APPLICATION OF GREEN TECHNOLOGY IN IMPROVING THE LEARNING EFFECTIVENESS OF EDUCATIONAL INSTITUTIONS IN BINJAI CITY

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Abstract: The application of green technology in educational institutions not only contributes to environmental conservation efforts, but can also increase the effectiveness of learning. This type of research is descriptive qualitative research, namely the data collected is in the form of words, images, not numbers. The primary data source in this research is the principal of elementary schools in Binjai City. Meanwhile, secondary data sources in this research were obtained through books, articles/journals, and documentation. The results of this research are The success of implementing green technology in increasing learning effectiveness also depends on how educational institutions manage existing challenges, such as implementation costs, infrastructure readiness, and educator training. By creating a healthier, more efficient and future-oriented learning environment, green technology not only helps educational institutions in preserving the environment, but also plays an important role in forming a generation that is ready to face global challenges in the future.

INTRODUCTION

Green technology, which is also known as environmentally friendly technology, is an effort to apply technological innovation that aims to reduce negative impacts on the environment. In recent years, green technology has become a major focus in various sectors, including the education sector. The application of green technology in educational institutions not only contributes to environmental conservation efforts, but can also increase the effectiveness of learning. Information and communication technology has been applied in the management of higher education institutions in various ways and shows that its application can have a positive impact. (Mesiono, 2023:2)

In the current digital era, educational institutions are required to make maximum use of technology to support a more effective, efficient and sustainable learning process. By integrating green technology, educational institutions can create a healthier and more conducive learning environment for students, while supporting global efforts to overcome

climate change and preserve the earth.

Furthermore (Handoko, 2024:20) explains that institutional effectiveness is the ability of an organization to achieve its stated goals by optimizing the use of its resources. The same thing was expressed by (Wijaya, 2016:184) that effectiveness is the extent to which a person's ability to achieve/realize the goals that have been set through correct and timely work processes as targeted.

According to Suryosubroto in (Ananda, 2019:6) explains that learning is a series of events that are planned to be delivered, to activate and encourage student learning which is the process of assembling a learning situation (which consists of a classroom, students and curriculum material) so that learning is easier. Furthermore
(Rafida, 2023:172) explains that innovative and interesting learning approaches are an effort to help improve the educational process by using varied learning.

As well as (Hadijaya, 2024:364) stated that in the teaching and learning process, teachers as teachers and students as learning subjects are required to have a certain qualification profile in terms of knowledge, abilities, attitudes and values as well as personal characteristics so that the process can take place effectively and efficiently. With the right approach, green technology has the potential to become an important tool in creating education that is more sustainable and responsive to the challenges of the times.

Based on preliminary observations, not all basic education institutions in Binjai City have adequate access to green technology, such as energy-saving devices, environmentally friendly infrastructure, or access to efficient e-learning platforms. This inequality in access can lead to differences in the quality of learning between institutions, which ultimately impacts the overall effectiveness of learning. Then there are the high costs of adopting green technology, including initial costs for installing energy-saving infrastructure or devices. Budget constraints can hinder the widespread adoption of green technologies, especially in educational institutions that lack resources. This can limit the potential for increasing learning effectiveness.

Furthermore, there is a lack of awareness and understanding among educators about the importance of green technology and how to integrate it in learning. Educators who lack understanding of green technology concepts may not be able to take full advantage of the potential they offer, which may reduce the positive impact on learning effectiveness. Apart from that, there is resistance from educators, students or

administrators of educational institutions towards the changes needed to implement green technology. Refusal or unwillingness to adapt to new technology can hinder the learning process and reduce the effectiveness of the implemented program.

Lack of supporting infrastructure, such as a stable internet network, appropriate software, or environmentally friendly physical facilities. Without adequate infrastructure, efforts to implement green technology may not be optimal, which in turn can affect the effectiveness of learning. There is no clear and structured mechanism for evaluating the impact of implementing green technology on learning effectiveness. Without adequate evaluation, it is difficult to measure how much green technology contributes to increasing learning effectiveness, so that necessary improvements or adjustments cannot be made.

