E-Waste Management Awareness in the Public Sector: A Study Among the Staff of Department of Polytechnic and Community College Education

Nadia Hairi[1,a)] and Fatimah Khair[1, b)]

[1] *Department of Polytechnic and Community College Education, Galeria PjH, Jalan P4W Presint 4, 62100 Putrajaya, Malaysia*

[a)]Corresponding author: nadiabintihairi@gmail.com
[b)]fatimah.khair@mohe.gov.my

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Abstract. *Electronic waste (e-waste) is among the fastest-growing waste streams globally, posing serious environmental challenges if not managed effectively. In Malaysia, regulatory frameworks and awareness programmes have been introduced, yet the knowledge, attitudes, and practices of public sector staff, particularly in education-related agencies remain insufficiently documented. This study addresses the gap by examining knowledge, attitudes, and practices on e-waste management among staff of the Department of Polytechnic and Community College Education (JPPKK). A quantitative survey was conducted with 170 staff members using a structured questionnaire covering awareness, attitudes, and practices. Descriptive statistical analysis, including mean and standard deviation, was applied to identify levels and variations across constructs. Findings reveal high awareness and positive attitudes among respondents toward e-waste management, but actual practices were only moderate, pointing to some knowledge–practice gap. This suggests that raising awareness alone is insufficient to drive behavioural change. The study concludes that stronger organizational measures are needed to transform awareness into practices. Providing accessible recycling facilities, embedding sustainability in workplace policies, and offering continuous organizational support are recommended as part of future sustainability strategies.*
Keywords: e-waste; environment; knowledge; awareness; practice

INTRODUCTION

Electronic waste or e-waste refers to discarded electrical and electronic equipment that is damaged or no longer in use. According to the United Nations Global E-Waste Monitor (2024), approximately 62 million tonnes of e-waste were generated worldwide in 2022, a figure expected to escalate in subsequent years (Baldé et al., 2024). In Malaysia, annual e-waste generation exceeds 400,000 tonnes (DOE, 2024). Studies found that university students held positive attitudes but lacked detailed knowledge of policies and infrastructure (Ngadiman et al., 2017; Zahari, 2024). Improper management of e-waste can negatively impact the environment and human health.

However, there is still a lack of awareness among Malaysian regarding proper disposal methods for unwanted electronic waste (Goh & Sukri, 2024; Hidayana et al., 2023; Mohamad et al., 2021; Zahari, 2024). Despite the existence of regulatory frameworks, including the Environmental Quality Act and initiatives spearheaded by the Department of Environment (DOE) and the Malaysian Communications and Multimedia Commission (MCMC), challenges persist. These include limited public participation, inadequate awareness, and reliance on informal recycling practices. Most damaged or outdated electronic devices are stored without systematic handling or worse, disposed of with domestic waste, which can harm the environment. While prior research has examined households (Akhtar et al., 2014; Goh & Sukri, 2024; Mohd Yahya & Tengku Hamzah, 2025)and students (Mohamad et al., 2021; Zahari, 2024), the awareness and behaviours of staff in the public sector specifically in education organizations remain unexplored.

To address this growing concern, public sector efforts are crucial in fostering responsible e-waste practices within organizations. Although Malaysia has made commendable progress in developing regulatory frameworks and awareness campaigns on e-waste management, the knowledge, attitudes, and practices of staff in public sector

remain underexplored in existing research. As a public sector, the Department of Polytechnic and Community College Education (JPPKK) plays an important role in ensuring sustainable practices are embedded among its members, especially in e-waste management. JPPKK members frequently use various electronic devices in daily tasks including computers, printers, mobile phones, and other equipment that eventually become e-waste when they reach end-of-life. However, the level of awareness and the extent of responsible e-waste management practices among JPPKK staff remains underexplored, highlighting the need for empirical evidence to guide policy and intervention.

Therefore, this study addresses the gap by examining the knowledge, attitudes, and practices of JPPKK staff towards e-waste management. By focusing on an underexplored group within public sector specifically education organizations, this study offers insights to inform public sector sustainability initiatives in Malaysia.

METHODOLOGY

This study employed quantitative research design using online survey questionnaire as the primary data collection instrument. The objective was to assess the level of awareness, attitudes, and practices related to e-waste management among the staff of the Department of Polytechnic and Community College Education (JPPKK). The questionnaire consisted of 2 sections which are 3 items for demographic data and a total of 15 items to measure awareness, attitudes and practices related to e-waste.

