

Integration of Climate Change Education in Islamic Leadership Training Through Circular Economy Principles

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ABSTRACT: *This study aims to describe how climate-change education is integrated into Islamic education through the principles of the Circular Economy and to analyse changes in students' understanding before and after the Islamic Leadership Training program. Conducted at Muhammadiyah 4 Surabaya Elementary School, this qualitative case study approach, supported by quantitative descriptive data, involved 24 sixth-grade students, the vice-principal, the teacher, and the committee member. The research team collected data through participatory observation, semi-structured interviews, documentation, and pre- and post-questionnaires. The analysis followed the Miles and Huberman interactive model, focusing on identifying patterns of Circular Economy integration within Islamic educational activities and mapping their influence on student learning. The results show that Circular Economy principles—reduce, reuse, recycle, repair, and rethink—were effectively implemented through Islamic Leadership Training programs such as worship routines, reflective discussions, and environmental practices. After Islamic Leadership Training, students demonstrated higher knowledge of 5R concepts, stronger environmental attitudes, and greater religious responsibility as khalifah fil ardh. The integration encourages behavioural change, reflective thinking, and a sense of social responsibility among students, aligning with the objectives of climate change education in fostering reasoning, socio-emotional awareness, and environmental action. The originality of this study lies in mapping the implementation of Circular Economy principles within religious education contexts, an area rarely explored in prior research. However, this study is limited to one Islamic elementary school, so the findings may not be generalised to other contexts. Future studies are recommended to expand the analysis to different educational settings to develop a replicable model for integrating Circular Economy-based climate education in Islamic schools.*

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Penelitian ini bertujuan untuk mendeskripsikan bagaimana pendidikan perubahan iklim diintegrasikan ke dalam pendidikan Islam melalui prinsip-prinsip Ekonomi Sirkular dan menganalisis perubahan pemahaman siswa sebelum dan sesudah program Pelatihan Kepemimpinan Islam. Dilaksanakan di SD Muhammadiyah 4 Surabaya, pendekatan studi kasus kualitatif ini, didukung oleh data deskriptif kuantitatif, melibatkan 24 siswa kelas enam, wakil kepala sekolah, guru, dan anggota komite. Tim peneliti mengumpulkan data melalui observasi partisipatif, wawancara semi-terstruktur, dokumentasi, dan kuesioner pra dan pasca. Analisis ini mengikuti model interaktif Miles dan Huberman, dengan fokus pada identifikasi pola integrasi Pelatihan Kepemimpinan Islam dalam kegiatan pendidikan Islam dan pemetaan pengaruhnya terhadap pembelajaran siswa. Hasil penelitian menunjukkan bahwa prinsip-prinsip Pendidikan Agama—mengurangi, menggunakan kembali, mendaur ulang, memperbaiki, dan memikirkan kembali—diimplementasikan secara efektif melalui program-program Pelatihan Kepemimpinan Islam seperti rutinitas ibadah, diskusi reflektif, dan praktik lingkungan. Setelah Pelatihan Kepemimpinan Islam, siswa menunjukkan pengetahuan yang lebih tinggi tentang konsep 5R, sikap lingkungan yang lebih kuat, dan tanggung jawab keagamaan yang lebih besar sebagai *khalifah fil ardh*. Integrasi ini mendorong perubahan perilaku, pemikiran reflektif, dan rasa tanggung jawab sosial di antara siswa, yang sejalan dengan tujuan pendidikan perubahan iklim dalam menumbuhkan penalaran, kesadaran sosial-emosional, dan aksi lingkungan. Orisinalitas penelitian ini terletak pada pemetaan implementasi prinsip-prinsip Pendidikan Agama dalam konteks pendidikan agama, suatu area yang jarang dieksplorasi dalam penelitian sebelumnya. Namun, penelitian ini terbatas pada satu sekolah dasar Islam, sehingga temuannya mungkin tidak dapat digeneralisasi ke konteks lain. Penelitian selanjutnya disarankan untuk memperluas analisis ke berbagai lingkungan pendidikan guna mengembangkan model yang dapat direplikasi untuk mengintegrasikan pendidikan iklim berbasis Pendidikan Agama di sekolah-sekolah Islam.

