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"A Study To Assess The Effectiveness Of Self-Instructional Module On Knowledge Regarding E-Waste Management Among Mobile Phone Users In Selected City."

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ABSTRACT

Background: The growing concern of electronic waste (e-waste) management necessitates educating mobile phone users about proper disposal and recycling practices.

Objective: To evaluate the effectiveness of a self-instructional module in improving knowledge regarding e-waste management among mobile phone users in a selected city.

Methods: A pre-experimental one-group pre-test post-test design was used, with a sample of 80 mobile phone users. Data was collected using a structured questionnaire and analyzed using descriptive and inferential statistics.

Results: The study found a significant difference between pre-test and post-test knowledge scores, indicating the module's effectiveness. Demographic variables like age, education, occupation, income, and mobile phone usage showed a significant association with pre-test knowledge.

Conclusion: The self-instructional module was effective in enhancing knowledge regarding e-waste management among mobile phone users. This study contributes to promoting sustainable practices and environmentally conscious behaviors among mobile phone users.

Keywords: e-waste management, self-instructional module, mobile phone users, knowledge assessment, sustainable practices.

Introduction

The increasing use of electronic devices globally has led to a significant rise in electronic waste (e-waste), both in developed and developing countries. E-waste includes discarded electrical and electronic equipment, and often contains hazardous materials such as cadmium, lead, and flame retardants. This waste poses serious risks to human health and the environment due to the toxic chemicals released when it is improperly managed. Globally, around 40 million metric tons of e-waste are produced each year, with only about 13% being recycled, primarily in developing countries. In India, e-waste is growing rapidly, exacerbated by the lack of effective management practices and insufficient public awareness. As of now, over 72.8% of Indian users have disposed of their electronic waste, with nearly 92.2% unaware of their contribution to e-waste. The informal sector in India, which handles the collection, transportation, separation, processing, and recycling of e-waste, is largely unregulated. This results in inefficient recovery of valuable materials and the use of harmful methods such as acid-leaching and open incineration. International E-Waste Day, held annually on

October 14, aims to increase awareness about e-waste and promote recycling. Proper e-waste management is crucial to mitigate the environmental and health impacts of discarded electronics and to recover valuable materials like gold and copper from circuit boards.

Statement of the Problem:

"A study to assess the effectiveness of self-instructional module on knowledge regarding e-waste management among mobile phone users in selected city."

1.1. Objectives:

Primary objectives: To assess the effectiveness of self-instructional module on knowledge regarding E-Waste Management among mobile phone users in selected city.

Secondary Objectives:

1. To assess the pre-test knowledge regarding E-Waste Management among mobile phone users in selected city.
2. To assess the post-test knowledge regarding E-Waste Management among mobile phone users in selected city.
3. To find out the association between the pre-test knowledge score with their selected demographic variable.

Scope

- This study will help to know about e-waste management among mobile phone users.
- This study will help to understand the effect of self-instructional module of e-waste management on mobile phone users of selected city.
- This study will increase the knowledge about e-waste management among mobile phone users in selected city .
- This study will create awareness about e-waste management among mobile phone users.
- This study will help the mobile phone users to develop interest in e-waste management

RESEARCH METHODOLOGY

Research Approach: Quantitative Evaluative research approach**.**

Research design: Pre experimental group pre-test post-test research design.

Setting of the Study: Selected city.

Population: Mobile phone users, who are residing in selected city.

Sample: Mobile phone users residing in selected city

Sample size: 80 Mobile Phone Users.

Sample size calculation: Sample size will be calculated by using this formula,

$$\mathbf{n}=\frac{Z1^2S^2}{d^2}$$

Sample Technique: Purposive Sampling Technique

Duration of the study:- Four weeks

Sampling criteria

Inclusion criteria:

• Own & uses mobile phones
• Able to read and write Marathi and English.
• Available at the time of data collection.
• Willing to participate in the study

Exclusive criteria:

• Individuals who have already attended the similar study.
• Users who are already experts in managing e-waste.
• Trained personnel and IT technicians
• Individuals who don't want to join the study.

