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Energy-Saving Triangle: Internalizing Islamic Ethical Values on Energy Saving in Integrative Learning

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Abstract: This study focused on integrating energy-saving education within the realms of natural science and religious, aligning with Islamic environmental values. Specifically, the aim was to create a teaching framework for instilling energy-saving values in Islamic secondary schools, integrating with the boarding school system (*pesantren*) guided by Islamic ethical principles. This research employed a descriptive case study approach in two Islamic school locations within Bandung Regency. Qualitative data were collected and analyzed using NVivo 12. Initially, a rich picture was used to depict the program's setting, identify issues, and assimilate energy-saving Islamic values. The result was the synthesis of a triangular model, illustrating the internalization of Islamic ethical values related to energy conservation across science, religious subjects, and daily school activities. This model serves as a viable solution, particularly for Asian countries such as Indonesia, where the education system intertwines religious and scientific education in their curriculum, fostering students' ecological awareness. The findings emphasize the need for competent educational stakeholders capable of innovatively integrating religion and science, possessing a solid understanding of energy conservation, to effectively implement these programs.

Keywords: science; religion; internalization; Islamic ethics values; energy saving; integrative learning

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1. Introduction

The energy literacy framework in natural and social sciences encompasses energy-saving integrative teaching and learning, referred to as the pillars (Hawa et al. 2021; Hestness et al. 2019; Ouariachi et al. 2019; Samperiz and Herrero 2018). These studies highlight that the ethical value of energy conservation is predominantly taught in two science disciplines—natural and social sciences—suggesting a potential alignment with energy-saving learning materials.

However, integrative education on energy conservation within religious studies has not been discussed. In Indonesia, religious studies constitute a mandatory component of the national curriculum. Unfortunately, the emphasis in religious education is primarily on promoting cultural harmony, tolerance, and enhancing local knowledge (Bano et al. 2016). To enhance students' comprehension of energy conservation, a deliberate and strategic focus on this topic is essential, particularly within public and Islamic schools. Religion holds significant influence in Asian societies, notably in Indonesian culture (PRC 2019), underscoring the importance of integrating environmental education that emphasizes

religious values (Parker 2016). For example, an Islamic boarding school in Indonesia has established a foundational environmental theology, emphasizing a three-dimensional harmonic relationship between God, humanity, and nature, propelling them to become leaders in agribusiness (Kartodihardjo 2015).

Moreover, previous research on internalizing the ethical value of energy-saving primarily focuses on universal ethical values related to environmental messaging (Samperiz and Herrero 2018), affinity and fear with nature (Cho and Lee 2018), climate change (Fleming et al. 2019; Hestness et al. 2019; Ouariachi et al. 2019), ecological impact (Zangori and Cole 2019), energy-saving (Bayley et al. 2020), alternative energy (Satriawan and Rosmiati 2022), energy efficiency (Brychkov et al. 2023), and reducing greenhouse gas (GHG) emissions (Fleming et al. 2019). Notably, our systematic review research in the preliminary study (Rohmatulloh et al. 2022) and by Wan Mohamad and Osman (2022) did not identify energy-saving learning integrated with religious ethical values.

However, certain studies, encompassing environmental education (Karim 2022), natural science subjects (Fahyuni et al. 2020; Suryaningsih et al. 2020), human science (Rohmah et al. 2019), and daily school activities (Suyatno et al. 2020), do integrate religious ethical values, albeit not specifically focusing on energy-saving ethical values. Consequently, there exist research gaps concerning the internalization of ethical ideals based on religious teachings promoting energy conservation. This gap is substantial given the significant role of religious ethical values in both the school (Rohmatulloh et al. 2021) and home (Van den Broek 2019).

This study makes a contribution by developing a conceptual framework for secondary schools to integrate energy-saving principles rooted in Islamic ethics. The model offers a solution for developing an integrated curriculum and learning approach, particularly relevant for countries where religious and science education is seamlessly combined, fostering students' ecological awareness—especially pertinent in the Indonesian context. The primary emphasis lies in recognizing the crucial role of energy-saving Islamic ethics within Islamic schools, seamlessly integrating with the boarding school system. This integration extends to amalgamating science and religion courses, along with daily activities, while addressing associated challenges and barriers.

This work is significant, given the current array of critical challenges prompting interdisciplinary empirical research in Islamic education studies (Sahin 2018). Concurrently, energy literacy studies in the Indonesian context predominantly focus on instrument development (Yusup et al. 2017), framing energy-saving messages (Fatmawati et al. 2018), developing learning technology (Sendari et al. 2015), and incorporating STEM-based project-centric learning on renewable energy generation (Ilmi et al. 2021).

Through an environmental education curriculum and learning, anchored in energy literacy, various stakeholders continually aid in absorbing Islamic principles of energy-saving ethics to meet 21st-century global obligations (Palmer 1998). Anticipated benefits of energy efficiency include a reduction in GHG emissions, a significant contributor to environmental challenges such as global warming and climate change. The trend of total carbon dioxide (CO_2) emissions continues to rise annually, with both Indonesian and global emissions contributing to this pattern (IEA 2021; MOEF 2021). Consequently, numerous entities—comprising the government, community, parents of students, and schools—dedicate efforts to promoting energy-saving consciousness and are committed to instilling energy awareness in education, particularly in Indonesia (Rohmatulloh et al. 2021). Private organizations also actively engage in discussions concerning environmental issues in Muslim nations, recognizing this as a matter of global concern (Khalid 2022).

