among teachers in Malaysia and the issues that deter the implementation of these green practices. A number of 930 teachers participated in the survey from all over Malaysia and their opinion was also recorded for analysis. The findings show that the level of awareness of green ICT practices is moderate among teachers and serious measures need to be taken by the administrators if we want to sustain our environment for generations to come.

Keywords: Green ICT, Knowledge, Attitude, Skill and Aspiration.

INTRODUCTION

Green Information and Communication Technology (Green ICT) is elaborated as an effort to manage ICT infrastructures while giving great consideration to the environmental problems if these infrastructures are mismanaged. Internationally, request were put forward by G8 countries to take sterner action towards implementing cleaner energy and sustainable development [1]. Hence, Green ICT practices is a necessary measure that need to be taken in addressing environmental degradation. Malaysian Administrative Modernisation and Management Planning Unit [2] has defined green ICT as the practice of production, use and disposal of computers, servers as well as accessories such as monitors, mice, printers and networking

equipment efficiently to avoid the detrimental effects to the environment. For any nation to move towards green practices, awareness is an important essence.

Level of awareness is measurable according to [3]. They also stressed that there are substantial progress in measuring the level of awareness and researchers have made steadfast progress in measuring it while noted that this task creates several interesting issues. In order for the awareness of green ICT to penetrate among people in general, initiatives should be taken to educate the young. Administering a proper curriculum which educates the future generation on sustainability and green ICT is vital in ensuring the nation's future and wellbeing. Teachers play a crucial part in the education system as one of the stakeholders [4]. Therefore the knowledge of green ICT and sustainability practices among teachers is indispensable to ensure a proper knowledge on handling ICT is passed on.

STATEMENT OF PROBLEM

A nation that only emphasizes on developing ICT knowledge and usage without implanting the green ways will eventually face environmental problems such as accumulation of e-waste and extensive carbon dioxide emission [5]. [6] stated in her research that "the ubiquity of ICTs leads to increased energy consumption and carbon dioxide emission with considerable negative impacts on the environment. This ubiquity also leads to an increase in the volume of e-waste." Subsequently, studies show that two percent of the global carbon dioxide emission is attributed to computer usage [7]. According to [8], the usage of ICT equipment especially computers are the main contributors of global carbon dioxide. [9] also reported that ICT sector is responsible for the 2 percent carbon dioxide emission in the overall carbon footprint.

Though there are many intensive researches done to show the importance of ICT literacy and being digitally advance but little is known on the awareness of green practices in relation to ICT usage [10]. [11] have stressed in their research that there are only scanty researches done on awareness of green ICT practices in Malaysia. Meanwhile a study by [10]. [11] showed that most teachers lack knowledge of green ICT.

REVIEW OF LITERATURE

Information and Communication Technology or better known as ICT denotes all electronic devices which is capable to capture, transmit and display data and information. According to [12], ICT comprises of all facilities which are equipped with computer network, data handling and telecommunication. Being widely employed in the field of education, research, administration and others, as an effective tool to bring about revolution of this modern era, ICT is capable of creating numerous benefits to sustainable development and enhance virtual communication and administration. However, ICT also creates a large environmental footprint over the world [13]

[14] stated that the carbon footprint can be defined as the whole amount of carbon dioxide produced unilaterally by an activity or the total amount produced in the life stages of the product. They added that all activities conducted by humans either directly or indirectly have to be taken into account.

On the other end, ICT components such as the computer monitor create a different problem when disposed in landfills as e-waste. The toxic components in these electronic wastes when dumped in landfill, contaminates the surrounding and diffuses into water and enters the waterways. [15] stressed that old computer hardware's especially with the CRT monitor which consists lead in glass portion of the cathode ray tube can explode when deposited in a landfill. The significant amount of lead that it contains can react with other chemical elements and cause serious contamination of soil, air and the underground water. Eventually this becomes hazardous to all living being in the environment [16]. Therefore creating awareness on green ICT practices

is vital in sustaining the environment from the negative impacts of ICT itself [17]. Study by [18] showed that application of any technology will be hindered if there is a lack in awareness about the technology. Hence, awareness on the part of teachers allows the knowledge of green practices to be propagated to students and eventually bring about the necessary changes among all users towards the stewardship of taking care of the environment in the longer run. There are some prominent researches done in assessing the level of awareness of people pertaining to green practices but few on teachers in Malaysia. Awareness of teachers on green ICT will influence their mind-set on ICT usage and influence the intention to go green.

