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Integration of ESD, 21st Century Competencies, and Technology in Islamic Education for Environmental Awareness

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Abstract

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Education for Sustainable Development (ESD) plays a strategic role in shaping a generation that is environmentally conscious, critically thinking, and equipped with social-emotional competencies. This article explores the implementation of ESD within the context of Islamic education, emphasizing the integration of 21st-century competencies, the utilization of technology, and experience-based learning methods. Environmental awareness and pro-environmental behavior are expected to improve through a holistic and pluralistic approach, which emphasizes not only declarative knowledge but also procedural, social, and affective dimensions of learning. A qualitative method was employed to analyze both literature and pedagogical practices, assessing the effectiveness of ESD approaches in developing students' character, social-ecological skills, and global competencies. Findings indicate that integrating technology, hands-on learning, and environmental negotiation simulations significantly enhances students' critical thinking, collaborative abilities, and environmental consciousness. The study underscores the necessity of transforming Islamic education toward ESD to produce change agents capable of addressing global challenges sustainably.

1. Introduction

Global transformations, including environmental crises, economic fluctuations, and public health emergencies such as the COVID-19 pandemic, have underscored the urgent need for education systems to adapt swiftly and effectively. Traditional models of education, which primarily emphasize the accumulation of factual knowledge, are increasingly insufficient to equip learners with the skills necessary to navigate the complex and interconnected challenges of the 21st century. In this context, Islamic education, as a foundational pillar within many societies, must evolve to integrate a more comprehensive, holistic, and sustainability-oriented approach that prepares students to respond to contemporary global issues effectively.

The expansion of environmental awareness and the pursuit of sustainable development represent two interrelated concepts that are essential for safeguarding the future of our planet (Agbedahin, 2019). Environmental awareness encompasses an individual's understanding of, concern for, and proactive engagement with environmental issues, while sustainable development seeks to meet present human needs without compromising the capacity of future generations to fulfill their own needs, thereby ensuring long-term ecological balance and social well-being. Integrating 21st-century competencies into educational practice including critical thinking, collaborative problem-solving, and social-emotional skills is crucial for fostering well-rounded learners. These competencies equip students not only to excel academically but also to act as responsible, engaged, and socially aware citizens (Kramer et al., 2021). Within this framework, Education for Sustainable

Development (ESD) emerges as a transformative educational paradigm that cultivates pro-environmental behavior, global consciousness, and social-ecological competence. ESD extends beyond traditional declarative knowledge, encompassing procedural, social, and affective dimensions of learning. This ensures that students are not only informed but also empowered to take meaningful action in support of sustainability and to appreciate the intricate interconnections between human activity and natural systems.

A pluralistic pedagogical approach is central to ESD, emphasizing reflection, dialogue, collaboration, and collective action. Pluralism encourages learners to consider diverse perspectives when addressing complex issues, fostering empathy and mutual understanding. This aligns with the experiential "learning by doing" methodology, which encompasses fieldwork, collaborative research projects, and simulations of environmental negotiations (Jamison et al., 2022). Such experiential learning strategies render education more relevant and meaningful, bridging theoretical knowledge with real-world application, and simultaneously nurturing cognitive, affective, and social skills essential for holistic development.

The role of digital technology in supporting ESD within Islamic education is equally significant. The use of computers, mobile devices, and the internet provides expansive access to information, facilitates self-directed learning, and enables global interaction, thereby broadening students perspectives and intercultural competence. For technology to be effective, it must be employed within a clear framework grounded in humanistic and sustainability-oriented objectives. When implemented thoughtfully, digital tools do more than enhance academic achievement they

cultivate emotional intelligence, foster environmental stewardship, and reinforce social responsibility among learners (Yen, 2022).

Despite the growing recognition of ESD's value, implementing it in Islamic educational settings presents distinct challenges (Sahin, 2018). Overemphasis on declarative knowledge can impede behavioral transformation, limiting students' ability to internalize and apply sustainable principles. Consequently, the integration of procedural, social, and affective knowledge is critical for producing a generation capable of addressing environmental, social, and economic challenges in a holistic manner. The transformation of Islamic education through ESD is envisioned to nurture change agents who are not only globally aware and competent but also morally grounded and capable of operationalizing sustainable development principles in everyday life.