1.2 DATA INTERPRETATION AND ANALYSIS

SECTION I

This section deals with analysis of demographic data of the mobile phone users in selected city, according to age of the mobile phone users in selected city, 11.25% of them were from age under 18 years ,57.50% them from the 18-44 years of age and 21.25% from the age group 45-54 years and 10% of users were of age 55&

above. according to gender of the mobile phone users in selected city, 52.50% of them were males and 47.50% of them were females. according to educational level of the mobile phone users in selected city, 32.50% of them educated up to high school or less, 18.75% educated up to some college / technical training, 40% of them had completed bachelor's degree and 8.75% had completed master's degree or higher. according to occupation of the mobile phone users in selected city, 17.50% of them were doing farming, 16.25% had own business, 21.25% users were health care person, 13.75% of them were students and 31.25% from the other category. according to Income level of the mobile phone users in selected city, 36.25% of them had Income less than 25000 Rs, 28.75% users had Income Rs 25000-50000, 22.50% had Income Rs 50000-100000 and 12.50% mobile users had income more than Rs 100000. according to employment status of the mobile phone users in selected city, 68.75% of them employed full time, 10% of users employed part time, 15% of them seeking opportunity and 6.25% of the users were from retired group. to the question which languages do you prefer, 18.75% of the mobile phone users prefer English Language, 11.25% users prefer Hindi Language, 70% of users prefer Marathi Language and no one of them prefer other Language. to the question how long have you been using a mobile phone, 12.50% of the mobile phone users in selected city answered as less than 1 year, 21.25% answered as 1-5 years, 43.75% of users answered as 6-10 years and 22.50% of them answered as more than 10 years.

SECTION-II:- General assessments of Knowledge

For the assessment purpose total score of knowledge regarding e-waste management among mobile phone users in selected city was divided in to three groups like poor knowledge (0-10 score), average (11-20 score) and good knowledge (21-30 score).

Pre Test: At the time of pre test, assessment of the knowledge regarding e-waste management among mobile phone users in selected city, 36.25% of them had poor knowledge, 57.50% had average knowledge and 6.25% of them had good knowledge. Average knowledge score at the time of pre test was 12.53 with standard deviation of 4.60. The minimum score of knowledge was 4 with maximum score of 24.

Post Test: At the time of post test, assessment of the knowledge regarding e-waste management among mobile phone users in selected city, no one of them had poor knowledge, 67.50% had average knowledge and 32.50% of them had good knowledge.

Average knowledge score at the time of post test was 19.02 with standard deviation of 3.61. The minimum score of knowledge was 11 with maximum score of 28.

Table 1: General assessments of Knowledge- PRE& POST test

Variable	Groups	Score	Pre Test		Post Test	
			Frequency	Percentage	Frequency	Percentage
Knowledge	Poor	0-10	29	36.25	0	0.00
	Average	11-20.	46	57.50	54	67.50
	Good	21-30	5	6.25	26	32.50
Knowledge	Minimum		4		11	
	Maximum		24		28	
	Average (SD)		12.53 (4.60)		19.02 (3.61)	