Keywords: *Islamic Leadership, Circular Economy, Climate Change Education, Sustainability.*

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I. INTRODUCTION

The Linear Economy is built on a model of extracting raw materials from nature, turning them into products, and then discarding them as waste (UNDP, 2023). Currently, only 7.2 per cent of used materials are cycled back into our economies after use (Circular Economy Foundation, 2023). Climate Change is an ecological global issue with widespread impacts such as rising global temperatures, extreme weather, and resource crises (IPCC, 2021). Meanwhile, the climate crisis refers to a condition where climate change has reached a critical level.

Indonesia ranks in the top third of the most vulnerable countries to the climate crisis due to its geographical situation (an archipelagic country) and social factors (many people's livelihoods depend on nature) (Sekarwulan et al., 2024). The limited understanding of

the urgency of the climate crisis further heightens this vulnerability. In fact, adaptation within the education sector is urgently needed to protect the benefits of education (World Bank, 2022).

In response, the Indonesian education system has begun to integrate climate change education into the national curriculum. Environmental education—covering issues such as energy conservation, waste management, and climate change—has been introduced starting from the primary level. This aligns with recommendations from international organisations such as UNESCO (2017), which emphasises the importance of equipping young generations with sustainability-oriented competencies as part of climate change education.

Education plays a crucial role in preparing for a sustainable transition, especially at the primary level, where attitudes and behaviours are developed. Encouraging students to care for the environment from an early age can help cultivate a generation ready to face global sustainability challenges. Furthermore, education stimulates changes in social behaviour and supports wise decision-making (Setiawan et al., 2023). Schools thus act as transformative agents by embedding sustainability into curricula and shaping values, attitudes, and actions toward sustainable living (Yuana, 2023).

Within this context, Islamic education holds a strategic role. The goals of Islamic schools align with the concept of *rahmatan lil 'alamin*—to instil universal values of stewardship, balance (*mizan*), and harmony between humans and the environment (Iqbal et al., 2022; Irpan & Sain, 2024). Islam views humans as *khalifah fil ardh*, stewards responsible for maintaining ecological balance as part of their moral and spiritual duty (Rasyidi, 2020). Therefore, integrating environmental ethics into Islamic education is not merely a curricular addition but an embodiment of Islamic values.

The Indonesian Ministry of Education and Culture (Kemendikbudristek), in its Climate Change Education Guidebook, also highlights that climate change education can be implemented through all learning dimensions—curricular, extracurricular, and co-curricular activities—including religious education programs. This policy provides an opportunity for Islamic schools to contextualise climate education within religious values.

One such example is Muhammadiyah 4 Surabaya Elementary School, a pioneering Islamic school that promotes environmentally responsible education through the Circular School Program (Mulyanto, 2024). A Circular School refers to an educational institution that implements the Circular Economy concept within its learning ecosystem. Circular Economy provides an alternative to linear economic practices by minimising waste and maximising the reuse of resources (Yuana et al., 2024). In essence, Circular Economy practices involve reducing raw material consumption, rethinking product designs to enable recycling, extending product lifespans through maintenance, and returning materials into production loops (Van Buren et al., 2016).

At Muhammadiyah 4 Surabaya Elementary School, the Circular Economy principles—known as the 5R (reduce, rethink, reuse, repair, recycle)—are embedded into the school's management and learning processes. This includes their curricular, intracurricular, extracurricular, and co-curricular programs. Notably, the integration of climate change education into religious co-curricular activities, such as the Islamic Leadership Training, reflects a holistic approach where environmental stewardship is taught as part of faith-based character education.

The Circular Economy approach has been widely studied in economics and industry Rejeb et al. (2024) and recently introduced in design education (Agustin & Rianingrum, 2019). It has also been applied in basic education to promote sustainability awareness (Yuana et al., 2024). However, studies exploring the integration of Circular Economy principles in Islamic education remain scarce, particularly within co-curricular religious settings. On the other hand, climate change education is primarily examined within STEM disciplines (Hakim et al., 2023). This gap demonstrates a lack of empirical studies addressing how Circular Economy-based learning can be contextualised within Islamic religious education to promote both environmental and spiritual development.