Numerous energy-saving programs have been implemented, but they generally yield insignificant results in terms of behavior change, even for students who have participated in them (DiMatteo et al. 2014). The knowledge gained from these programs often does not align with children's attitudes and behaviors related to energy conservation (Aguirre-Bielschowsky et al. 2017). Moreover, while students acknowledge the importance of energy-related issues (Avramides et al. 2016), they lack the motivation to learn how to

mitigate energy problems, likely because they already bear the cost of their education (Chokriensukchai and Tamang 2010). Further, other studies have found that improved knowledge is related to improved awareness in using energy wisely (Ntanos et al. 2018).

On the other hand, despite diligent efforts, educators and practitioners continue to develop efficient integrated learning models to assist students in internalizing energy-saving principles and optimizing the relationship between new information and changes in attitudes and actions regarding energy conservation. Energy-saving learning emphasizes practical experiences, facilitating decision-making, judgment, and ethical considerations, in addition to imparting scientific knowledge (Lay et al. 2013).

2. Literature Review

2.1. Internalization of Islamic Ethical Values of Energy Conservation

In this study's context, internalizing Islamic ethical principles or character (Rahim 2013) pertaining to environmental protection is aimed at acquainting students with responsible energy use, both individually and in groups (Davis et al. 2015; Lazzeri 2014). Energy saving, or conservation, represents a terminal value achieved through chosen behavioral patterns in routine activities facilitated by learning (Głaz 2015). The energy literacy framework serves as the foundation of energy-saving learning, placing significant emphasis on attitudes and behaviors. Within this framework, the attitudinal and behavioral components take a prominent position at the base of the triangle, being actively prioritized over cognitive components at the top (Brychkov et al. 2023).

Value plays an important role in both the theoretical and practical realms of education (Halstead and Taylor 2005). The internalization of values in students is a comprehensive process involving a strategic approach in the classroom and the broader school environment, targeting desired knowledge, attitude, and behavioral aspects (Lickona 2004). The process of culture infiltrating the mind is known as internalization, wherein individuals harbor embedded values, often referred to as their culture. These values are layered through experiences and gradually settle (Zittoun and Gillespie 2015). Values encompass beliefs, goals, and standards that guide behavior (Halstead and Taylor 2005; Schwartz 2012). In simpler terms, values steer behavior (Bardi and Schwartz 2003) in response to one's environment and self (Davis et al. 2015; Lazzeri 2014).

In religious societies, the Divine Principle, considered the origin of all things, is deemed essential to be intertwined with all forms of thought and behavior. This underscores that maintaining a connection with God is vital for individuals to stay true to the true nature of both themselves and their surroundings. Religion serves as the conduit that facilitates a connection between the entire human world and God (Nasr 2003). Given that Indonesia had the largest population of Muslims globally in 2010 and is projected to remain second only to Pakistan in terms of population by 2030 (PRC 2011), religion holds immense significance in the lives of Indonesians, exerting a considerable influence on them (PRC 2019). Religion plays a crucial role in maintaining life balance, work, and other responsibilities (Sav 2019). It guides pro-environmental values through its beliefs, organizing believers, and influencing non-religious communities (Yang and Huang 2018). Individual religious participation aids in shaping frugal practices, curbing excessive spending on food consumption (He and Tian 2023). Furthermore, religion plays a vital role in disaster management, emphasizing care for disaster mitigation (Ha 2015).

Due to this emphasis, Indonesia's national education system incorporates and reinforces religious values as fundamental principles. Islamic education, in contrast to liberal secular education, adopts a God-centered perspective, prioritizing ethical and moral principles based on Islamic teachings for Muslim learners (Sahin 2018). Islam, according to (Nasr 2003, 2004), operates within a hierarchy of three concepts: submission (Islam), faith (*iman*), and spiritual beauty or virtue (*ihsan* or ethics). These levels are essential for achieving a character where ethics takes precedence. Ethics also facilitate critical reflection for decision-making and appropriate actions (Siddiqui 1997). The Qur'an and hadith provide guidance on good conduct and behaviors, offering Muslims a framework for their daily

lives (Nasr 2003), encompassing interactions with all living beings and objects in the universe. A significant contemporary challenge is the absence of a spiritual ethical dimension in society, necessitating its integration into daily activities to foster both individual and communal character development (Rahim 2013).

Habituation, as a pillar of moral education to instill virtues (Attaran 2015), aligns with protecting the environment and conserving energy, a principle rooted theologically in the Qur'an and the guidance of the Prophet Muhammad (Khalid 2022). Research by Iwasa (2017), Lisnawati (2016), and Suyatno et al. (2019, 2020) indicate that habituation is a common strategy for internalizing ethical values in both school and daily life. Islam sets ethical standards to avoid harming the environment, stressing that humans will feel the effects themselves in surah *Ar-Rum* [30]: 41 and advocating for a non-wasteful lifestyle, contextualized within the wise use of energy in surah *Al-Isra'* [17]: 26–27 (Al-Damishqī 2000; Shihab 2011).

The Prophet Muhammad PBUH set an example by using minimal water during ablution (hadith narrated by Bukhari number 157–159) and turning off lights when not needed (hadith narrated by Bukhari number 5623–5624) (Al-Bukhari 1997). To truly internalize the importance of energy-saving Islamic ethics in learning, students must directly engage (to do), be part of a community group conscious of energy conservation (live together), and cultivate high moral principles (to be) (Delors 1996). Solutions for this are discussed in the following section, including integrative-thematic and science–religion integration in learning.