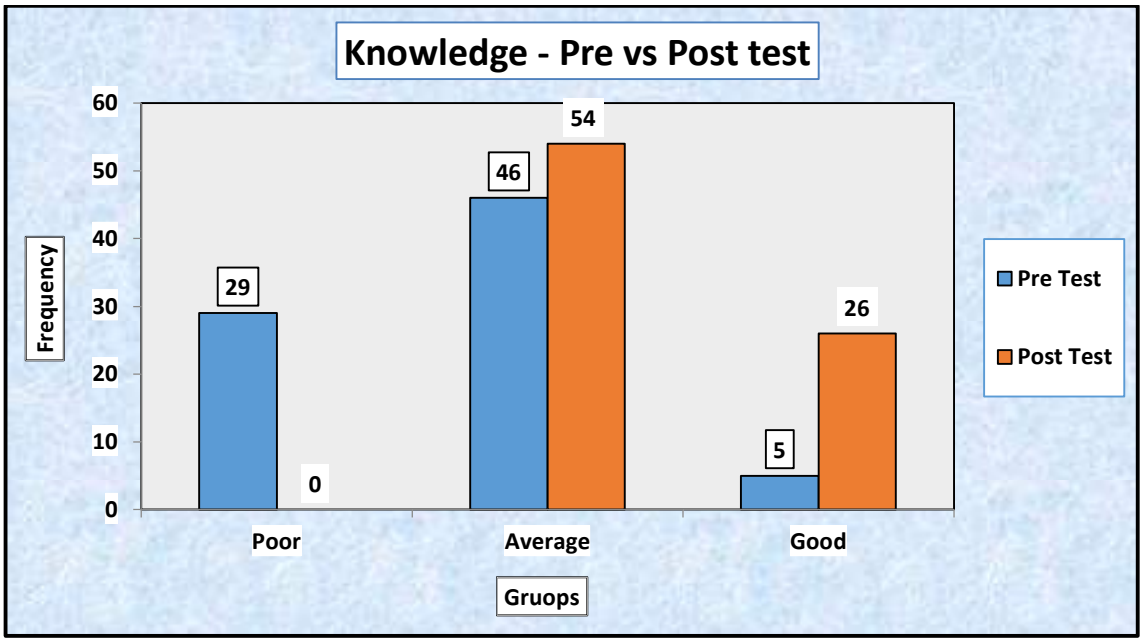

Figure No-1: General assessments of Knowledge - PRE & POST test

SECTION III:- Deals with analysis of data related to the effectiveness of self-instructional module on knowledge regarding e-waste management among mobile phone users in selected city.

Table 2: Comparison of the pre and post test Knowledge (paired t-test)

Group	Frequency	Mean	S.D.	t value	P value
Pre Test	80	12.53	4.60	29.48	0.000
Post Test	80	19.02	3.61		

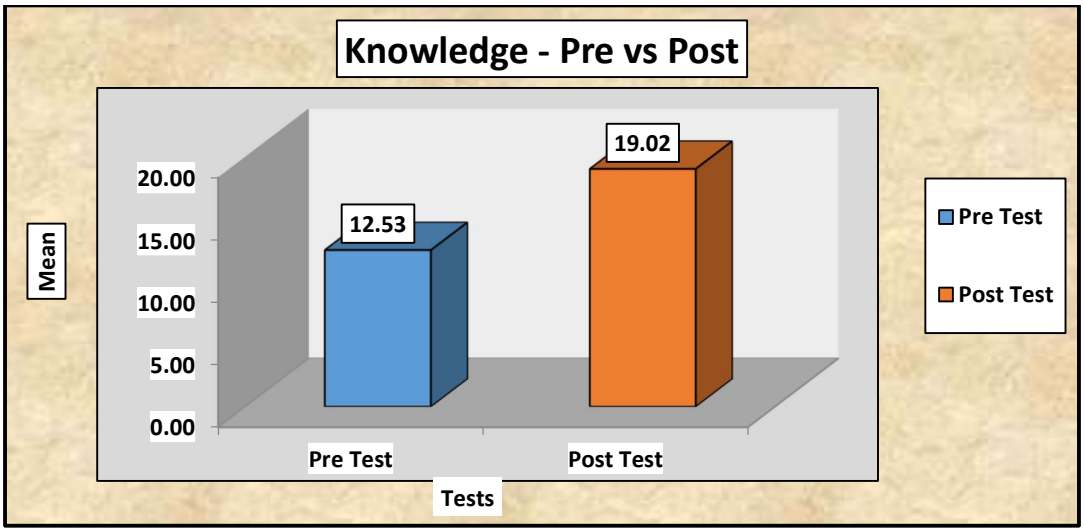

Figure 2: Comparison of the average pre and post test Knowledge.

SECTION IV:- Deals with analysis of data related to the association between pre test knowledge regarding e-waste management among mobile phone users in selected city with selected demographic variables.

Table 3: Association of Knowledge with demographic variables Pre Test.

Variable	Groups	Knowledge - PRE		Chi Square	d.f.	p value	Significance
		below Md	above Md				
Age (in years)	under 18	9	0	9.96	3	**0.019**	**Significant**
	18-44	22	24				
	45-54	11	6				
	55 & above	3	5				
Gender	Male	29	16	1.14	1	0.28	Not Significant
	Female	19	19				
	Other	0	0				
Educational Level	High School or less	23	3	19.68	3	**0.000**	**Significant**
	Some College / Technical Training	5	10				
	Bachelor's Degree	16	16				
	Master's Degree or higher	1	6				
Occupation	Farming	13	1	15.83	4	**0.003**	**Significant**
	Business	6	7				
	Health Care Person	8	9				
	Student	9	2				
	Other	9	16				
Income	Less than 25000	24	5	15.43	3	**0.001**	**Significant**
	25000-50000	12	11				
	50000-100000	5	13				
	More than 100000	4	6				
Employment Status	Employed full time	26	29	6.54	3	0.088	Not Significant
	Employed Part time	6	2				
	Seeking opportunity	10	2				
	Retired	3	2				
Which Languages do you prefer?	English	5	10	4.05	2	0.13	Not Significant
	Hindi	6	3				
	Marathi	34	22				
	Other	0	0				
How long have you been using a	Less than 1 year	9	1	11.23	3	**0.011**	**Significant**
	1-5 years	13	4				
	6-10 years	16	19				
	More than 10 years	7	11				

MOBILE PHONE?							