Integrating climate change education into Islamic religious activities through Circular Economy principles is crucial for several reasons. *First*, research demonstrates that using a social identity approach to communicate climate change enhances environmental responsibility as a shared moral and religious duty (Goldberg et al., 2019). *Second*, religious communities have shown greater awareness and engagement in environmental action, particularly when messages are aligned with their faith (Nche, 2023). Religious leaders also play a vital role in mobilising environmental awareness and promoting youth involvement in climate solutions (Abdussalam & Abukur, 2021). *Third*, Circular Economy principles—emphasising waste reduction, resource optimisation, and reuse—align with Islamic teachings on simplicity (*zuhud*), cleanliness (*thaharah*), and moderation (*wasathiyah*). Goulah (2017) emphasises that religious and ecological identities can be simultaneously nurtured, linking spiritual reflection with environmental ethics.

The importance of embedding climate change education in schools is also widely acknowledged, as it strengthens students' knowledge, awareness, and readiness to take environmental action (Ojomo et al., 2015). Religious-based institutions can thus leverage their moral authority to promote sustainability and inspire environmental stewardship among their communities (Umboh et al., 2023).

In light of the above, this study focuses on integrating climate change education into the Islamic Leadership Training through Circular Economy principles at Muhammadiyah 4 Surabaya Elementary School. The study aims to map the activities within Islamic Leadership Training that reflect Circular Economy-based climate education and examine how these activities nurture students' environmental awareness, critical thinking, and Islamic character.

Previous studies have explored the intersection between religion and environmental education, yet few have focused on Islamic schooling. Nche (2023) found that Christian congregations encourage environmental stewardship through moral teachings, while Ecklund et al. (2016) and Altmeyer (2021) examined ecological ethics within church education. In the Indonesian context, Yuana (2023) discussed the Circular School movement as a model for sustainable learning, but without linking it to Islamic pedagogy. Likewise, Agustin & Rianingrum (2019) emphasised Circular Economy in design education rather than religious instruction. To date, research has not addressed how Circular Economy principles can be systematically embedded in Islamic co-curricular programs such as Islamic Leadership Training. This study fills that gap by analysing how Circular Economy-based climate-change education operates within the Islamic leadership-training framework at an Islamic elementary school.

This study contributes to the growing discourse on Islamic environmental education by providing empirical evidence of how Circular Economy principles can be embedded

within Islamic leadership programs. Theoretically, it expands the framework of ecopedagogy within Islamic contexts. At the same time, it offers a replicable model for other Islamic schools to strengthen environmental literacy and sustainability through faith-based education.

II. METHOD

This study used a qualitative case study approach to describe how climate change education based on the principles of the Circular Economy is integrated into the Islamic Leadership Training at Muhammadiyah 4 Surabaya Elementary School. This method was chosen to understand the process and meaning of applying Circular Economy principles in religious educational activities.

This study employed a qualitative descriptive design supported by quantitative descriptive data from student questionnaires. The research was conducted at Muhammadiyah 4 Surabaya Elementary School during the Islamic Leadership Training held from 1–5 October 2024. Participants included 24 sixth-grade students who participated in the training, the vice-principal, teachers, and a committee member. The Islamic Leadership Training was held from October 3–5, 2024, at Arayana Hotel, Trawas.

Data were collected through participatory observation, semi-structured interviews, and documentation. The research team observed Islamic Leadership Training activities to identify actions that reflected Circular Economy principles. The team interviewed informants to explore their understanding, implementation, and perceived impact of Circular Economy-based education. The team also analysed documents such as handbooks, contracts, and reports to support the findings.

Data validation was performed using triangulation of sources, methods, and time (Alfansyur & Mariyani, 2020). Field notes and reflective journals were used to maintain the accuracy and reliability of the data. Data analysis followed the interactive model of Miles and Huberman (Sugiyono, 2019), consisting of data reduction, data display, and conclusion drawing. The analysis focused on identifying patterns of Circular Economy integration in Islamic Leadership Training activities and interpreting them from the perspective of Islamic education.