According to [19] the level of awareness in any program can be investigated by evaluating an individual's knowledge on the particular program, the attitude one has in the application, theirs skills and their aspiration towards the program. Hence this theory on awareness is also applicable in assessing the level of awareness in green ICT among teachers. By evaluating the knowledge of teachers in Green ICT, their attitude in handling the ICT infrastructures, their skills and aspiration towards going green, the level of awareness on green ICT among teachers in Malaysia can be explored.

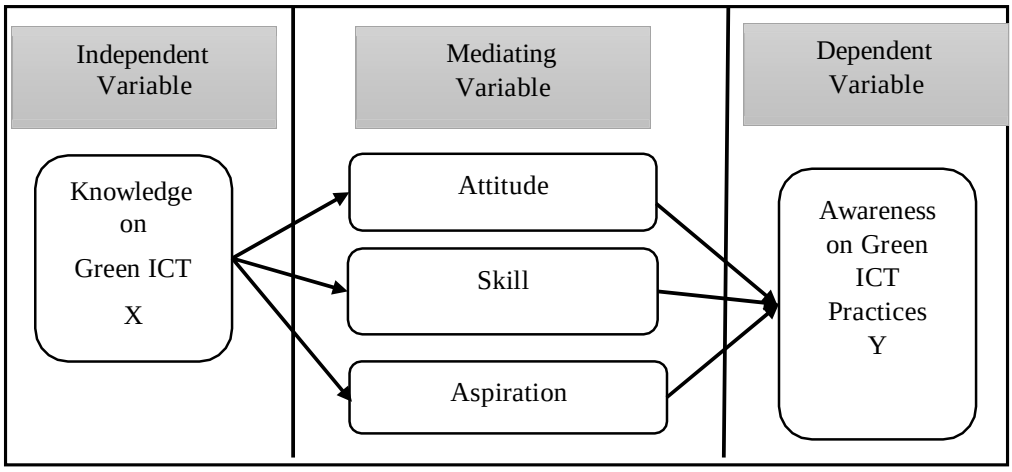

Figure 3.1: *Theoretical Framework*
Source: Authors Construct, 2021

METHODOLOGY

This study harboured on quantitative mode whereby the data was obtained through an online survey. A survey is an efficient method as suggested by [20] to obtain data from a large group of samples. Therefore, letters were sent by email to 90 schools in each states randomly requesting the participation of 5 teachers from each school. The letter contains the QR Scan code and URL (Uniform Resource Locator) for the questionnaire that is required to be answered by 450 teachers from each state. A number of 930 teachers responded from 13 states and 1 Federal Territory. The responds were from 326 primary school teachers comprising of 138 male teachers and 188 female teachers. Meanwhile 604 teachers from secondary schools comprising of 142 male teachers and 462 female teachers were the respondents in this survey.

FINDINGS AND DISCUSSIONS

For each variable or aspect the mean of the response for each item was obtained and plotted on a radar diagram. The findings are as shown in Figure 5.1 whereby the average mean for each variable from the teachers' response is plotted against the expected or targeted mean. The area of the polygon for the responses stands at 54.95% in comparison to the area of targeted results. The percentage was calculated

by determining the area of the polygon [21]. From the findings, it can be concluded that the awareness of green ICT practices among the teachers who responded in this survey is moderate.