2.2. Integrative Learning of Energy Conservation

Integrative learning involves studying a specific topic or theme from the vantage point of multiple disciplines (Drake and Reid 2018). The term integration is often employed in philosophical and theological discussions to reunite science and religion (Barbour 2000). In the context of holistic learning and teaching that mirrors the interactive real world, integration and interdisciplinarity are used interchangeably, offering learners the advantage of applying knowledge for both professional and personal growth (Atwa and Gouda 2014; Wall and Leckie 2017). The inception of integrated learning in the early 20th century facilitated a thorough study of a subject with students taking on a leadership role (Drake and Reid 2018; Vars 1991). Notable models in this domain are the ladder and Fogarty's integrated model of the integrative curriculum (Atwa and Gouda 2014; Fogarty 1991). Despite differences in classification or typologies, they converge on the integrated curriculum model (Drake and Reid 2018). The spider web or interdisciplinary model employed in this study represents one such typology of an integrative curriculum.

Integrative learning is a comprehensive approach to character education aligning three psychological domains—cognitive, affective, and behavioral—supporting one another through strategies in the classroom and across the school environment (Lickona 2004). It is a method of infusing values into all teaching and learning activities in various realms: the classroom, school environment, family, and society or community. Energy-saving integrative learning aligns with the energy literacy framework, encompassing an understanding of fundamental energy concepts (cognitive), cultivating a positive attitude toward energy consumption, and nurturing energy-saving habitual behavior (DeWaters and Powers 2013).

3. Method

3.1. Design and Locus of the Study

This study employed a descriptive case study inquiry strategy (Hestness et al. 2019; Lewis et al. 2014). The study was conducted in two Islamic schools integrated with the boarding school system, commonly known as *pesantren*, under the purview of the Ministry of Religious Affairs. These schools, located in Bandung Regency, West Java, were chosen as the primary case analysis units due to their distinct accreditation ratings: one with an excellent (Islamic School A) and the other with a good (Islamic School B) reputation. The selection was guided by the schools' vision and mission, emphasizing the cultivation

of noble behavior in students. These institutions, which provide a balance between general and religious education, demonstrate a commitment to environmental concerns aligned with Islamic teachings. Their policies emphasize the development of noble character among graduates and incorporate learning programs integrating environmental aspects into subjects and daily activities, involving substantial use of electrical and electronic equipment, as well as water. The planning and implementation of this research spanned from January 2019 to March 2020. However, due to the COVID-19 pandemic, research activities were temporarily halted and resumed in November 2020.

3.2. Situational Analysis

The initial step in this research methodology involved conducting a situational analysis to establish a comprehensive understanding of the context and scope of the program for internalizing Islamic ethical values pertaining to energy conservation. This analysis encompassed an examination of stakeholders, identification of key issues requiring attention, and an assessment of the state and condition of educational institutions and their ecosystems.

The analyzed program is a program that has been implemented in accordance with policies within the Indonesian national education system. Integrative learning on environmental education and energy efficiency is included in the national education curriculum or "Kurikulum Merdeka," which was launched since the occurrence of the COVID-19 pandemic,[1] as well as in the Islamic education curriculum based on the classical book recitation (*kitab kuning*). This program is also one part of the Adhiwiyata environmental culture school program, even though both schools are not categorized as Adhiwiyata schools.

Researchers portrayed the findings derived from interviews and field observations during the preliminary study using a rich picture or detailed image. This tool, effectively employed by Conte and Davidson (2020), serves as a system thinking tool to navigate the diverse perspectives of academics from various sectors in collaborative research efforts.

3.3. Value Identification

Following the situational analysis, which provided an overarching view of the execution of energy-saving programs in the research location during the preliminary research, the subsequent stage involved identifying the energy-saving values embedded in both schools. Primary data sources included interviews with principals, boarding school leaders, and teachers specializing in natural science or *Ilmu Pengetahuan Alam* (IPA) and Islamic religious education or *Pendidikan Agama Islam* (PAI) Islamic law or Fiqh. Secondary data sources encompassed textbooks, lesson plans, and school strategic planning materials. In total, 16 interviews were conducted with participants from the two schools, comprising 11 men and 5 women.

3.4. Internalization of Values

The subsequent step involved assessing the implementation of Islamic energy-saving ethics within classroom contexts and students' daily lives. Primary data were gathered through interviews with natural science and religion teachers in the schools, as well as with students. Sixteen participants from grades 7 and 8, from both schools, agreed to group interviews. In School A, the participants were divided into three groups: group one (four males), group two (four males), and group three accompanied by a teacher (four females). School B had one group accompanied by a teacher, comprising two males and two females.

Non-participant observation of learning encompassed secondary data sources, such as lesson plan documents and everyday activities involving water and electricity usage, infrastructure, and facilities for electrical and electronic devices. The target population for learning about internalizing the value of energy saving consisted of students attending boarding schools. These students reside in the dorms around the clock and receive teacher assistance. The research did not focus on pupils attending school under the full-day system (from 7 a.m. to 3 p.m.) every day.

3.5. Conceptual Model Development

The final step involved presenting a visual logic model that synthesized the numerous findings from the stages of value identification, learning implementation, and obstacle identification. Independent focus groups were conducted in each school, allowing participants, including school principals and teachers from various subjects, to review this draft conceptual model. The in-person focus group sessions were held in both locations with 19 participants in Islamic school A and 13 in Islamic school B, respectively. Doctoral students in Islamic Education, who were also lecturers and teachers, participated in this online focus group, alongside government and community officials with a focus on energy saving, totaling 10 participants. To adhere to COVID-19 safety protocols, an online focus group discussion of the conceptual model draft was also conducted via Zoom as an advanced communication tool (Bailenson 2021), given the dispersed locations of the participants across Jakarta, Banten, and West Java.