Then there is limited training and professional development for educators regarding the use of green technology in teaching. Without adequate training, educators may struggle to integrate green technology into the curriculum, which can reduce learning effectiveness. Another similar thing was found to be uncertainty or changes in regulations related to the application of green technology in education. Policy uncertainty can cause inconsistencies in implementation, which can hinder efforts to increase learning effectiveness through green technology. Based on the presentation of the material above, researchers see that educational institutions in Binjai City need to increase the application of green technology to the learning effectiveness of educational institutions in Binjai City.

RESEARCH METHODS

This type of research is descriptive qualitative research, namely the data collected is in the form of words, images, not numbers. (Danim, 2002:51) According to Bogdan and Taylor, as quoted by Lexy J. Moleong, qualitative research is a research procedure that produces descriptive data in the form of written or spoken words from people and observed behavior. Meanwhile, descriptive research is a form of research aimed at describing or illustrating existing phenomena, both natural phenomena and human engineering. (Moleong, 2000:17) This research was used to determine the application of green technology in increasing the effectiveness of learning in educational institutions in Binjai City. The research location is precisely a basic education institution in Binjai City. According to Lofland and Lofland as quoted by Lexy. A. The primary data source in this research is the principal of elementary schools in Binjai City. Meanwhile, secondary data

sources in this research were obtained through books, articles/journals, and documentation.

RESULTS AND DISCUSSION

A. Green Technology Concept

Green Technology is a technological concept that focuses on the development and use of sustainable technology to reduce negative impacts on the natural environment. The main goal of green technology is to create and promote technology that is more environmentally friendly, as well as providing better and more efficient alternatives in the use of natural resources. (Sunarjono, Dimyati, & Absori, 2010).

Based on the theory above, it can be concluded that green technology is a concept and application of technology designed to minimize negative impacts on the environment and promote sustainability. The main goal of green technology is to reduce pollution, save natural resources, and support the use of more efficient and renewable energy.

Examples of green technology applications include renewable energy such as solar, wind and biomass power; environmentally friendly buildings that use energy efficient materials and designs; sustainable transportation such as electric vehicles; as well as organic farming practices that reduce the use of hazardous chemicals. Green technology also includes effective waste management through recycling and reusing materials to reduce the burden on the environment. By adopting green technology, society and industry can contribute to environmental conservation, reduce carbon footprints, and ensure the availability of resources for future generations.

Implementation of Green Technology not only provides benefits for the environment, but can also provide economic and social benefits. More environmentally friendly technology can reduce operational costs and improve the quality of life in the surrounding environment. Apart from that, Green Technology can also create new jobs and improve workforce qualifications in related industries (Handoko, 2020)

This concept seeks to create technology that is more environmentally friendly, efficient and can promote environmental sustainability. Green Technology offers a better alternative to conventional technology which tends to exacerbate environmental damage and provides an effective solution in overcoming climate change, natural resource shortages and environmental pollution. (Rahmawati, 2015). Some examples of green

technology applications include:

1. Renewable Energy: This technology utilizes renewable energy sources such as sun, wind, water and biomass to produce electricity that is environmentally friendly and can reduce greenhouse gas emissions.

2. Environmentally Friendly Transportation: This technology includes electric vehicles, hybrid vehicles, or the use of environmentally friendly alternative materials to reduce greenhouse gas emissions and air pollution.

3. Waste Processing: This technology includes the use of technology that can reduce the waste produced and recycle materials to reduce the amount of waste discharged into the environment.

4. Energy Efficient Building Design: This technology involves the use of more environmentally friendly building materials, such as recycled building materials or building materials that can reduce energy use for heating and air conditioning.

5. Energy Management System: This technology is used to control energy use in buildings or industries by managing energy use at the right time and reducing unnecessary energy consumption.