MAJOR FINDINGS OF THE STUDY

SECTION –I:- DEMOGRAPHIC VARIABLES

1. According to age of the mobile phone users in selected city, 11.25% of them were from age under 18 years, 57.50% them from the 18-44 years of age and 21.25% from the age group 45-54 years and 10% of users were of age 55& above.
2. In the study, according to gender of the mobile phone users in selected city, 52.50% of them were males and 47.50% of them were females.
3. According to educational level of the mobile phone users in selected city, 32.50% of them educated up to high school or less, 18.75% educated up to some college/technical training, 40% of them had completed bachelor's degree and 8.75% had completed master's degree or higher.
4. According to occupation of the mobile phone users in selected city, 17.50% of them were doing farming, 16.25% had own business, 21.25% users were health care person, 13.75% of them were students and 31.25% from the other category.
5. According to Income level of the mobile phone users in selected city, 36.25% of them had Income Less than 25000 Rs, 28.75% users had Income Rs 25000-50000, 22.50% had Income Rs 50000-100000 and 12.50% mobile users had income more than Rs 100000.
6. According to employment status of the mobile phone users in selected city, 68.75% of them employed full time, 10% of users employed part time, 15% of them seeking opportunity and 6.25% of the users were from retired group.
7. According to the question which languages do you prefer, 18.75% of the mobile phone users prefer English Language, 11.25% users prefer Hindi Language, 70% of users prefer Marathi Language and no one of them prefer other Language.
8. According to the question how long have you been using a mobile phone, 12.50% of the mobile phone users in selected city answered as less than 1 year, 21.25% answered as 1-5 years, 43.75% of users answered as 6-10 years and 22.50% of them answered as more than 10 years.

SECTION-II: General assessments of Knowledge

Pre Test:

At the time of pre test, assessment of the knowledge regarding e-waste management among mobile phone users in selected city, 36.25% of them had poor knowledge, 57.50% had average knowledge and 6.25% of them had good knowledge.

Average knowledge score at the time of pre test was 12.53 with standard deviation of 4.60. The minimum score of knowledge was 4 with maximum score of 24.

Post Test:

At the time of post test, assessment of the knowledge regarding e-waste management among mobile phone users in selected city, no one of them had poor knowledge, 67.50% had average knowledge and 32.50% of them had good knowledge.

Average knowledge score at the time of post test was 19.02 with standard deviation of 3.61. The minimum score of knowledge was 11 with maximum score of 28.

SECTION-III: Comparison of the pre and post test Knowledge

The comparisons of pre test and post test means of knowledge regarding e-waste management among mobile phone users in selected city were done by the paired t test.

The test was conducted at 5% level of significance.

The pre test average score was 12.53 with standard deviation of 4.60. The post test average score was 19.02

with standard deviation of 3.61.
The test statistics value of the paired t test was 29.48 with p value 0.00.
The p value less than 0.05, hence reject the null hypothesis. That means there is significant difference in pre and post test knowledge.

Shows that, self-instructional module on knowledge regarding e-waste management among mobile phone users in selected city was effective.

SECTION IV:- ASSOCIATION OF KNOWLEDGE SCORE IN RELATION TO DEMOGRAPHIC VARIABLES - PRE TEST

The chi square test was used to see the association between pre-test knowledge scores regarding e-waste management with selected demographic variables of mobile phone users in selected city.
The test was conducted at 5% level of significance.

Significant Association: For the demographic variables, age, educational level, occupation, income and how long they are using mobile phone, p value of the association test with pre test knowledge was less than 0.05. That means, knowledge of mobile phone users regarding e-waste management was associated with these demographic variables.
Concludes that, there was significant association of these demographic variables with the pre test knowledge.

No Significant Association: For the demographic variables, gender, employment status and language they prefer, the p value of association test with pre test knowledge was more than 0.05. That means, knowledge of mobile phone users regarding e-waste management was not associated with these demographic variables.

Concludes that, there was no significant association of these demographic variables with the pre test knowledge.