The construction of the conceptual model followed an iterative process to achieve optimal outcomes aligned with theory and field observations. Nine professors with expertise in educational psychology, Islamic religious education, Islamic theology, physics education, ethics and religion, and sociology of education actively participated in this process. They provided opinions, advice, arguments, and queries through formal discussions in the examination forum and informal mentoring sessions from the initiation of the research until the report's completion.

3.6. Data Analysis

The process of qualitative data analysis encompassed classifying data based on their nature and source, organizing the data for analysis, and transcribing the discourse. This analysis was conducted continuously throughout the data collection process until its conclusion. Initially, qualitative data analysis was performed manually using traditional methods with paper and pencil, and subsequently with the aid of the NVivo 12.0 software (Aguirre-Bielschowsky et al. 2017; Erstad and Silseth 2019). The analysis comprised three stages: initial coding, focused or category coding, and theoretical or theme coding, involving investigation and coding, characterization and development of categories and themes or theories, and their presentation using tables and figures (Ouariachi et al. 2019; Qureshi and Ünlü 2020).

To ensure data credibility, this process was reiterated, employing methods such as member checks involving three different data sources or participants, input from peers engaged in doctoral-level research, and insights from experts. The utilization of multiple methods, including interviews, focus group discussions (FGDs), observations, and document studies, constituted method triangulation. Finally, the model's logic and consistency were validated using the if–then test (Miles and Huberman 1994).

4. Findings

4.1. Program Context

Figure 1 provides a comprehensive overview of the context and scope of the program aiming to internalize Islamic ethical values promoting energy conservation in integrated learning across both schools. The findings reveal that this program was implemented within educational institutions involving various stakeholders, such as parents at home, the government, and society at large. Figure 1 vividly illustrates the scope and context of the issue within schools, emphasizing the disconnect observed in the internalization program of Islamic ethical values concerning energy saving in both subjects and daily activities.

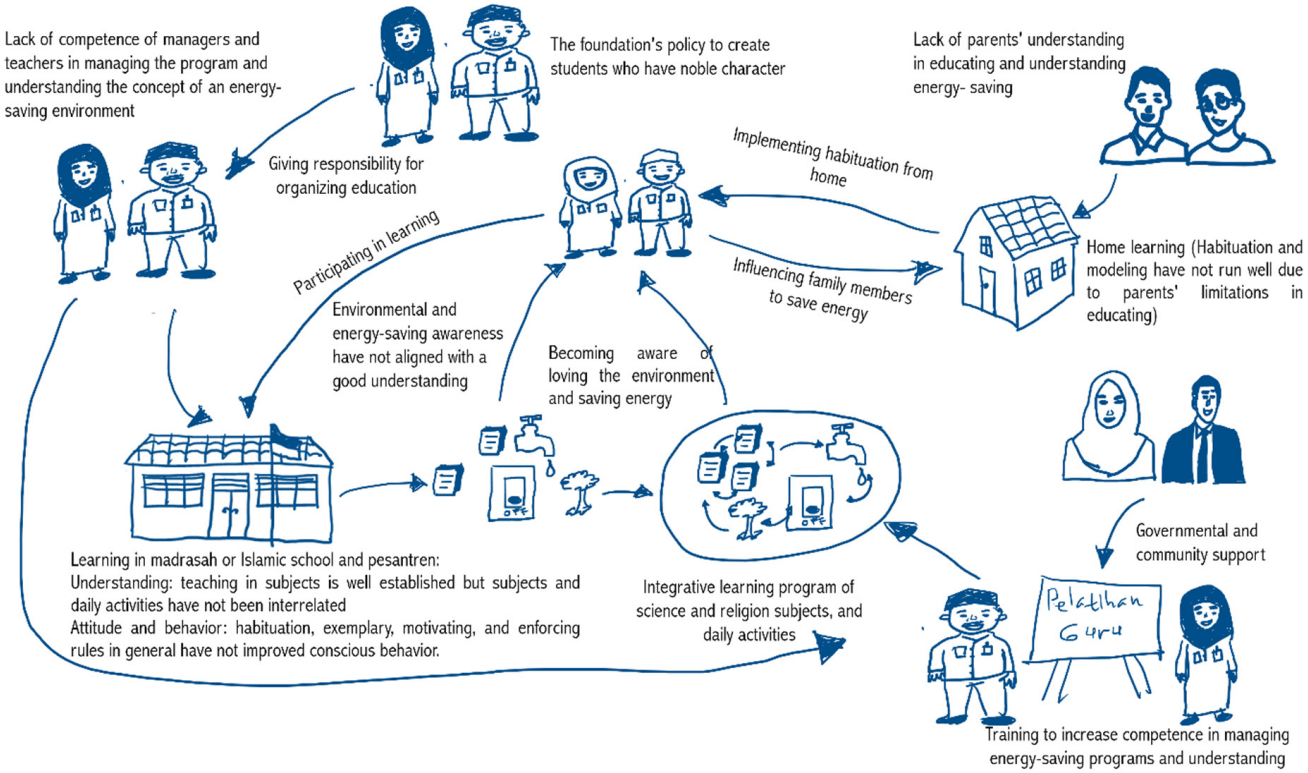

Figure 1. Rich picture of the internalization program of the value of energy-saving Islamic ethics.

Figure 1 also illustrates that the implementation of the internalization program of Islamic ethics on energy conservation lacks clear interconnection and objectives between the learning activities and daily activities at schools and Islamic boarding schools. In the learning activities, there is also a lack of interconnection between the subjects of science and religion.