These examples show that green technology has many different applications in various fields and can help reduce negative impacts on the environment and create a more sustainable environment.

B. Goals and Benefits of Renewable Energy

Basically, the main purpose of creating alternative energy is to replace energy originating from fossil fuels. Therefore, alternative energy is starting to be developed by humans, either in community groups or groups in the form of companies. Some of the benefits of energy are as follows:

1. Using renewable energy is certainly more environmentally friendly because it can reduce air pollution and environmental damage due to exploration.

2. The costs or expenses incurred to produce energy tend to be cheaper because the energy source is available for free. Apart from that, the maintenance or upkeep costs required are also cheaper because the equipment used can be said to be quite simple.

3. Optimizing the use of renewable energy encourages an energy independent society, because there is no longer a need to depend on non-renewable energy supplies or

supplies which are still predominantly imported.

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4. It does not require special centralization of production because it can be produced anywhere. (Arifin, 2023:60)

C. Effectiveness of Learning on Green Technology

The effectiveness of learning in the context of implementing green technology in educational institutions can be measured from various aspects, including increasing students' understanding of the environment, changes in students' behavior towards environmental issues, as well as improving the quality of learning itself. Below are some points that explain how green technology can increase learning effectiveness:

1. Increased Environmental Awareness

    a. Contextual Learning: Green technology enables more contextual and relevant learning, especially regarding environmental issues. For example, through real projects such as renewable energy management or recycling programs, students can understand the impact of human activities on the environment directly.

    b. Project-Based Learning: Students involved in green technology projects, such as composting, school garden management, or energy audits, can experience more in-depth and applicable learning. This not only improves their understanding of environmental concepts but also their critical and creative skills.

2. Increase Student Engagement and Motivation

    a. Interactive and Practical Learning: Green technology often involves interactive tools and methods, such as the use of digital devices to access paperless learning materials or manage environmentally based projects. This can increase student engagement, as they see the real impact of what they are learning.

    b. Emotional Engagement: When students learn about green technology and sustainability, they often feel more emotionally connected to the subject matter, as these issues relate directly to their future. This can increase motivation to learn and be involved in school activities.

3. Skills Improvement

    a. Collaboration and Communication: Many green technology projects in schools require teamwork and effective communication. For example, students might

work together in teams to manage recycling projects or develop solutions to reduce the school's carbon footprint. This helps students develop important collaborative and communicative skills.

b. Problem Solving and Innovation: Green technology encourages students to think critically and creatively in finding solutions to environmental challenges. This helps them develop problem-solving and innovation skills, which are important in their future lives and careers.

4. More Efficient and Environmentally Friendly Learning

a. Less Resource Use: By reducing paper use and switching to digital learning platforms, schools can reduce costs and their environmental footprint, while providing easier access to learning materials for students.

b. Implementation of Energy Saving Technology: The use of energy efficient equipment not only supports environmental sustainability but also ensures that school resources are used efficiently, which can be reallocated to support other learning activities.

5. Positive Influence on the School Community

a. A More Sustainable School Culture: By implementing green technology, schools can establish a more environmentally conscious culture. This not only affects students but also staff, teachers, and parents, all of whom can contribute to sustainability goals.

b. Role Model for Society: Schools that implement green technology can be a positive example for the surrounding community, promoting sustainable practices beyond the school environment and contributing to wider change in society.

6. Evaluation and Continuous Development

a. Continuous Monitoring and Assessment: The effectiveness of learning through green technology can be enhanced by continuous monitoring and assessment. For example, schools can measure reductions in energy consumption or waste, as well as assess increased environmental awareness among students.

b. Flexibility and Adaptability: With green technology, schools can more easily adapt their learning methods based on student needs and the latest developments in technology and environmental practices.

Overall, the application of green technology not only increases the effectiveness of learning by making it more relevant and interesting for students, but also helps shape a generation that is more environmentally conscious and ready to face the global challenges of the future.