The result of this process was a mapping of how Circular Economy principles—reduce, rethink, reuse, repair, and recycle—are applied in Islamic religious co-curricular activities as a form of climate change education in Islamic schools.

III. RESULT AND DISCUSSION

Integration of Circular Economy Principles in Islamic Leadership Training Activities

The Islamic Leadership Training at Muhammadiyah 4 Surabaya Elementary School integrates the Circular Economy principles as part of its religious co-curricular activities. The Islamic Leadership Training aims to build students' leadership, environmental responsibility, and Islamic character. The implementation of Circular Economy is visible through five main practices known as the 5Rs—reduce, rethink,

reuse, repair, and recycle (Mulyanto, 2024). These principles are applied in every stage of the training, both in preparation and during Islamic religious activities.

Students are encouraged to bring their own utensils, use refillable bottles, and minimise food waste (reduce). The committee promotes creative rethinking of materials by designing games and leadership exercises using recycled items (rethink, reuse). Damaged equipment is repaired and reused in subsequent programs (repair), while remaining materials are processed for recycling (recycle). These actions represent the school's effort to link environmental responsibility with Islamic values of moderation (*wasathiyah*) and stewardship (*khalifah fil ardh*) (Juwita, 2017).

This integration is not only practical but also educational. Teachers relate the Circular Economy principles to Qur'anic teachings on maintaining balance in nature and avoiding wastefulness (QS. Al-A'raf: 31). Thus, Islamic Leadership Training becomes a contextual platform for implementing Islamic environmental ethics in daily school life.

The integration of climate change education into religious activities at this school is evident through efforts to link religious teachings with awareness of environmental preservation, leading to a sustainable way of life. In the lessons and other religious activities, students are taught that taking care of the Earth is part of their religious duty (Nasution, 2024). The act of caring for the Earth can begin with small, continuous actions, emphasising *istiqamah* (steadfastness).

Implementation of Circular Economy Principles in Islamic Religious Activities

The Islamic Leadership Training at Muhammadiyah 4 Surabaya Elementary School serves as a religious co-curricular program that integrates climate change education through the principles of the Circular Economy: rethink, reduce, reuse, recycle, and repair (5R). The program rigorously applies these principles through structured worship routines, formal learning contracts, guided material discussions, collaborative problem-solving sessions, concise three-minute religious lectures, communal dining practices, and leadership-focused outbound activities (Rahmania, 2024).

According to Purnomo (2024), the vice principal, integrating Circular Economy into all school activities demonstrates the school's commitment to becoming a Circular School. Students are habituated to bring reusable water bottles and lunch boxes (reduce/reuse) and to dispose of used plastic bottles in designated Sebotik bins (recycle). This shows that climate change education can be effectively implemented through Circular Economy principles, even in religious contexts. The Islamic Leadership Training also includes a special session titled "Muhammadiyah and the Environment" (rethink), designed to prepare students as future leaders with environmental piety.

During the session, the speaker reminded students of their role as *khalifah fil ardh* (stewards of the Earth), emphasising that protecting nature is an act of obedience to Allah. Conversely, harming the environment means neglecting divine commands (Observation, October 4, 2024). This message aligns with the Qur'anic principle in QS Al-A'raf: 56, which prohibits causing harm and destruction on Earth.

The discussion and problem-solving sessions also covered climate change topics, encouraging students to identify causes and propose solutions. Students were guided to rethink their daily actions to mitigate environmental impacts. When presenting their group findings, they discovered new insights—such as how the school's digital management system and use of solar panels reflect environmental protection efforts.

Some students also expressed new commitments to reducing single-use plastics and bringing reusable bags when shopping (Observation, October 3, 2024).

In the Islamic religious lecture (*tausiyah*) session after prayer, a student delivered a short sermon on environmental conservation, linking faith and ecological responsibility: "Allah entrusts humans to protect the Earth from harm" (Tsabita, 2024). This illustrates how students internalise *akhlak al-biah* (environmental ethics) through Islamic teachings in daily practice.