4.2. Islamic Ethical Values in Energy Saving

In both research locations, the school development plan's documentation, encompassing the vision, mission, goals, and motto, emphasized the benefits of conserving energy and used Islamic ethics to shape students into individuals of integrity. Although the terminology varied between the two schools, they both underscored the importance of reducing water and energy consumption. Ethical principles promoting environmental stewardship in Islamic School A encompassed living modestly, expressing gratitude, being serious (*man jadda wajada*), avoiding extravagance, maintaining balance (*tawazun*), and avoiding exceeding limits (*tatharuf*). Islamic School B emphasized cooperative efforts in environmental management, particularly in preventing waste (*isyraf* and *tabzir*), and encouraged a lifestyle of simplicity.

4.3. Internalization of Values in Islamic Religious Education Subjects

To ensure a comprehensive understanding and knowledge of Islamic legal provisions and the proper performance of worship in daily life, the ethical value of energy conservation or environmental love was incorporated as a central theme in the PAI Islamic law or Fiqh curriculum. In Islamic school A, the Fiqh material integrated the subtopic "Procedures for purifying from impurities" within the broader theme of "Purify your inner and outer self, reach for the love of your God," aiming to help students internalize the importance of energy-saving ethics. This material focused on fundamental skills, including having faith in the value of purification from impurities, cultivating clean behavior to implement purification procedures, understanding excrement and the purification procedures, and demonstrating how to purify oneself from impurities.

The ethical values related to energy conservation were further internalized through acts of ablution and bathing. The curriculum guided students to comprehend the procedures of ablution through the requirements and practices involved in ablution. Students engaged in discussions regarding the requirements, the Sunnah of ablution, factors that invalidate ablution, and the correct method of performing ablution. It was emphasized that water, essential for ablution, required efficient usage as wasting it was discouraged. This lesson also instilled values of balance (*tawazun*) and avoiding exceeding limits (*tatharuf*) in water usage, considering it as the source of all life and essential for purification rituals.

Students were instructed on the importance of integrating simple Islamic practices to conserve energy, particularly emphasizing water usage for ablution and daily needs. Water, being vital to support worship services and other activities, was underscored. A similar electric pumping system, used in Islamic school A, was employed to extract groundwater for the school's use. This approach not only conserved water but also reduced monthly electrical expenses. Given the extensive use of technology-based learning resources in the Islamic school, minimizing monthly electricity costs was crucial. However, the teachers delivering these lessons often lacked an understanding of the connection between water usage and energy conservation. The potential of water as an environmentally friendly alternative energy source was not sufficiently discussed due to the teachers' incomplete understanding of energy concepts and sources. Additionally, to reinforce the ethical value of energy conservation, teachers reminded students to turn off lights in classrooms or the mosque, especially as learning often extended into the night.

In Islamic school B, a similar material titled "Small impurity and procedures for purification (*Thaharah*)" was simultaneously utilized to instill ethical principles related to energy conservation in students. The act of purification through ablution served as a practical context to internalize ethical values concerning energy conservation. The school utilized electric water pump technology to extract groundwater for worship and drinking purposes. The value of avoiding waste (*isyraf* and *tabzir*) was emphasized to impart the lesson of water conservation. Given water's critical role in supporting various activities, Islamic schools emphasized simple living by utilizing water efficiently, especially during ablution. The water used in these schools was extracted from groundwater using electrical machinery, resulting in a reduced monthly electricity cost. Despite these efforts to deliver energy-saving messages to students, instances of ineffective implementation persisted, such as the continued wasteful usage of electricity and water—for example, neglecting to switch off lights after they were no longer needed—indicating the need for further reinforcement of these principles.

4.4. Internalization of Values in Science Subjects

The objective of the science curriculum was to provide students with a comprehensive understanding of the environment and its components, drawing upon various scientific disciplines such as biology, physics, and chemistry. This integrated science curriculum incorporated content from these disciplines, focusing on energy conservation as a central theme. Energy-saving concepts have been systematically taught to students since elementary school, consistently addressing the topic of energy conservation within science classes. The curriculum aimed to fulfill core competencies and basic proficiencies, encompassing spiritual and social attitudes, knowledge, and skills, utilizing eco-friendly, energy-saving materials.

In Islamic school A, the internalization of Islamic energy-saving ethics was linked to the fundamental understanding that energy is indispensable for life, emphasizing both renewable and non-renewable energy sources. The curriculum included practical demonstrations, using calcium carbide and sunlight to illustrate energy concepts. Everyday lighting served as a means to instill ethical values related to energy conservation, encouraging gratitude and conscientious usage by consuming energy only when necessary and reminding students to switch lights on and off appropriately.

On the other hand, Islamic school B employed movies to educate students about energy concepts and sources while integrating the internalization of energy-saving Islamic ethical principles. Although the execution was not yet optimal, students were able to discern between energy-saving practices and wasteful behaviors in daily life, facilitating the internalization of ethical norms associated with energy conservation. For instance, during discussions, teachers prompted students to contemplate what should be conducted after finishing watching a television show, aiming to instill awareness that excessive television consumption constitutes a wasteful use of energy, encouraging students to adopt more mindful habits.

4.5. Daily Activities

Establishing responsible usage of energy and water as a habitual practice necessitated the internalization of energy-saving values within the daily activities of the school. At Islamic school A, this habit formation was achieved through a repetitive daily routine. Students were encouraged to commute to school without using motorized vehicles, utilize electrical appliances for daily chores such as ironing clothes, manage lighting and television usage, utilize water pumps for filling bathtubs, apply water for ablution and bathing, utilize audio-visual equipment for classroom and mosque learning activities, and participate in speech creativity sessions (*muhadhoroh*) held on Mondays in the school hall.