Against this backdrop, the present article aims to explore and critically analyze the application of ESD within Islamic education, emphasizing a holistic and pluralistic approach. It investigates how integrating 21st-century competencies, leveraging digital technology, and employing experience-based learning strategies can enhance environmental awareness, foster pro-environmental behaviors, and strengthen students' social-ecological competencies, thereby preparing them to contribute meaningfully to sustainable development initiatives in both local and global contexts.

2. Literature Review

2.1. Sustainable Concepts and Foundations of ESD

Education for Sustainable Development (ESD) is a modern educational paradigm that emphasizes the development of students' competencies to face various complex global challenges, including environmental, social, and economic issues. Mahel (2021) asserts that there are two fundamental principles underlying the implementation of ESD: holism and pluralism. The principle of holism emphasizes the importance of integrating content from various disciplines so that students gain a comprehensive and contextual understanding of sustainable development. With this approach, students do not just acquire partial knowledge, but are able to see the relationship between social, economic, and environmental systems as a whole.

On the other hand, the principle of pluralism emphasizes the importance of learning methods that are reflective, collaborative, and encourage students to take real action. This approach differs significantly from traditional education, which tends to emphasize the accumulation of declarative knowledge, because ESD integrates the dimensions of procedural, social, and affective knowledge. The emphasis on these three dimensions aims to foster pro-environmental behavior and global awareness, so that students not only understand the theory but are also able to apply it in a real context.

the implementation of ESD can increase students' environmental sensitivity, strengthen communication skills, and build more effective collaborative abilities. This shows that ESD not only supports the mastery of academic content but also shapes individuals who are able to think critically, work together, and make decisions

based on sustainability values. Thus, ESD provides a holistic and pluralistic educational framework to equip the younger generation to be ready to face future challenges competently, responsibly, and with environmental awareness.

2.2. Integration of Technology and Experience-Based Learning

The development of digital technology today has opened up various significant opportunities for Islamic education to adopt a more independent, flexible, and interactive learning model. The use of gadgets, computers, and the internet network allows students to access global information, interact with various cultures, and establish cross-country collaboration, which was previously difficult to do within the framework of traditional education. In the context of Education for Sustainable Development (ESD), the application of digital technology must be designed with clear goals, supporting humanistic and sustainability principles, and not harming the environment or society (Yulianto & Hartanto, 2020).

In addition, experience-based learning methods, such as "learning by doing," fieldwork, collaborative research, and environmental negotiation simulations, provide an opportunity for students to gain direct experience and be actively involved in real-world situations. These methods not only improve academic understanding but also develop 21st-century skills, including critical thinking, collaborative abilities, complex problem solving, and deep social and ecological awareness (Malik, 2018). The experience-based learning approach also fosters a sense of collective responsibility, empathy for others, and students' ability to apply the principles of sustainable development in the context of real life.

The literature shows that the integration of ESD in Islamic education through holistic, pluralistic, and experience-based approaches, supported by digital technology, can provide significant transformation. Not only does this approach increase students' knowledge, but it also shapes pro-environmental behavior, relevant social-ecological skills, and higher global awareness, thereby creating a competent, responsible, and positive generation that contributes to sustainable development in the future.

3. Methods

This research uses a qualitative approach based on a literature review to analyze the implementation of Education for Sustainable Development (ESD) in the context of Islamic education. This approach was chosen because it allows researchers to collect, evaluate, and integrate various relevant empirical and theoretical findings from scientific literature, international organization reports, and recent journal articles that discuss sustainability issues, pedagogy, and educational technology. With the literature review method, the research can build a strong conceptual framework, understand the development trends of sustainable education, and identify the best practices that have been applied in various educational contexts, especially Islamic education.