On another occasion, a teacher gave a sermon on Circular Economy principles using the example of Umar bin Khattab, who repeatedly repaired his clothing to avoid waste—an example of the reuse and repair principles in action. Such religious narratives reinforce discipline and simplicity (*zuhd*) and the Islamic value of moderation (*wasathiyah*).

Throughout the Islamic Leadership Training, the committee applied Circular Economy practices in logistical arrangements. Reusable eating utensils were provided to minimise disposable waste. Students were encouraged to take only as much food as needed to reduce leftovers. Drinking water was supplied in gallon dispensers for bottle refills, decreasing the use of single-use plastics. Students who forgot their tumblers were required to collect and return their disposable bottles for recycling (Observation, October 3, 2024).

The leadership's outbound activities also reflected Circular Economy principles by reusing existing materials rather than purchasing new ones. For example, games utilised students' old hangers, recycled bottles, and pencils (Debby, 2024).

Documentation in the Islamic Leadership Training handbook also demonstrated circular principles in its learning contract, which included commitments such as bringing personal tumblers and minimising food waste. These agreements cultivate responsibility, self-control, and environmental awareness consistent with Islamic values of stewardship and cleanliness (*nazhafah*).

The integration of Circular Economy principles in Islamic Leadership Training demonstrates that Islamic religious activities can be powerful vehicles for environmental education. The findings reveal that the 5R framework aligns naturally with Islamic teachings on moderation and care for creation. This approach supports previous studies that link religious values with pro-environmental behaviour (Altmeyer, 2021; Nche, 2023).

The combination of ibadah (worship), leadership, and environmental responsibility represents an Islamic adaptation of Ajzen's Theory of Planned Behaviour, where attitude and perceived responsibility influence behavioural change. As Goulah (2017) emphasised, integrating ecological identity into religious education strengthens students' moral awareness and action. In this study, students not only gain environmental knowledge but also express it as an act of faith—turning sustainability into ibadah.

Mapping the Implementation of Climate Change Education in Religious Activities Based on a Circular Economy

This section categorises Islamic Leadership Training activities that implement circular principles, based on data from observations, interviews, and documentation. The results of this study show at least 20 types of activities that integrate climate change education into the co-curricular religious activities of Islamic Leadership Training, which apply

Circular Economy principles at Muhammadiyah 4 Surabaya Elementary School. The Islamic Leadership Training activities that integrate climate change education (adaptation and mitigation) through Circular Economy principles include: learning contracts, Muhammadiyah and the Environment materials, problem-solving discussions and presentations, seven-minute lectures, meals, and outbound activities.

Table 1. Mapping the implementation of adaptation and mitigation through circular economy principles in Islamic leadership training activities

Activity	Implementation	Adaptation/ Mitigation	Circular Principle
Learning Contracts	Agreement to bring a tumbler during activities to reduce single-use bottles	Mitigation	Rethink, Reduce
	Agreement to take only as much food as needed and be responsible	Mitigation	Rethink, Reduce
	Some students who had to use single-use water bottles because they forgot their tumbler must be responsible for collecting the bottles and bringing them back to school for recycling	Mitigation	Recycle
Muhammadiyah and the Environment	Discussing with students the importance of being a responsible leader, including caring for the environment	Mitigation	Rethink
	Reflecting on the human duty to protect all creatures on Earth, including nature	Adaptation, Mitigation	Rethink
	Mapping out what Khalifah should do to protect the Earth	Adaptation, Mitigation	Rethink
	Some responses from the discussion include using just enough water for ablution during prayer.	Adaptation, Mitigation	Rethink, Reduce
	Saving energy, such as turning off lights or air conditioning when not needed.	Mitigation	Rethink, Reduce
	Using public transport, like school shuttles, to reduce carbon emissions	Mitigation	Rethink, Reduce
	Problem-Solving Discussions & Presentations	Discussing climate change issues, causes, and solutions	Mitigation
Three-Minute Lectures after Prayer	Students learned that the school's digital program and use of solar energy are also efforts to protect the environment.	Adaptation, Mitigation	Rethink, Reduce
	Students began to commit to reducing the use of single-use plastic bags and bringing cloth bags when shopping.	Mitigation	Reuse, Reduce
	<i>Kultum</i> conveyed a religious message that consistently instils values of goodness, including environmental care	Mitigation	Rethink
Meals	Encouraging the use of items for a long time, citing the example of Khalifah Umar bin Khattab, who repaired his clothes several times	Mitigation	Repair
	The committee provided reusable	Mitigation	Reduce, Reuse