Guided by the saying of the Prophet Muhammad (PBUH) that "Being frugal or economical is half of life", regularly reiterated during recitations, ceremonies, and post-prayer messages, students were instilled with the essence of energy-saving principles. Incorporating wise sayings and meaningful texts, memorization was encouraged, embedding the conviction that sincerity leads to success and encompassing the application of this principle within the context of an Islamic school's daily life. The importance of aligning this conviction with conscientious initiatives to preserve the environment through the ethical and cost-effective use of water and energy was emphasized. Daily environmental protection duties were carried out during environmental cleaning activities.

Similarly, at Islamic school B, controlling the use of electrical and electronic devices, managing water pump operations, adjusting bathtub faucets, and appropriately using lighting in various areas were organized through cooperative activities and routine pickets. These endeavors aimed at ingraining the values of energy-saving ethics in students and establishing daily life habits. The usage of electrical appliances for lighting, water pump operations for bathtub filling and washing, and mindful use of lights in designated areas were guided by these activities. As the school maintained limited usage of electrical and electronic devices, teachers were less accustomed to teaching with such resources. Notably, the dispenser in the teacher's room was one of the few frequently used electrical devices. Encouraging mindful behavior, the habituation process included requesting students to unplug the electricity when no longer needed. This habituation approach, fostering the internalization of ethical values related to energy conservation and environmental stewardship, was reinforced during Friday night religious preaching sessions (*tausiah*) and recitation activities when the entire school community was present.

4.6. The Conceptual Model

Through the reconstruction of field data and relevant theories, a model or conceptual framework was developed to facilitate the internalization of energy-saving Islamic ethics within integrative learning. This endeavor was pursued systematically, employing a structured method or system approach. The internalization program encompassed learning within both science and religious subjects, as well as daily activities, all guided by the overarching theme of energy-saving Islamic ethical values. This model is visually represented in Figure 2, depicted as an energy-saving triangle model.

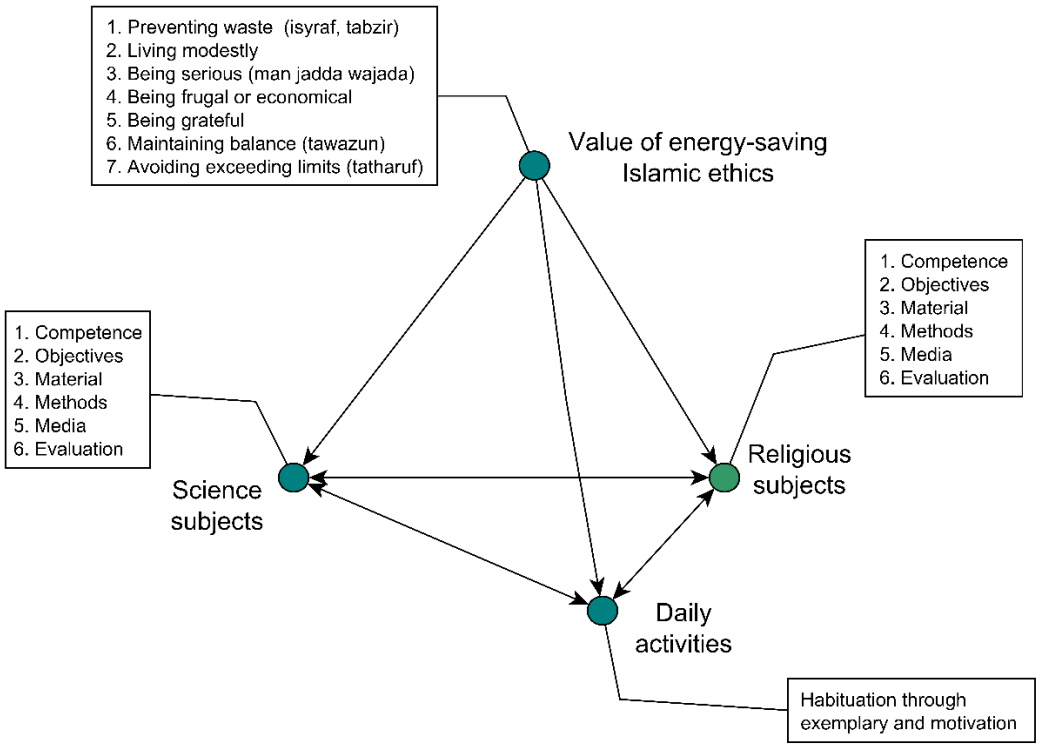

Figure 2. Energy-saving triangle model.

The value of energy conservation in Islamic ethics is ingrained in every facet of subjects and daily activities. This core value emanates from a central point, akin to the emission of light rays. These rays of light not only illuminate our lives but also symbolize the sun, the primary source of illumination for the entire biosphere on Earth. Additionally, we can harness artificial lighting, such as energy-efficient bulbs, to illuminate various areas within the classroom that align with the day's subjects and routines.

5. Discussion

The Islamic school in this research location represents a modern Islamic education institution developed by *pesantren*, thereby deeply influenced by Islamic ethical values within its culture. This trajectory aligns with the broader pattern of educational evolution in Indonesia, where schools have evolved from conventional Islamic educational systems (Supani 2009). This school policy aimed to nurture students embodying the distinct qualities associated with Islamic educational institutions. By prioritizing religious and ethical values in education, Islamic schools set themselves apart from public schools (Isbah 2020).