A non-probability purposive sampling method was employed, focusing on staff members of JPPKK. Responses were obtained from 170 staff members, which is considered an adequate sample size for this type of survey research. A minimum of 100–200 respondents as sample size is sufficient for descriptive and inferential analyses in social science research (Bryman, 2016). Descriptive analysis, including mean and standard deviation, were employed to evaluate the levels of awareness, attitudes, and practices among respondents. This approach allowed for the identification of overall trends, strengths, and areas requiring improvement.

RESULTS

The results are based on responses collected from 170 staff members of JPPKK. Their responses provide insights into three dimensions which are awareness, attitudes, and practices related to e-waste.

(a) Awareness

TABLE 1. Level of Awareness

No.	Item	Mean	SD
1	I know what e-waste is.	4.26	0.59
2	I am aware that e-waste contains substances that are harmful to the environment.	4.34	0.58
3	I know how e-waste can be recycled.	4.13	0.69
4	I am aware of the laws or regulations regarding e-waste disposal	3.95	0.84
5	I know the negative effects of disposing of e-waste carelessly	4.25	0.68

The analysis of awareness items among respondents is presented in Table 1. The overall mean scores indicate a generally high level of awareness, with values ranging from 3.95 to 4.34 on a five-point Likert scale. Respondents demonstrated the highest awareness on the item *"I am aware that e-waste contains substances that are harmful to the environment"* (M = 4.34, SD = 0.58), suggesting strong recognition of the environmental risks associated with improper e-waste management. Similarly, high scores were recorded for knowledge of the definition of e-waste (M = 4.26, SD = 0.59) and awareness of its negative effects when disposed of carelessly (M = 4.25, SD = 0.68). However, a lower awareness was observed for item *"I am aware of the laws or regulations regarding e-waste disposal"* (M = 3.95, SD = 0.84), although the mean still reflects a moderately high level. This item indicates that not all respondents were equally familiar with the existing policies, pointing to a need for clearer communication and education on policy matters.

(b) Attitudes

TABLE 2. Level of Attitudes

No.	Item	Mean	SD
1	I feel responsible for disposing of e-waste properly.	4.33	0.69
2	Taking care of the environment is everyone's responsibility.	4.48	0.68
3	e-waste is a major threat to health and the environment.	4.36	0.69
4	I am interested in participating in more programs related to environmental sustainability.	4.29	0.68
5	I believe education can raise awareness about e-waste.	4.44	0.66

Table 2 represents the results on respondents' attitudes towards e-waste management. Overall, the findings demonstrate a very positive attitude, with mean scores ranging between 4.29 and 4.48. The highest score was recorded for the item *"Taking care of the environment is everyone's responsibility"* (M = 4.48, SD = 0.68), indicating strong collective responsibility perceived by respondents. Similarly, high means were observed for belief in the role of education in raising awareness (M = 4.44, SD = 0.66) and recognition that e-waste represents a major threat to health and the environment (M = 4.36, SD = 0.69). Respondents also showed strong personal responsibility in disposing of e-waste properly (M = 4.33, SD = 0.69) and expressed interest in participating in additional environmental programmes (M = 4.29, SD = 0.68). The relatively low standard deviations (all <0.70) suggest a high level of consensus among staff, with most respondents sharing similar positive views.

(c) Practices

TABLE 3. Level of Practices

No.	Item	Mean	SD
1	I collect e-waste at home before sending it for disposal.	3.74	0.87
2	I dispose of e-waste at the correct disposal site.	3.75	0.96
3	I have sold or donated electronic devices that are still working.	3.71	1.02
4	I ask or look for information about e-waste disposal.	3.71	0.96
5	I encourage family and friends to dispose of e-waste properly.	3.90	0.92

Table 3 shows the level of e-waste management practices among respondents. The results indicate that practices are at a moderate level, with mean scores ranging between 3.71 and 3.90. The highest mean was recorded for the item *"I encourage family and friends to dispose of e-waste properly"* (M = 3.90, SD = 0.92), suggesting that respondents are most consistent in promoting proper practices within their social circles. This was followed by disposing e-waste at the correct disposal site (M = 3.75, SD = 0.96) and collecting e-waste at home before disposal (M = 3.74, SD = 0.87). By contrast, lower mean scores were observed for selling or donating electronic devices that are still working (M = 3.71, SD = 1.02) and seeking information about e-waste disposal (M = 3.71, SD = 0.96). The relatively higher SD values (particularly >0.90) suggest greater variability in respondents' practices, pointing to limited engagement in proactive practices. Future efforts should provide staff with the support and facilities needed to turn awareness into action.