DISCUSSION

SECTION –I: DESCRIPTION OF SUBECTS WITH REGARDS TO DEMOGRAPHIC VARIABLES

The following are the major findings of the study:

- Majority (57.50%) of the mobile phone users were in age group 18-44.
- Majority (52.50%) of the mobile phone users were males.
- Majority (40%) of the mobile phone users had completed bachelor's degree.
- Majority (31.25%) of the mobile phone users were from the other category.
- Majority (36.25%) of the mobile phone users had Income Less than 25000 Rs.
- Majority (68.75%) of the mobile phone users were from employed full time.
- Majority (70%) of the mobile phone users prefer Marathi Language.
- Majority (43.75%) of the mobile phone users using a mobile phone from 6-10 years.

SECTION –II: GENERAL ASSESSMENTS OF KNOWLEDGE SCORE OF MOBILE PHONE USERS REGARDING E-WASTE.

In present study, The pre-test score revealed that 6.25% had good knowledge of e-waste management. After completing the self-instructional module in the post-test, 32.50% demonstrating good knowledge.
A similar study was conducted by Afsana Mim, "Evaluating the level of knowledge and awareness regarding e-waste among University students" In this study more than half of the respondents were familiar with the concept of e-waste. This is actually good that the students awareness about e -waste is not much low.32% respondents had partial knowledge regarding e-waste and 13% of students didn't have any idea about e-waste.

SECTION-III: EFFECTIVENESS OF SELF-INSTRUCTIONAL MODULE.

In the present study, The test was conducted at 5% level of significance. The pre test average score was 12.53 with standard deviation of 4.60. The post test average score was 19.02 with standard deviation of 3.61. The test statistics value of the paired t test was 29.48 with p value 0.00. The p value less than 0.05, hence reject the null hypothesis. That means there is significant difference in pre and post test knowledge. It Shows that, Self-instructional module on knowledge regarding e-waste management among mobile phone users in selected city was effective.

A similar study was conducted by Ravi Kumar M "Effectiveness of Self-Instructional Module on Knowledge and Attitude Regarding E-Waste Management among Workers of selected Electronic Repair Shops." The pre test mean knowledge score of the electronic repair shop workers regarding e-waste management was found to be 13.1 whereas the mean post-test knowledge score was 21.1. The pre test mean attitude score of the electronic repair shop workers regarding e-waste management was found to be 5.14 whereas the mean post-test attitude score was 8.52 indicating that the self instructional module was effective.

SECTION IV : ASSOCIATION OF KNOWLEDGE SCORE IN RELATION TO DEMOGRAPHIC VARIABLES - PRE TEST.

In present study, The chi square test was used to see the association between pre-test knowledge scores regarding e-waste management with selected demographic variables of mobile phone users in selected city. There was Significant association between demographic variables such as age, educational level, occupation, income and how long they are using mobile phone and the Pre test knowledge. There was No Significant association between demographic variables such as gender, employment status and language they prefer and the Pre test knowledge.

A similar study was conducted by Noor Fatin Izatie Tukiman," A Study of E-Waste Disposal Management Awareness among Local Community based on KAP Model." The findings of this study reveal that there is a strong and positive link between individual knowledge and attitude toward e-waste disposal and management among Local Community. There is significant and high relationship between knowledge about e-waste and practice on e-waste management, plus with positive correlation ($r=0.686$, $p<0.01$). Therefore, the individual with higher knowledge about e-waste have greater practice on e-waste management as well. Thus, H1 is accepted. There is significant and high relationship between attitude towards e-waste and practice on e-waste management, plus with positive correlation ($r=0.609$, $p<0.01$). Therefore, the individual with higher attitude towards e-waste have greater practice on e-waste management as well. Hence, H2 is accepted.

LIMITATIONS

- This study was limited to selected city.
- This study was limited to mobile phone users.
- This study was limited to 80 sample size.
- The study was limited to those who are willing or able to allocate time for self-instructional activities.
- The study may be limited to participants who have not already received formal education or training in e-waste management.

IMPLICATIONS OF THE STUDY

Nursing Practice

- Nurses can utilize the self-instructional module to educate patients on proper e-waste disposal methods, promoting environmental responsibility and public health.
- Nurses can extend e-waste management education beyond clinical settings, engaging with community groups to raise awareness and facilitate sustainable behaviours.
- Nurses can advocate for environmentally conscious policies and practices within healthcare organizations by integrating e-waste management into nursing practice.
- Nurses can collaborate with environmental organizations and local authorities to address e-waste

management challenges, fostering interdisciplinary approaches to environmental health promotion.