	plates, glasses, and spoons to be washed and reused.		
	Students were encouraged to take their food responsibly to avoid the irresponsible disposal of organic waste.	Adaptation, Mitigation	Reduce
	The committee provided water in gallon containers to refill student bottles, reducing the use of disposable bottles.	Adaptation, Mitigation	Reduce, Reuse
Outbond	Relay race using students' <i>sarung</i>	Adaptation	Reduce, Reuse
	A clothes hanger relay game that uses the teacher's clothes hangers, so there's no need to buy new items	Adaptation	Reduce, Reuse
	The pencil-in-the-bottle game used students' pencils and recycled bottles	Adaptation	Reduce, Reuse

Source: Research observation results

Impact of Integrating Climate Change Education in Islamic Religious Activities with Circular Economy principles

The implementation of Circular Economy principles in religious activities has a significant impact on students' understanding and behaviour, in line with the objectives of climate change education, which include three aspects: reasoning, social-emotional development, and action (Sekarwulan et al., 2024).

First, reasoning: developing students' knowledge and scientific thinking skills to face the challenges of the climate crisis. In religious activities that integrate Circular Economy principles, students are trained to rethink the impacts of the climate crisis and consider what adaptations and mitigations can be made as khalifah on Earth. Activities such as discussions and problem-solving, presenting material on the correlation between religion and the environment, or three-minute lectures after prayers are some examples.

Zainiyati et al. (2024) said that Islamic reflection and discussion are one of the solutive strategies to affirm the religiosity of students. Discussion about the duties of a Khalifah towards nature is also included. Discussions and problem-solving, presenting material on the correlation between religion and the environment, or three-minute lectures after prayers are solutive strategies to increase scientific and religious thinking skills.

Second, social-emotional development: encouraging the growth of attitudes and character that enable collaboration, negotiation, and communication in responding to the climate crisis. This includes building self-reflection skills, values, attitudes, and motivation to develop students' capacity to address the climate crisis. This is implemented through outbound activities and reflection on nature (rethink), fostering attitudes of care for nature by saving water or electricity (reduce), and maintaining nature through simple habits such as reusing what is available (reuse).

The third aspect, action, aims to empower students to take collective action in addressing the climate crisis and build a low-carbon lifestyle in accordance with the context of their local environment. Since Islamic Leadership Training is a leadership activity, students are trained to become leaders who care about climate change, starting with leading themselves (Islam et al., 2021). Students are also encouraged to collaborate in addressing the climate crisis by creating action plans during discussions and problem-solving activities.

Integration of Circular Economy Principles in Islamic Leadership Training

Three theoretical perspectives support the integration of Circular Economy principles within Islamic Leadership Training. *First*, the Religious-Based Character Education Theory Al-Attas (1999); Tilaar (2002) emphasises the spiritual and moral dimension of learning, where adab (ethical conduct) and divine consciousness guide the pursuit of knowledge and shape behaviour. According to Al-Attas (1999), education (*ta'dib*) is the process of instilling wisdom and justice, aligning human conduct with divine order. Similarly, Tilaar (2002) views education as a moral and social transformation rooted in values and national spirituality. These principles reinforce the moral framework of Islamic Leadership Training, which positions environmental responsibility as an act of ibadah (worship) and moral obligation. *Second*, Ajzen's (1991) Theory of Planned Behaviour explains that environmental awareness and perceived behavioural control influence students' intention to act sustainably, a pattern clearly observed in their daily school behaviour. *Third*, the pedagogical theory of the Circular Economy Van Buren et al. (2016); Yuana et al. (2024) emphasises efficiency, reflection, and innovation, transforming learning into an active, solution-oriented process that fosters sustainability. Together, these frameworks demonstrate that the integration of Circular Economy principles in Islamic Leadership Training is not merely practical but also moral, cognitive, and transformative—bridging faith, knowledge, and environmental ethics.

