Education on Green Computing Awareness at SMK Free Methodist Medan

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Abstract

Green computing education was conducted at SMK Free Methodist Medan on March 25, 2024, to improve students' understanding of environmentally friendly information technology practices. The main issue identified was the low awareness of energy consumption in ICT devices, electronic waste management, and efficient computing behavior. The purpose of this study is to evaluate the effectiveness of the education program using lectures, demonstrations, and interactive discussions. The research method used is descriptive, with data collected through observation and questionnaires. The results show a 67% improvement in student understanding after the program. The activity had a positive impact on initial behavioral changes among students in adopting more energy-efficient ICT usage. These findings highlight the importance of implementing green computing education in vocational schools as a foundation for environmentally aware digital behavior.

Keywords: *green computing; ICT education; energy efficiency; digital literacy; vocational school.*

I. INTRODUCTION

The increasingly rapid development of information technology has had a significant impact on human life. On the one hand, technology provides various benefits such as easier access to information, accelerated work processes, and improved educational quality. However, on the other hand, uncontrolled use of technology can have negative impacts, particularly related to increased energy consumption and the generation of electronic waste (e-waste), which continues to grow annually. According to the Global E-Waste Monitor 2023 report, the global volume of electronic waste reached over 62 billion tons, with only around 22% being recycled. This situation is a serious concern, especially in the education sector, where computer devices are a primary requirement for learning.

In vocational high schools (SMK), particularly in majors related to information technology, the use of devices such as computers, laptops, printers, and networking devices is very high. However, preliminary observations by researchers indicate that most students do not yet understand the concept of green computing, which is the effort to minimize the negative impact of technology on the environment through the use of efficient devices, energy conservation, and proper management of electronic waste. This creates a gap between the widespread use of technology and students' knowledge of how to manage technology responsibly.

Previous research has shown that green computing education has a significant impact on changing technology user behavior. According to Putri and Hasan (2022), systematically delivered education can increase students' awareness of energy-efficient technology practices by up to 55%. Meanwhile, Ardiansyah (2021) emphasized that technical demonstration-based education is far more effective in fostering student understanding than lecture-only methods.

In this context, implementing green computing education at the Free Methodist Vocational School in Medan is crucial. In addition to their high device usage, vocational school students, as potential technology workers, are a strategic group for implementing green technology principles in the future. This research also contributes to filling the research gap regarding the implementation of green computing education in vocational schools, particularly in Indonesia.

The purpose of this study was to analyze the effectiveness of the educational activities, measure improvements in student understanding, and evaluate initial changes in student behavior related to energy conservation and information technology device management after the activities.

II. RESEARCH METHODOLOGY

The research used a quantitative descriptive method with a counseling-based educational approach. The activity was conducted on March 25, 2024, with the following stages:

A. Activity Design

Material delivery through presentations.
Demonstration of power management on computers and laptops. Simulation of electronic waste management.
Q&A discussion.

B. Research Participants

35 tenth and eleventh-grade students majoring in Computer and Network Engineering.

C. Data Collection Techniques

Observation of student activities before and after the education.A Likert-scale questionnaire to measure improvements in understanding.
Photo documentation of the activity.

D. Analysis Techniques

The analysis was conducted descriptively by calculating changes in students' understanding scores between the pre-test and post-test using a simple percentage increase formula.

III. RESULTS AND DISCUSSION

A. Pre-test and Post-test Results

Before the education, the average student's understanding of green computing was only 32%. After the education, the level of understanding increased to 87%. This represents an increase of:

Increase = 87 − 32 × 100% = 67%
Increase = 32

87 – 32 × 100% = 67%

This increase demonstrates the effectiveness of the interactive education method used.

B. Student Responses

Based on the questionnaire:
82% of students found the material easy to understand.
75% of students committed to reducing the energy consumption of their devices.
68% of students understood the dangers of e-waste.

C. Discussion

These findings align with research by Putri & Hasan (2022), which showed an increase in environmentally friendly digital literacy among vocational high school students after education. Furthermore, live demonstrations have been shown to increase students' interest in energy-efficient behavior.

A contributing factor to the activity's success was the delivery of material relevant to students' daily lives, particularly the use of computers in the laboratory. Meanwhile, a limiting factor was time constraints, preventing all practical exercises from being conducted in-depth..

IV. CONCLUSION

Based on the entire series of green computing educational activities that were carried out on March 25, 2024 at the Free Methodist Vocational School Medan, it can be concluded that this educational program has a very significant influence not only on increasing students' conceptual understanding of the basic principles of using efficient, energy-saving, and environmentally friendly information technology, but also on the formation of critical thinking patterns and their ecological awareness in facing the challenges of the development of modern digital technology, which increasingly demands the intensive use of electronic devices, where this increase in understanding is reflected through the results of the pre-test and post-test evaluations which show a spike in knowledge of 67%; In addition, this activity also triggers changes in students' initial behavior, which is characterized by the emergence of new habits such as turning off devices when not in use, activating power saving mode on computers and laptops, avoiding excessive use of electrical devices, and starting to understand the importance of recycling and proper management of electronic waste to reduce long-term environmental impacts, so that overall it can be emphasized that green computing education is not only effective as a means of transferring technical knowledge, but also plays a very important role in building students' character to become a generation that has ecological responsibility, is able to make decisions about using technology more wisely, and is ready to face future technological developments that require a balance between digital needs and environmental conservation, and thus this activity is recommended to be implemented sustainably, expanded in scope, and integrated into the school curriculum so that its impact can be increasingly optimal and provide a real contribution to the creation of a sustainable technology culture in the educational environment.

V. RECOMMENDATIONS

Based on the results of research and implementation of green computing education activities at SMK Free Methodist Medan, it is recommended that schools, teachers, and other educational stakeholders develop structured, sustainable, and more comprehensive follow-up programs by adding intensive practice sessions on efficient management of information technology devices, expanding material on the long-term impact of electronic waste on the global environment, providing laboratory facilities that support the implementation of environmentally friendly concepts such as the use of energy-saving devices and automatic power management systems, strengthening the integration of green computing materials into the ICT learning curriculum so that students not only understand the basic concepts but are also able to apply them in real situations, conducting periodic evaluations to monitor changes

in student behavior towards the use of energy and digital devices, establishing partnerships with environmental agencies or e-waste recycling institutions to provide students with a deeper understanding of the correct electronic waste management process, and encouraging further research that focuses on the long-term influence of green computing education on technology usage patterns among students so that efforts to increase environmental awareness can be carried out effectively, measurably, and produce a real impact on the creation of a sustainable technology culture in the educational environment and the wider community.

VI. REFERENCES

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