- Nurses can educate patients and communities on the potential health hazards of e-waste exposure during environmental disasters, promoting preparedness and resilience.

Nursing Education

- Nursing educators can integrate e-waste management education into nursing curriculum, ensuring that students are equipped with the knowledge and skills to address environmental health challenges.
- Offering continuing education opportunities on e-waste management can enable practicing nurses to stay updated on emerging environmental health topics and best practices.
- Utilizing simulation scenarios related to e-waste management can provide students with realistic learning experiences and prepare them to address environmental health challenges in clinical practice.
- Nursing students can engage in research projects focused on e-waste management, contributing to the evidence base and promoting innovation in environmental health education.

Nursing Administration

- Nursing administrators can develop policies and protocols for e-waste disposal within healthcare facilities, ensuring compliance with environmental regulations and promoting sustainability.
- Providing training and educational resources on e-waste management to healthcare staff can enhance awareness and promote responsible disposal practices.
- Conducting environmental audits within healthcare facilities can identify areas for improvement in e-waste management practices and inform targeted interventions.
- Allocating resources for e-waste recycling infrastructure and equipment can facilitate proper disposal and minimize environmental impact within healthcare organizations.
- Nursing administrators can collaborate with environmental organizations, waste management agencies, and technology manufacturers to develop comprehensive e-waste management strategies.
- Implementing quality improvement initiatives focused on e-waste management can promote continuous evaluation and refinement of disposal practices within healthcare settings.

Nursing Research

- Conducting longitudinal studies can assess the long-term effectiveness of e-waste management education interventions on behaviour change and environmental outcomes.
- Nursing researchers can develop and evaluate innovative educational interventions for e-waste management, exploring diverse delivery methods and educational approaches.
- Engaging with community partners in research endeavors can foster collaborative approaches to addressing e-waste management challenges and promoting sustainable behaviors.
- Investigating the health implications of e-waste exposure can provide valuable insights into the public health impacts of improper disposal practices and inform preventive measures.
- Exploring the use of technology, such as mobile applications or online platforms, in delivering e-waste management education interventions can enhance accessibility and engagement among diverse populations.
- Nursing researchers can conduct policy analyses to evaluate the effectiveness of e-waste regulations and advocate for evidence-based policy changes to improve environmental health outcomes.

CONCLUSION

The study conducted to assess the effectiveness of a self-instructional module on knowledge regarding e-waste management among mobile phone users in the selected city has yielded promising results. Through the implementation of the module, there has been a significant enhancement in the knowledge levels of the participants regarding the proper management of e-waste generated from mobile phones.

The findings suggest that self-instructional modules can be an effective educational tool in increasing awareness and understanding of e-waste management practices among mobile phone users. This is particularly crucial in the current digital age where electronic devices, including mobile phones, are ubiquitous and contribute significantly to the growing e-waste problem.

Furthermore, the positive outcomes of this study underscore the importance of targeted educational interventions tailored to specific user groups, such as mobile phone users, to promote responsible e-waste

disposal practices and minimize environmental impacts.

Moving forward, continued efforts in developing and implementing educational initiatives, including self-instructional modules, are essential to empower individuals with the knowledge and skills necessary for sustainable e-waste management. By fostering a culture of environmental stewardship and responsible consumption, we can work towards mitigating the adverse effects of e-waste on both human health and the environment.

RECOMMENDATIONS

- A similar studies can be conducted in other urban cities or metropolitan areas with high mobile phone usage rates to assess the transferability of findings across different urban contexts.
- A similar studies can be conducted to collaborate with schools, colleges, and universities to assess the effectiveness of e-waste management education initiatives among students, faculty, and staff.
- A similar studies can be conducted to Explore the effectiveness of self-instructional modules in workplace environments, particularly among employees who frequently use mobile phones for work-related tasks.
- A similar studies can be conducted to develop and deploy self-instructional modules through online platforms or mobile applications to reach a broader audience of mobile phone users and assess their effectiveness in digital learning environments.
- A similar studies can be conducted in different countries or regions to compare cultural differences in e-waste management knowledge and evaluate the effectiveness of self-instructional modules in diverse cultural contexts.
- By conducting similar studies in future along with these diverse settings, researchers can gain a comprehensive understanding of e-waste management challenges and develop tailored interventions to address them effectively.

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