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The Study of E-waste Management Awareness Among Students of UiTM Seremban 3

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ABSTRACT

This research aims to learn about university students' knowledge, and attitudes about the existence, danger, and management of e-waste, one of the world's fastest-rising concerns in our country. It also tried to evaluate whether the students' current e-waste management practices conformed with current government policies. Six (6) of the Bachelor Degree of Environmental Administration students' awareness about e-waste management in Malaysia was evaluated using an open-ended interview research technique. The respondents' knowledge, attitude, and practice in e-waste management were assessed using thematic analysis. Overall, students' understanding of e-waste management was relatively low. The findings indicate that students need a broader understanding of e-waste management. Educational and government-led initiatives to improve e-waste management should be provided.

Keywords: awareness; attitude; e-waste; management; university students

INTRODUCTION

Electric waste, often known as e-waste, is one of the world's fastest-growing solid waste sources, and it has the potential to harm the environment and human health due to hazardous chemical compounds. Under Directive 2012/19/EU, electrical or electronic appliances, including all parts, electronic components, or consumables that are part of the device when discharged, are referred to as e-waste. Article 1(a) of Directive 75/442/EEC defines waste as any material or item discarded (Nurul Aini et al., 2019). E-waste refers to all electronic wastes, such as electrical and electronic equipment (EEE) and computer equipment parts, abandoned as waste by their owners with no intention of being reused (StEP Initiative, 2014). WEEE (Waste Electrical and Electronic Equipment) is another name for electronic waste, which has different meanings in different parts of the world and under different conditions. As a result, e-waste encompasses a wide range of goods, most of which come from households or enterprises that provide electrical power or battery components (Baldé et al., 2017).

The rise of the electronics sector has impacted the planet in two ways: large-scale electrical waste disposal and growing demand for primary-resource precious metals. This high rate of e-waste generation can be ascribed to increased consumer demand and a shorter lifespan for electrical and electronic devices (EEE). The United Nations report that 44,7 million metric tonnes (Mt) of e-waste in 2017; however, only 20% (8,9Mt) of it was collected and reused appropriately

(Balde et al., 2017). Moreover, according to a United Nations report, computer sales in India would increase up to 500 percent in South America and 400 percent in China by 2020, compared to 2007 (UNEP, 2009). By 2020, e-waste production from abandoned cell phones will be 18 times higher in India and around seven times higher in China, according to this study (Agamuthu and Victor, 2011). The StEP organization has released data on e-waste creation from 184 nations. The latest recorded figure for e-waste generation in Malaysia was 232,000 metric tonnes in 2014. In comparison to 2008, this figure showed an increase of only 12,065 metric tonnes. By 2008-2020, the estimated amount of e-waste output of 690,827,529 metric tons may be satisfied (StEP Initiative, 2014).

Managing e-waste, on the other hand, is a significant challenge in Malaysia and a global issue (Environmental Quality Report, 2013). Many of Malaysia's landfills are nearing the end of their useful lives. Malaysia's e-waste has accumulated due to the diminishing shelf life of electrical and computer items (Muaz & Mohamed, 2008). As a result, e-waste processing, including e-waste recycling, is still in its infancy in Malaysia (Ahmad Faisal et al., 2014). The most severe worry in Malaysia is the community's lack of response to e-waste recycling (Ho et al., 2015). This research was carried out to determine the level of awareness of e-waste management in Malaysia among students. A group of students from UiTM Seremban 3 has been chosen to respond to a survey. Young consumers, particularly university students, use technology such as computers, laptops, tablets, smartphones, and other devices in their learning sessions and everyday routines.

PROBLEM STATEMENT

The purpose of this study is to examine student awareness of e-waste management in Malaysia. Each person cannot avoid the use of technological or electronic equipment due to era changes and the rapid growth of technology advancement. According to this condition, future generations will increase the amount of e-waste produced. However, most individuals in this country are unaware of the adverse effects of e-waste on our environment. E-waste is mentioned in the Environmental Quality Regulation (2005), which prohibits the disposal of e-waste in landfills. Recycling and recovering e-waste must take place on premises specified or approved, and disposal must take place exclusively on the prescribed premises and in an environmentally friendly manner (Fatihah Suja et al., 2014).

The most concerning aspect is how people, particularly a group of students, are affected by Malaysia's e-waste management regulations. Furthermore, if just a tiny percentage of Malaysian students are aware of the e-waste regulations, the effectiveness of policy implementation is called into doubt (Syahrul Eidham & Muhammad Aizul,2021). If this assertion is correct, what role should the Malaysian government and community raise student knowledge of e-waste management? According to the data, the demand for electronic devices, which is constantly increasing, plays a role in technical growth. This causes the producer to expand their output in order to meet both their profit and demand. However, production is too quick, reducing the lifespan of electronic equipment (Yong et al., 2019). For example, from 2015 to 2020, numerous models of devices were from companies such as Apple, Samsung, Oppo, Lenovo, and Xiaomi. Every device a firm produces is more efficient in terms of processor, chipset, camera, internal storage, and RAM. This information persuaded individuals to upgrade their devices constantly, even if they had one that was still useful (Fang-Mei & Hui, 2011).