DISCUSSION

Implementing green technology in basic education institutions requires a well-planned strategy so that environmental sustainability goals can be achieved without sacrificing the quality of learning. Here are some strategies that can be implemented:

1. Education and Training for Teachers and Students
   a. Teacher Training: Provide training to teachers on the concepts and benefits of green technology, as well as how to integrate them into the curriculum and daily activities at school.
   b. Environmentally Based Learning: Integrate environmental and sustainability topics into a variety of subjects, such as science, mathematics, and social studies, to raise students' awareness from an early age.

2. Development of Environmentally Friendly Infrastructure
   a. Use of Renewable Energy: Install solar panels or wind turbines in schools to meet energy needs. This can be a source of hands-on learning for students about renewable energy.
   b. Green Building Design: If possible, design or renovate school buildings with green design principles, such as natural ventilation, natural lighting, and the use of environmentally friendly building materials.

3. Reducing Paper Use
   a. Digitization of Learning Materials: Switch to the use of tablets or computers for assignments and delivery of learning materials. Provide access to e-books, online modules and other digital learning platforms.
   b. Paperless Administration System: Digitalization of school administration processes, such as attendance reports, grades, and communication with parents, to reduce paper use.

4. Effective Waste Management
   a. Recycling Program at School: Start a recycling program at school by providing

separate bins for plastic, paper, and organic waste. Involve students in recycling activities to increase their awareness about the importance of waste management.

b. Compost from Organic Waste: Utilize organic waste from the canteen or school garden to make it into compost, which can then be used to fertilize the school garden.

5. Use of Energy Saving Technology

a. Installation of LED lights: Replace conventional lights with LED lights which are more energy efficient and long lasting. Installing motion sensors for lighting can also help save energy.

b. Energy Saving Devices: Choose electronic devices such as computers, projectors and air conditioners that have energy saving certification.

6. Sustainable Transportation Program

a. Bike and Walk to School Campaign: Encourage students to walk or bike to school. Schools can provide safe bicycle parking and run health and environmental campaigns to promote this habit.

b. Use of Environmentally Friendly Vehicles: If the school provides transportation, choose a school bus that uses environmentally friendly fuel or an electric vehicle.

7. Collaboration with Community and Government

a. Collaboration with Local Governments: Work with local governments to obtain support in the form of funding, regulations, or resources needed to implement green technology in schools.

b. Parent and Community Involvement: Involve parents and the surrounding community in school green initiatives, such as reforestation programs, creating school gardens, or recycling activities.

8. Monitoring and Evaluation

a. Periodic Reporting: Create a periodic reporting system to monitor energy use, waste management, and the effectiveness of other green technology programs. Carry out evaluations to continuously improve strategy and implementation.

b. Involving Students in Monitoring: Involve students in these monitoring and evaluation activities as part of their learning about the environment and sustainability.

9. Giving Awards and Recognition

a. Class or Student Awards: Reward classes or students who demonstrate a high commitment to environmentally friendly practices. This could be in the form of a competition between classes to reduce paper use or keep the school environment clean.

b. Recognition at the School Level: Schools can participate in regional or national environmental programs or competitions to gain recognition as a green school.

These strategies will help elementary schools create sustainable learning environments, while providing education that focuses on the importance of protecting the environment to the younger generation.

CONCLUSION

The success of implementing green technology in increasing learning effectiveness also depends on how educational institutions manage existing challenges, such as implementation costs, infrastructure readiness, and educator training. Institutions that are able to overcome these challenges are likely to see significant improvements in student learning outcomes and operational efficiency. Overall, green technology offers an innovative and sustainable approach to improving the effectiveness of learning in educational institutions. By creating a healthier, more efficient and future-oriented learning environment, green technology not only helps educational institutions in preserving the environment, but also plays an important role in forming a generation that is ready to face global challenges in the future. Implementing green technology is a strategic step that, if done correctly, can have far-reaching positive impacts on education and our planet.

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