The data collection process was carried out by searching for scientific sources from academic databases, Google Scholar, and institutional journal portals like ResearchGate, using relevant keywords such as "Education for Sustainable Development," "Islamic Education," "pedagogical holism and pluralism," "21st-

century competencies," "digital technology in education," and "experience-based learning." Furthermore, the literature obtained was critically evaluated based on its relevance, source credibility, research methodology, and its contribution to the understanding of ESD in Islamic education. Data analysis was conducted through a narrative synthesis, which organized the literature findings into main themes related to the research objectives. These themes included the principles of ESD, the integration of 21st-century competencies, the use of digital technology, experience-based learning methods, and the transformation of student behavior. In this way, the research was able to highlight the relationship between theory and practice, identify challenges and opportunities, and provide recommendations for the effective implementation of ESD in the context of Islamic education.

This qualitative approach based on a literature review also allows researchers to emphasize critical reflection and interpretation of the existing literature, not just collecting facts, thus providing a more holistic and in-depth understanding of how ESD can be applied conceptually and practically. Thus, this method provides a comprehensive theoretical foundation to support the development of sustainable Islamic education that is relevant to global demands and technological developments.

4. Results and Discussion

The application of Education for Sustainable Development (ESD) in the context of Islamic education has shown a significant impact on students' perspectives, learning methods, and the use of technology in the educational process.

Based on the literature review, ESD emphasizes the holistic development of students' competencies, which not only focuses on the mastery of declarative knowledge but also emphasizes the mastery of procedural, social, and affective skills that are relevant in facing the challenges of sustainable development. This approach becomes very relevant, especially when global society faces various crises, such as climate change, pandemics, and economic pressures, which demand an adaptive, creative, and innovative response from individuals and educational institutions.

A number of previous studies show that the application of ESD which emphasizes sustainability values can increase students' environmental awareness and global perspective. For example, Kimanen and Innanen (2020) observed that students who participated in a cross-cultural competency-based ESD program experienced an increase in self-reflection abilities, open-mindedness, and sensitivity to the surrounding community and environment. These findings are in line with the principle of ESD which emphasizes pluralism in pedagogy, where students are encouraged to think critically, collaborate, and take real action in diverse contexts. In Islamic education, these principles can be synergized with spiritual and moral values, so that learning not only shapes intellectual intelligence but also students' character, ethics, and social-ecological competencies.

In addition, the role of digital technology is an important element in supporting ESD implementation. The use of the internet, computers, and gadgets as learning media allows students to access global information, conduct cross-cultural collaboration, and develop learning independence. The research by Yulianto and Hartanto (2020) shows that digital technology can be an effective tool to

stimulate 21st-century skills, such as critical thinking, empathy, and problem-solving abilities, as long as its use is done with a clear vision, purpose, and planning. Thus, technology is not just a tool for transferring information, but plays a role as an interactive medium that encourages the development of students' social, emotional, and ecological awareness.

Experience-based learning methods have also proven to be an effective strategy in shaping student competencies. The "learning by doing" approach, fieldwork, collaborative research, and environmental negotiation simulations, as observed by Tinkler et al. (2019), allow students to connect theory with real practice. These activities provide a relevant context for understanding the complexity of environmental and social problems, and equip students with systems thinking, anticipatory, strategic, and collaborative skills. This experience-based approach emphasizes collective responsibility, so that students learn to appreciate the importance of cooperation, building communities, and understanding their role in realizing sustainability in a real way.

The results of ESD implementation in Islamic education confirm that competency development does not stop at the mastery of knowledge alone (Almazroa, 2022). Learning is directed to shape individuals who are able to make critical decisions, be proactive, and internalize sustainability values in daily life. Competencies such as self-awareness, integrated problem-solving abilities, and normative competencies are an important part of ESD-based education. Mahel (2021) emphasizes that these competencies allow students to evaluate the consequences of their actions, understand the norms and values underlying

decisions, and be able to adapt to complex, ambiguous, and uncertain situations. In the context of Islamic education, this means that students not only understand religious teachings textually but are also able to apply them contextually in social, environmental, and economic life.