DISCUSSION

The findings of this study provide important insights into the knowledge, attitudes, and practices of JPPKK staff towards e-waste management. Overall, the results reveal that respondents demonstrated high levels of awareness**,** very positive attitudes, but only moderate practices**.** This pattern suggests the existence of a knowledge–practice gap, which is consistent with previous research both in Malaysia and internationally (Baldé et al., 2024; Jain et al., 2023; Mohd Yahya & Tengku Hamzah, 2025; Shad et al., 2020; Yusof et al., 2023; Zahari, 2024).

In terms of awareness, respondents displayed strong understanding of the harmful effects of e-waste on health and the environment, as well as knowledge of its definition and negative impacts of improper disposal. However, lower scores were observed for awareness of laws and regulations, indicating a gap in regulatory knowledge. This suggests that while general awareness is high, respondents may not be fully informed about specific policies

governing e-waste management, echoing findings by (Hidayana et al., 2023) on limited regulatory understanding among Malaysian households.

Regarding attitudes, the results are particularly encouraging, as respondents expressed strong feelings of personal and collective responsibility. Importantly, the willingness of staff to participate in future sustainability programs provides a clear opportunity for public sector to leverage these positive attitudes in support of targeted initiatives. The recognition of education as a key driver of awareness further underscores the important role of public sector in shaping sustainable behaviour, both within their own communities and in society at large.

Nonetheless, the translation of positive attitudes into practice remains uneven. Moderate engagement in recycling, donating, or seeking disposal information suggests structural and contextual barriers such as limited access to collection points, insufficient institutional support, or lack of convenient recycling options. The variability in practices indicates that while some staff are proactive, others remain less engaged, reinforcing the argument that awareness alone is insufficient to ensure consistent sustainable behaviour.

Taking together, these results point to the need for public sector interventions that bridge the gap between awareness and practice. While JPPKK staff clearly recognize the importance of e-waste management and hold favorable attitudes, practices remain inconsistent and dependent on individual initiative. To strengthen sustainable behavior, organizations should provide accessible disposal facilities, formalize donation and recycling channels, and integrate sustainability elements into workplace policies and training programs. Currently, only industrial e-waste is required to be managed by parties appointed by the Department of Environment Malaysia (DOE), as there is no specific legislation mandating proper disposal of household e-waste. This implies that a systematic management approach should be implemented for all types of e-waste, including those from residential sources. Policymakers, manufacturers, collectors, educational institutions and other stakeholders must work together to put comprehensive strategies that solve these problems into practice (Mohd Yahya & Tengku Hamzah, 2025; Zahari, 2024). In doing so, the positive attitudes and strong awareness demonstrated by staff can be converted into consistent, responsible practices that contribute to Malaysia's broader sustainability agenda.

CONCLUSION

This study has examined the knowledge, attitudes, and practices of JPPKK staff towards e-waste management, highlighting several important findings. Despite good awareness and a positive attitude toward environmental responsibility, more effort is needed to encourage actual behavior change. Moderate engagement in recycling, donating, or seeking disposal information suggests structural and contextual barriers such as limited access to collection points, insufficient institutional support, or lack of convenient recycling options. The variability in practices indicates that while some staff are proactive, others remain less engaged, reinforcing the argument that awareness alone is insufficient to ensure consistent sustainable behaviour.

From a policy perspective, this study also underscores the need for organizational interventions to translate awareness and attitudes into consistent practice. Initiatives such as establishing accessible collection points, promoting donation and recycling programmes, and embedding sustainability elements into professional training could enhance uniformity in staff behaviour. With clear regulations, supportive infrastructure, and continuous education, the government can strengthen efforts to ensure that environmental awareness is effectively transformed into sustained, responsible action across all levels of society. These approaches can help people better understand what actions to take and make it easier for them to dispose of e-waste properly. Involving the community and providing easy access to disposal facilities can also encourage better habits.

In conclusion, this study highlights the need for future interventions to prioritise enabling infrastructure, incentives, and institutional support rather than focusing solely on awareness, which is already high. By creating convenient opportunities for recycling and embedding e-waste management within workplace policies, public sector organizations can play a pivotal role in narrowing the knowledge–practice gap. With staff already demonstrating strong responsibility and willingness, they can act as catalysts for broader sustainability efforts within the public sector.

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