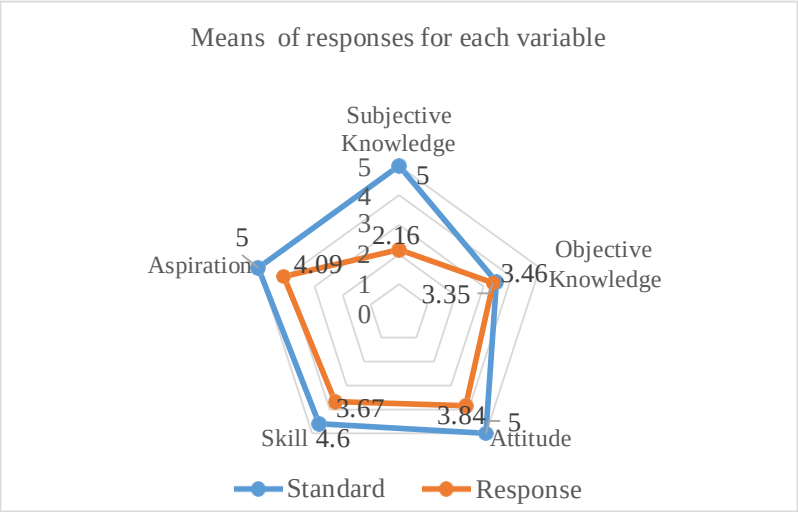

Figure 5.1: ***The means of responses for each variable on radar diagram***

Moreover, a number of 674 teachers from 930 respondents of this study, recorded their opinions regarding green ICT practices in the open ended question in the questionnaire. This is about 72.47 percent from the total number of respondents. Each comment was carefully read and grouped according to several themes and the percentage of their comments were calculated. Table 5.1 shows the responses which have been categorized and the number of respondents related to their opinions.

A majority of 304 respondents or 45.11 percent strongly agree that green ICT should be practiced by everyone to sustain the environment for the future generation. Some respondents stressed that energy conservation is crucial and proper attention should be given to e-waste management and paperless work should be given priority to reduce environmental degradation and preserve the environment.

20 respondents which is about 2.97 percent intends to practice green applications in ICT whenever possible. This denotes that this study have provoked some awareness among the respondents on the importance of green practices in ICT.

Table 5.1

Comments by the respondents according to themes

Comments according to the themes	Number of respondents	Percentage
Strongly Agrees that green ICT should be practiced by everyone to sustain the environment for the future generation	304	45.11
Intend to practiced green ICT from now onwards	20	2.97
Not well informed due to lack of exposure, more emphasize should be given and intends to find out more about Green ICT practices	56	8.31

Feels that green ICT practices should be taught in schools right from young to create the awareness on green ICT practices	74	10.98
Government should make the move to implement through courses and workshops while monitoring and enforcement should be done at all times.	30	4.45
Public should be informed on the importance of green ICT and practices should be applied in all public sectors for energy and resources conservation	152	22.55
Teachers should be well informed about green ICT practices so that the idea reaches all walks of life	38	5.63
Total	674	100

Source: Authors Construct, 2021

However 56 respondents or 8.31 percent have admitted that they are not well informed on the matter due to lack of exposure. They advocated that more emphasize should be given to practices of green ICT. Moreover these 56 respondents also intend to find out more about green ICT practices.

On the other hand a number of 74 respondents or 10.98 percent feels that green ICT practices should be taught in schools right from young to create the awareness on green ICT practices. This move in the longer run will create a society that practices green applications in all endeavours of life.

30 respondents or 4.45 percent feel that government should make the move to implement green ICT practices through courses and workshops. Government should also constantly execute monitoring and enforcement in all sectors for better implementation on green ICT practices.

A larger group of 152 or 22.55 percent of respondents expressed that public should be informed on the importance of green ICT and practices should be applied in all public sectors for a better energy and resources conservation.

And finally a number of 38 (5.63%) respondents emphasized that teachers should be well informed about green ICT practices so that the idea reaches all walks of life. They feel that teachers are the sparks who can bring about the prudent changes in a society which in the longer run provoke the idea of sustainable development in a country.

CONCLUSION

Whilst Malaysia is moving forward to excel in the digital world, the impact of ICT to the environment overall should not be overlooked. There are still some significant barriers to adopting green ICT in many organisations that prevents widespread of green ICT awareness. Carbon footprints are becoming a serious problem to nations globally and new measures have to be employed in handling this effect on the environment. Awareness of green ICT practices by teachers can as well bring about

cascading changes among students and the public in general. Government must play a more salient role in promoting green ICT awareness among the public for the prosperity of the nation in the longer run.

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