When consumers frequently change their electronic devices, the amount of electronic waste produced increases. The old device will either be disposed of or left unused. According to the United Nations University's (UNU) global e-waste monitor report 2017, the global amount of garbage, including electronic devices or e-waste in 2016, was 44.7 million tonnes (Balde et al., 2017). In the worst-case situation, e-waste is one of the contributors to environmental devastation. This is since the gadgets' chemical materials are not ecologically friendly. In the end, the impact of e-waste will affect human health, with the risk of developing a chronic condition. Polychlorinated biphenyls (PCBs) are currently found in e-waste, which can cause cancer in people and impact human health (Muaz & Mohamed, 2008). Hence, three (3) research questions are addressed in this article; a) What is the level of students' knowledge and understanding of e-waste in the environment? b) What

are the students' intentions when disposing or recycling e-waste? and c) Are the methods of e-waste disposal practices by students according to the government policies?

LITERATURE REVIEW

Insight into e-waste awareness in Malaysia

Concern for and educated interest in a specific situation or development are both examples of awareness. In the context of e-waste, awareness refers to a sense of concern and understanding about the growing volume of e-waste and its impact on the environment and human health. Awareness of the e-waste recycling process is a critical step in reducing the environmental consequences of e-waste emissions. People's knowledge of effective e-waste management will grow due to increased awareness, allowing them to achieve and maintain a healthy environment.

The Malaysian Department of Environment (n.d) provides a website dedicated to raising e-waste awareness, including information on the notion of e-waste, estimations, and how e-waste households in Malaysia can be disposed of. Environmental contamination and damaging public health implications are reduced when people are aware of the societal effects of e-waste. According to the product's end-of-life cycle, focusing on recycling, reuse, reconstruction, and proper disposal is critical. Visual pollution will improve mental and physical health through its effects on social quality of life, individual well-being, lower economic health, aesthetic attractiveness, and public awareness. Because electrical components such as cables, wires, tables, and unorganized dumping of structures during construction are not ordered, this occurs. This practice affects people's perceptions of the environment (Jana & De, 2015).

Knowledge, attitudes, practices (KAP)

With the adaptation of the knowledge, attitudes, and practices (KAP) theory, e-waste management awareness was defined into three primary parts in the context of this study. According to the findings of Wang et al. (2015)'s study, there was a clear relationship between awareness of knowledge, attitude, and practice, demonstrating the importance of raising air quality awareness among Shanghai communities through general education and environmental conservation initiatives.

The first KAP studies were established in the 1950s and are now widely used for sociological study in many areas. Because they are resource-saving and highly directed, KAP investigations are more economical than other social science approaches (Eckman & Walker, 2008). As a result, a "Knowledge, Attitudes, and Practices" survey is a representative sample of a society's understanding, perception, and behavior on a single issue (Zahedi et al., 2014). As a result, KAP studies have become a standard method for evaluating human behavior in the context of environmental issues. As a result, this study uses the KAP model to investigate the degree of students' awareness regarding e-waste management in Malaysia.

METHODOLOGY

Previous research on KAP's model (El-Gilany et al., 2017 and Ahmad et al., 2015) has generally used a quantitative method involving questionnaires. However, this study employed a qualitative method to examine students' e-waste management awareness.

The respondents were chosen among the Bachelor Degree of Environmental Administration students in UiTM Seremban 3. Open-ended questions were utilized to gain more complexity of answers from the interviewees. The research adopted the KAP's model in designing the interview questions: questions regarding Knowledge, Attitudes, and Practices to determine students' level of awareness on e-waste management. Purposive sampling was used in conducting the research. The researcher employed purposive sampling because students in the Bachelor in Environmental Administration were more aware of e-waste than students from other programs.

Population and sampling

Six students (parts 6) from the Bachelor Degree of Environmental Administration, UiTM Seremban 3, were involved in this study.

Data collection method

Qualitative research generally explores attitudes, behaviors, and experiences using interviews or focus groups for participants' in-depth opinions. Although few people were required for the study participation, the researcher spent more time with respondents (a crucial aspect in qualitative studies) to explore attitudes, behaviors, and experiences (Dawson, 2002). Specifically, the qualitative research design utilized face-to-face and semi-structured interviews with the chosen individual residents.