Islamic ethics education entails equipping students with the knowledge to distinguish between right and wrong morals, foster positive attitudes, and perform moral acts with courage, patience, and justice as a balancing factor. For instance, applying justice standards to the concept of frugality involves striking a balance between wastefulness and miserliness (Al-Ghazali 2014). Students' behavior is deeply impacted by the internalization of Islamic ethical norms (Nuriman and Fauzan 2017), integral to all aspects of Islamic life and inseparable from ethics (Rahim 2013).

Moreover, the core importance of environmental education cannot be detached from the internalization of the value of energy-saving Islamic ethics in both schools. This implies a direct link between energy conservation and environmental education. The findings emphasize the significance of environmental ethics as the primary value, which further translates into Islamic ethical sub-values applicable to efficient energy use, such as avoiding wastefulness (*tabzir* and *isyraf*), living simply, being earnest, organizing work, being economical, showing gratitude, achieving balance (*tawazun*), and avoiding excess (*tatharuf*). Islamic values permeate many science and religion textbooks, as supported by

research (Zabidi et al. 2021). These values are positive and beneficial, distinct from previous ecological and energy literacy studies that often focused on elements such as fear of nature (Cho and Lee 2018) and ecological impact (Zangori and Cole 2019).

These results emphasize that education stakeholders need a comprehensive theological understanding of environmental messages in religion, highlighting Islamic teachings' caring attitude towards the environment and energy. However, in practice, this understanding often falls short in aligning with efforts to use energy wisely (Rohmatulloh et al. 2021), aligning with the notion that religious education is sometimes seen as merely knowledge and dogmatic (Hidayat 2015).

Energy-related issues, such as instances of global warming, are invariably linked to environmental challenges. The preservation of environmental functions is a critical aspect taken into account in energy management in accordance with the energy policy-Law No. 30 of 2007 on Energy). Consequently, both approaches emphasize the moral principles of environmental education, underscoring the significance of environmental stewardship and collective efforts for its management. However, a closer examination reveals that the applied ethical sub-values are rooted in the Islamic ethical principle of energy conservation.

In Islamic teachings, the issues of energy and water are intrinsically linked to human ethics towards the environment, considering everything around humans as necessary to meet their needs. Islamic teachings emphasize the importance of respecting all mechanisms that sustain the ecosystem to avoid causing environmental harm as evident in surah *Al-Rum* [30]: 41 (Al-Damishqī 2000; Shihab 2011).

Lastly, energy literacy and environmental education are deeply intertwined (Jorgenson et al. 2019; Lewis et al. 2014; Ntona et al. 2015; Samperiz and Herrero 2018), intersecting with themes such as ecological behavior of recycling (Coskun and Topkaya 2019), awareness of reducing carbon gas emissions (L. Lee et al. 2013; L. S. Lee et al. 2017), learning in botanical gardens (Sellmann and Bogner 2013), and addressing climate change and biodiversity loss (Barata et al. 2017). This convergence underlines the critical role of education in instilling energy literacy and promoting sustainable environmental practices.

The alignment of the curriculum and school regulations with the practical implementation of Islamic energy-saving values in classrooms was validated through research on Tawhid-based green learning. Despite environmental education being outlined in the institutional policies concerning the vision, mission, goals, learning materials, quality assurance, and outcomes within education institutions (Masturin et al. 2022), emphasizing the importance of energy-saving Islamic practices among students was crucial, given the pivotal role of water and electrical energy in everyday school activities.

Modern educational settings necessitate substantial electrical energy for utilizing advanced technological tools in teaching, resonating with the ongoing trend in education embracing various advancements in information and communication technologies. The incorporation of virtual reality, augmented reality, artificial intelligence, the Internet of Things, and cloud computing has revolutionized pedagogical practices and facilitated more effective learning environments (Almufarreh and Arshad 2023). Consequently, energy conservation becomes a vital aspect for students, highlighting the role of learning media in internalizing the value of energy-saving Islamic ethics.

Internalizing energy-saving Islamic ethical norms in schools proved advantageous for implementing education quality indicators and school accreditation exams. The application of these ethics extended beyond energy-related science courses and influenced all areas of general science, religion, and daily activities. This integration was crucial for effective environmental and energy-saving efforts. Other researchers emphasized the necessity of streamlining environmental education by clarifying the selection of materials to integrate multidisciplinary disciplines. Conversely, a lack of support across disciplines could cause confusion and pose challenges for field-based teachers in executing environmental and energy-saving activities (Charif 2022).

The integration of energy-saving Islamic ethics within PAI subjects was seen as a potential solution to internal and external issues encountered in this type of learning. The underlying issue was the lack of alignment between PAI learning strategies and the daily issues faced by students and society, such as environmental harm and energy waste. Despite not explicitly addressing energy literacy, researchers addressed this concern by discussing the internalization of environmental ethical ideals in PAI learning (Sunhaji 2014).

Fostering students' awareness of energy efficiency through habituation was a significant strategy. Character habituation required a comprehensive, systematic approach using rules that were modeled, encouraged, and enforced. The results showed that habituation and modeling were the most prevalent techniques in both schools, aligning with broader research on values cultivation in classrooms (Suyatno et al. 2019).

Al-Baqarah [2]: 238 implicitly emphasized the sincere, flawless, repeated, and mutually reminded nature of habit formation according to the Qur'an (Shihab 2011). The influence of domestic education was found to be substantial, with schools building on the character development initiated at home (Iwasa 2017). The educational aim at home was to instill excellent character traits in children, and schools furthered this development (Lickona 2004).