Educationally, this integration resulted in three main impacts on students. First, in the cognitive dimension, students developed critical awareness of environmental issues, including the relationship between human actions, climate change, and Islamic stewardship. Reflection and discussion sessions enhanced their analytical and problem-solving skills. Second, in the behavioural dimension, students adopted sustainable habits such as reusing materials, repairing items, and reducing waste—consistent with Ajzen's behavioural change theory. Third, in the social and spiritual dimension, students began to demonstrate environmental piety, applying these habits beyond school and influencing their families to live more sustainably. This integration of faith and action nurtures *akhlaq al-biah*—ethical responsibility toward the environment grounded in Islamic teaching.

These findings extend previous research on the relationship between religion and environmental awareness. Nche (2023) found that churchgoers in Christian contexts exhibit strong ecological engagement, while Ecklund et al. (2016) and Altmeyer (2021) emphasised moral stewardship in religious education. However, this study advances the discussion by situating environmental stewardship within Islamic elementary education through a religious co-curricular framework. It also supports Goulah (2017) argument that religious and ecological identities can develop simultaneously, affirming that Islamic pedagogy provides a practical foundation for sustainability education. Thus, this study fills a gap in the literature by mapping how Circular Economy principles can be operationalised within faith-based elementary education to foster environmental awareness and moral formation.

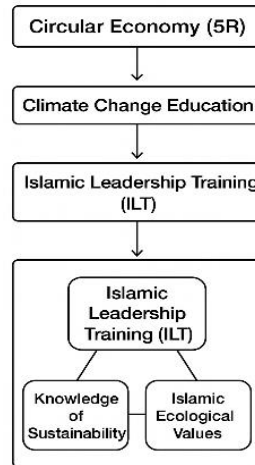


Figure 1. Integration of circular economy principles in Islamic leadership training

Reflection on the replication potential shows that this model can be adapted in other Islamic schools, provided there is adequate teacher readiness, institutional support, and a school culture that values sustainability as part of Islamic character formation. These factors are crucial for ensuring consistent application and long-term effectiveness. The integration of Circular Economy principles in Islamic Leadership Training demonstrates that environmental education can be both spiritually grounded and practically achievable within the Islamic schooling system.

Student Understanding Before and After Islamic Leadership Training

The analysis of students’ responses before and after the Islamic Leadership Training shows a clear improvement in their understanding and awareness of sustainability and Islamic responsibility toward the environment. Three key domains were measured: knowledge of the Circular Economy (5R) principles, attitude toward the environment, and religious responsibility as stewards of nature.

Table 2. Student’s understanding before and after Islamic leadership training

Dimension	Before	After
Knowledge of 5R	2.3	4.8
Attitude toward the environment	2.6	3.7
Religious responsibility	2.0	3.6

1. Knowledge of 5R Principles

Before the Islamic Leadership Training, most students had a limited understanding of the 5R principles — reduce, reuse, recycle, repair, and rethink. Their answers generally associated environmental care only with “not littering” or “cleaning the classroom.” Few students could identify how the 5R concepts applied to daily life or school activities. After participating in Islamic Leadership Training, the majority demonstrated improved conceptual understanding. They were able to explain each 5R component correctly and provide concrete examples, such as bringing reusable bottles and lunchboxes (reduce and reuse), collecting plastic waste for recycling, and repairing broken learning tools instead of discarding them. This indicates that Circular Economy-based instruction within Islamic Leadership Training effectively enhanced students’ environmental literacy and practical reasoning.