Individual face-to-face and semi-structured interviews were employed to avoid deviations from the study theme. Semi-structured interviews also allowed informants to express opinions on the subject matter liberally. Furthermore, the interview sessions were conducted in English and Malay. Four students preferred the interview sessions to be conducted in English, whereas another three preferred the sessions to be conducted in Malay. The duration of each interview ranged from one to two hours. Overall, the data collection process was completed in one month. Moreover, a rubric is also prepared to determine students' e-waste knowledge level. The rubric ranges from high, moderate and poor levels.

According to Sekaran (2003), face-to-face interviews may give rich data, build connections with respondents, and investigate and comprehend a complicated topic. The data collected through an online interview (Google Meet) were thematically analyzed. The audio recorded during the interview sessions was transcribed verbatim and manually coded for analysis. Furthermore, the research questions were thematically classified into themes and sub-themes. This study used a single embedded case study design comprising students with a Bachelor of Environmental Administration to provide possible similarities or differences that would provide insights into the fundamentals of the study variables. Following the interview sessions, data transcription and the subsequent verification by experts were performed within one month.

Development of interview questions

Before conducting interview sessions, the proposed interview questions were validated by experts from the Universiti Kebangsaan Malaysia and Universiti Putra Malaysia. Since the interviews were bilingually conducted (using both English and Malay), the clarity and consistency of the translations were evaluated by language experts.

Research themes

The central theme is categorized into three main themes (knowledge, attitude, and practice). The sub-theme under knowledge is students' knowledge of e-waste management and students' understanding of the effects of e-waste on the environment. The sub-theme under attitude can categorize students' intention to dispose of unused electronic devices properly and determine whether students willingly send e-waste to the recycle center. Finally, the practice theme can be categorized into two sub-themes: the methods of e-waste disposal practices by students according to the government policies and students' acknowledgment of government policies and regulations on e-waste management.

Interview questions

There are six questions asked during the interview sessions. These questions are:
(i) What is your current knowledge of e-waste management?
(ii) What is your understanding of the effects of e-waste on the environment?

(iii) How do you dispose of unused electronic devices properly?
(iv) Do you willingly send e-waste to the recycling center?
(v) Do you practice e-waste disposal according to government policies?
(vi) Do you acknowledge government policies and regulations on e-waste management?

RESULTS AND DISCUSSION

Knowledge theme

Sub-theme: to identify student's knowledge into e-waste management.

The respondent's level of knowledge on e-waste was at a low to moderate level. The respondents could identify that electronic and electrical devices and appliances being turned into waste were called e-waste. The students realized that e-waste needed proper treatment before being disposed of. Nonetheless, the proper treatment mentioned was not being explicitly stated by them. Moreover, most respondents strongly agreed that proper e-waste management in Malaysia was essential to reduce the risk of environmental threats.

According to most research, the Malaysian population had a high level of e-waste understanding; however, when questioned about e-waste management, the Malaysian public's replies were unsatisfactory (Hanifah Mahat et al., 2019). Moreover, the respondents only had a little information on the government regulation on e-waste management specifically. A study by Afroz et al. (2019) showed that environmental knowledge and awareness significantly impact attitudes toward the households' recycling intention.

Sub-theme: to identify student's understanding of the effects of e-waste on environment

The result showed that two (2) of the students recognized the harmful effects of e-waste on the environment as the components and chemical substances would lead to environmental problems (see table 1). They had learned this from one of the subjects they had taken in the previous semester.

The duration of e-waste decomposing became a threat to the environment. Nonetheless, the production of e-waste had been steadily rising, making up the waste that would be adequately recycled and disposed of. The lower prices placed on each gadget influenced the user to purchase and utilize it. This fast-paced manufacturing process had resulted in a surge in the number of electronic gadgets in Malaysia (Needhidasan, Samuel & Chidambaram, 2014)

Four (4) of the respondents did not identify the adverse effects of e-waste on human health because it showed no threat to them. Thus, some respondents practised proper e-waste management to avoid harmful impacts on their health and bodies. Chemically hazardous e-waste was harmful to both the environment and human health. Mercury, lithium, and other elements were found in batteries as hazardous substances that could be released into landfills. Additionally, e-waste was classified as a hazardous solid waste source due to the presence of dangerous chemicals. Examples included lead in cathode ray tubes or CRTs, batteries and PCBs, mercury and cadmium-containing components, and chemicals like halogenated flame retardants (Cobbing, 2008). The leaching and solubilization of hazardous compounds in soil, groundwater, and essential water from waste electric and electronic equipment could cause pollution. Electrical waste caused many environmental health issues since radioactive and hazardous chemicals were released into the air, water, and land (Cayumil et al., 2016).