The results depict the triangular conceptual model, highlighting how schools nurture pupils with noble character through their educational programs. Morality, an essential aspect of religion linked to faith (*iman*), Islam, and *ihsan*, is deeply ingrained in classroom activities and everyday school life. The pursuit of the highest moral degree, *ihsan*, requires the harmonious integration of faith, Islam, and *ihsan* itself (Siddiqui 1997).

The model utilizes the sun's light, symbolizing a renewable energy source that is environmentally friendly, or lights utilizing light-emitting diode technology to conserve energy during learning and daily activities. Humans, blessed with intelligence, can create objects such as the sun and the moon that emit light rays. Additionally, they can harness green energy by converting light energy through solar panel modules. Conservation is vital, especially for non-renewable energy, considering the potential impact of energy waste on future generations. The integration of the significance of Islamic energy-saving practices into classroom learning is believed to cultivate energy awareness from an early age.

The practical integration of energy-saving Islamic ethics into subjects and daily activities can be achieved through student participation at school, hands-on experiences at home (Aguirre-Bielschowsky et al. 2017; L. Lee et al. 2013; Zografakis et al. 2008), field trips (Sellmann and Bogner 2013), blended learning (Hestness et al. 2019), learning games (Bayley et al. 2020), and various constructivist learning models (Karpudewan et al. 2015; Ratinen 2013).

Critical to the success of the energy-saving moral education program is the role of human resources (HR) capable of comprehending energy-saving morals and devising integrative learning programs. Enhancing HR competency significantly supports the successful implementation of integrated learning (Malik and Malik 2011). Bridging competency gaps, such as understanding and applying energy literacy in daily life, and effectively developing learning materials, can be addressed through training and professional development (Bodzin 2012; Chokriensukchai and Tamang 2010; Sukendar and Setiawan 2018). Furthermore, environmental factors play a crucial role as external components, reinforcing energy conservation habits among students (Davis et al. 2015).

This is also in line with the theory of a comprehensive approach to character education, and previous research stating that the support of the school, home, and community environments must be a priority to achieve the success of this program. These efforts are expected to provide specific reinforcement, especially for students categorized as needing ecological education, indifferent to the environment, but potentially active when motivated by the school (Ntanos et al. 2018).

The implications of the findings extend beyond Islamic schools in Indonesia. Religiously grounded ethical values, universal in nature, can be internalized across subjects and daily life aspects. This suggests applicability in public schools and faith-based schools globally. For example, in Japan, where religion's influence is often overlooked (PRC 2019),

the importance of moral education based on religious principles or religion's societal role is acknowledged in education policy-Basic act on education 2006 (Takahata 2012). Employing an inter-religious model could facilitate inter-religious dialogue related to environmental and energy ethics (Bagir 2004). Various religious teachings, such as Buddhism and Confucianism, also offer valuable principles promoting simplicity, harmony with the environment, and responsible resource usage (Alliance of Religions and Conservation 2012; International Confucian Ecological Alliance 2015).

6. Conclusions

The triangle model for internalizing Islamic values presents an innovative approach to addressing energy-saving learning. While integrative learning for energy conservation is typically integrated into social and natural science subjects, there is a need for contextualization, especially in PAI subjects. These subjects should address a broader spectrum of challenges related to energy usage that extends beyond set parameters and affects both society and the environment. Learning from everyday situations is an effective means to instill positive energy-use behaviors. Therefore, the triangle model, applied in schools using the Islamic boarding system, seamlessly combines integrated learning in science and religious topics with daily activities, all guided by energy-saving Islamic ethical values. Faith-based and public schools without a boarding system can also adopt this model, aligning it with religious values in subjects and daily activities at home. Successful implementation requires education stakeholders skilled in developing innovative curricula, creative learning technologies that engage learners, and practical knowledge of energy conservation. Furthermore, the implementation also utilizes a comprehensive approach that not only involves the primary responsibility of schools but also engages the support and roles of the household environment and the community.

7. Recommendation and Limitations

The integration of religious and science education across various subjects can make the model more comprehensive and interconnected. In this study, we focused on natural science and Fiqh subjects, limiting the scope. Future research should broaden this fundamental approach, especially integrating PAI subjects beyond Fiqh, such as Islamic cultural history, Arabic language, Qur'an and Hadith, faith (*Aqidah*), and character (*Akhlak*), as well as consider daily household tasks. Internalizing Islamic values that conserve energy at home is pivotal in ensuring that pupils develop positive character traits at an early age, and this reinforcement continues at school. The model's applicability can be expanded to a wider range of settings, particularly in Islamic and public schools that do not use the Islamic boarding system or exclusively use the full-day system. Additionally, future research should investigate how individuals learn energy-saving ethical principles—whether through applying normative norms (universal, humanistic, and religious), reflecting on values, or emulating human role models. Comparative studies on integrated learning from other religious traditions, implementing the internalization of energy-saving ethical values in various contexts, would also be beneficial.

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Notes

[1] Implementation of "Kurikulum Merdeka" for learning recovery is based on policy: Decree of the Minister of Education, Culture, Research and Technology Decree No. 262/M/2022 on Amendments to Minister of Education, Culture, Research and Technology No. 56/M/2022 on Guidelines for Curriculum Implementation in the context of Learning Recovery, and Decree of the Minister of Religious Affairs No. 347 of 2022 on Guidelines for Implementing the Merdeka Curriculum in Madrasahs.

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