Furthermore, ESD encourages students to develop a broader capacity for critical thinking and autonomous action, known as "ESD2" (Hjorth Warlenius, 2022). This approach aims to build the ability to think and act critically in facing real problems, different from "ESD1" which is more normative and focuses on the application of certain behaviors. The implementation of ESD2 in Islamic education provides an opportunity for students to become change agents, who are able to manage systemic, ambiguous, and dynamic problems, and play an active role in the transition to sustainable development in various sectors. This is in line with the vision of modern education which emphasizes the integration between religious knowledge, science, and practical skills to shape individuals who are adaptive, constructive, and socially and ecologically responsible.

In addition, the literature shows that experience-based learning and active interaction increase students' abilities in collaboration, negotiation, and critical reflection. Collaborative competence allows students to understand the perspectives of others, build empathy, and resolve conflicts in a participatory manner (Konrad et al., 2020). Systems thinking and anticipatory competencies enable students to analyze the complex relationship between humans, the environment, and economic systems, and project the impact of their actions on the future. Normative and strategic competencies emphasize the importance of determining values, principles, and

innovative strategies that encourage sustainability, both at the local and global levels. The integration of all these competencies creates a holistic framework that prepares students to face the complex challenges of sustainable development in a real and effective way (Huang et al., 2020).

However, the literature also highlights several challenges in the implementation of ESD in Islamic education. The focus of traditional education that is too strong on declarative knowledge often hinders the formation of pro-environmental behavior and the development of social-ecological competencies. Procedural, social, and affective knowledge is still often neglected, so that long-term behavioral transformation becomes limited. Therefore, a paradigm shift is needed in Islamic education, from merely transferring knowledge to developing competencies and shaping character through a holistic, pluralistic approach, as well as strengthening experience-based learning and optimal use of digital technology (Guhin, 2020).

The results of the analysis show that the application of ESD encourages the integration of Islamic values with 21st-century skills and environmental awareness. Students who are used to interacting with real contexts, working collaboratively, and using technology productively show an increase in adaptive abilities, creativity, and active participation in society. This is in line with the concept of education that emphasizes the development of independent, responsible individuals who are able to face complex problems through an interdisciplinary and holistic approach.

This discussion confirms that the integration of ESD in Islamic education provides a double benefit. First, it increases students' environmental awareness,

social-ecological skills, and critical thinking capacity. Second, it allows students to apply Islamic values contextually in dynamic social and environmental situations. The synergy between digital technology, experience-based learning, and pluralistic pedagogy results in education that is relevant to current global challenges. The implementation of ESD not only strengthens individual capacity but also shapes a learning community that is responsive to sustainability issues, encourages collaboration, and produces real actions that support sustainable development. Thus, ESD-based Islamic education is able to equip students with the essential knowledge, skills, and attitudes to support sustainable development and prepare a future generation that is competent, adaptive, and responsible toward society and the environment.

5. Conclusion

The application of Education for Sustainable Development (ESD) in Islamic education shows that the integration of sustainability values, 21st-century competencies, and holistic and pluralistic pedagogical approaches can result in significant educational transformation. ESD not only emphasizes declarative knowledge but also develops procedural, social, and affective knowledge, which encourages students to become environmentally aware, proactive, and socially-ecologically responsible individuals. Thus, students not only gain theoretical understanding but also skills and attitudes that support sustainable behavior in daily life. In addition, the use of digital technology and experience-based learning methods, such as fieldwork, collaborative research, and environmental negotiation

simulations, have proven effective in increasing students' critical thinking, collaboration, and self-reflection abilities. The integration of technology allows for global access to information, cross-cultural interaction, and the development of independent learning, while experience-based learning connects theory with real practice, making learning more relevant and contextual.

ESD implementation also provides an opportunity for Islamic education to integrate spiritual values with 21st-century skills, shape character, and foster the adaptive abilities needed to face global challenges. This educational transformation produces students who are able to make critical decisions, act as change agents, and contribute to sustainable development at the local and global levels. Thus, ESD is an important strategy to strengthen the relevance of Islamic education in the modern era, ensuring that education not only produces academic competence but also shapes individuals who are ethical, responsible, and ready to face the complexity of an ever-changing world. The integration of ESD opens the way for a future generation that is competent, independent, and cares about the environment and society.

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