Attitude theme

Sub-theme: to determine student's intention on disposing unused electronic devices properly.

Most of the respondents intended to dispose of unused electronic devices properly (see table 2). Nonetheless, from the individual perspective, standards, and beliefs, they had the rational reasoning to keep the e-waste first in a place, then they would proceed with their intention to dispose, sell, or recycle.

A study done by Azman et al. (2020) about e-waste management awareness among young adults in Malaysia. The result demonstrated a high level of awareness (91%) but a lack of responsibility (as low as 52%) of young adults. Thus, increasing accessibility to e-waste recycling along with increased public awareness was the way forward in terms of educating young adults and instilling e-waste recycling habits in the general public; this was necessary in order to address e-waste management for a sustainable environment. Improving e-waste recycling accessibility and raising public awareness were the best ways to educate and cultivate e-waste recycling practices among the public at large in order to address e-waste management for environmental conservation.

Most of the respondents kept their electronic and electrical devices, such as smartphones and laptops until their technological obsolescence. The utilization of the lifespan of the devices impacts people's willingness to consume a thing until it reaches the end of its useful life (Kiddee et al., 2013). However, an individual's attitude toward updating new technological devices was influenced by his or her financial position.

Sub-theme: to determine whether students are willingly sent e-waste to the recycle centre.

Three (3) students were unwilling to send e-waste to the recycling center because there was a lack of access to recycling facilities (see table 3). As a result, the most logical thing for them was to sell or dispose of the unneeded devices, hoping that this was the most appropriate approach or action to do. In this regard, it could be shown that implementing educational initiatives to help users better understand the benefits of waste management in terms of environmental protection was needed (Nguyen et al., 2019). This may encourage students to dispose of or recycle e-waste in more sustainable ways. Furthermore, the students' availability of enough time, space, money, and effort to undertake recycling activities may be characterized as inferior. Thus, the intention to recycle electronic waste was positively affected by perceived convenience, according to Gonul Kochan et al. (2016), since an individual may have more time and enough space available in his or her house to allow him or her to store the garbage until delivering it to a recycling facility.

Practice theme

Sub-theme: to identify the methods of e-waste disposal practices by students are according to the government policies.

All of the respondents did not practise the method of e-waste properly. Hence, the individuals should understand that identifying the proper e-waste disposal practices would help reduce the risk of environmental issues. Chemical substances such as lead, cadmium, beryllium, arsenic, and brominated combustible chemicals were all present in all electronic trash. The improper disposal of electronic devices and machinery increased the risk of soil deterioration, air pollution, and hazardous chemical leakage (Muaz & Mohamed, 2008). If e-waste is deposited in a landfill, it will leach trace elements by absorbing them through the water. While recycling was ecologically friendly, it usually resulted in imports and the disposal of gadgets hidden in crates (Hanifah Mahat et al., 2019).

In addition, according to the Global e-waste Monitor (2020) report, Malaysians generated 364 kilotons (kt) of e-waste in 2019, an average of 11.1kg per capita. This means that the recycling

efforts are falling behind the daily volume of e-waste generated. While recycling has increased by 1.8 million tonnes since 2014, the total amount of e-waste has escalated by 9.2 million tonnes.
(b) Sub-theme: to determine student's acknowledgment into government policies and regulations on e-waste management

Based on the findings, the students understood the importance of government policies and regulations on e-waste management as it could make the individual have proper behaviour towards e-waste disposal (see table 4). Individual waste management practices would be influenced by the government's external policies' perceived efficacy in its attempts to recover wastage output. Xu, Lu, and Shen (2017) discussed the importance of waste practices and perceived policy effectiveness (PPE). The PPE results in a favorable or unfavorable assessment of the individual's policy measures' clarity, appropriateness, and facilitation. Therefore, successful government policies and regulations served as a motivator that moderated the link between an individual's attitude and waste management.

CONCLUSIONS

The results suggest that the students have a poor to moderate understanding of e-waste management. The students recognized that e-waste must be appropriately treated before being discarded. Nonetheless, they were not aware of the proper treatment. Also, the respondents had limited knowledge of government regulations on e-waste management. The majority of students were unaware of the negative consequences of e-waste on the environment. They also failed to detect the negative consequences of e-waste on human health. Students are found reluctant to bring e-waste to a recycling center due to a lack of access to the recycling facilities. As a result, the most appropriate course of action for them is to sell or dispose of the obsolete equipment, thinking that this is the best method or action to take.

The findings of the present study indicate that students should be encouraged to practise e-waste management. Policies implemented by governments have a significant impact on how resources are obtained. The government initiatives such as policy regulations and campaigns should be implemented.

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CONFLICT OF INTERESTS

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

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