2. Attitude Toward the Environment

Students' environmental attitudes also shifted significantly. Prior to Islamic Leadership Training, their responses reflected a passive awareness — they knew environmental cleanliness was important, but often viewed it as the school's or teachers' responsibility. After the training, students exhibited a stronger sense of ownership and initiative. Many expressed motivation to act sustainably both inside and outside school, such as conserving water, reducing paper waste, and encouraging peers to reuse materials. The shift from passive to proactive attitude suggests that Islamic Leadership Training experiential approach — combining reflection, teamwork, and daily application of the 5R — successfully fostered an emotional and behavioural connection with environmental values.

3. Religious Responsibility

In the pre-training responses, students tended to separate environmental actions from their religious obligations. When asked about stewardship (*khalifah fil ardh*), most linked it only to prayer or charity. After the Islamic Leadership Training, students increasingly associated environmental care with fulfilling Allah's command to protect creation. They referred to Quranic values such as *amanah* (trustworthiness) and *ihsan* (doing good) as reasons for adopting eco-friendly habits. Some even mentioned that damaging the environment contradicts Islamic teachings. This transformation shows that integrating Circular Economy principles within faith-based education can internalise ecological ethics as part of spiritual character formation.

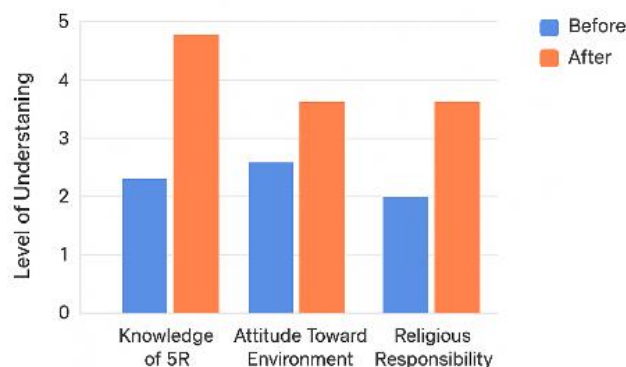


Figure 2. Students' understanding before and after Islamic Leadership Training

Overall, students' understanding evolved from awareness to action, demonstrating both cognitive and affective growth. The integration of Circular Economy principles into Islamic education through Islamic Leadership Training enabled students to translate environmental knowledge into moral behaviour. The findings align with Tilaar (2002) religious-based character-education theory, which emphasises moral internalisation through contextual experiences, and with Ajzen's (1991) Theory of Planned Behaviour, showing that enhanced knowledge and attitude predict behavioural change. In this context, the Islamic Leadership Training model not only strengthened ecological literacy but also linked it to *akhlaq al-karimah* (noble character), supporting the development of environmentally responsible Muslim leaders.

IV. CONCLUSION

This study concludes that the Islamic Leadership Training at Muhammadiyah 4 Surabaya Elementary School effectively applies the principles of the Circular Economy—rethink, reduce, reuse, repair, and recycle (5R)—as an approach to integrate climate change education within Islamic religious activities. These principles are in harmony with Islamic teachings on moderation (*wasathiyah*), balance (*tawazun*), and stewardship (*khalifah fil ardh*), encouraging students to practice environmental care as a reflection of their faith. The inclusion of pre–post student questionnaires strengthens the empirical dimension of this research. Quantitative descriptive data indicate a substantial improvement in students’ understanding and behaviour following Islamic Leadership Training. *First*, Knowledge of the 5R principles increased as students could clearly define each principle and apply it to daily practices such as bringing reusable bottles and repairing school tools. *Second*, environmental attitudes shifted from passive awareness to active responsibility, with most students expressing a more substantial commitment to sustainability after the program. *Third*, Religious responsibility deepened, as students increasingly perceived environmental care as part of their *amanah* (trust) and ibadah (worship).

Theoretically, the study contributes to the development of an interdisciplinary framework that connects religion-based character education, behavioural change theory, and Circular Economy pedagogy. Empirically, it demonstrates that Circular Economy-based religious activities can enhance students' critical thinking, reflective behaviour, and social responsibility, thus forming a sustainable Muslim identity grounded in spiritual and environmental ethics. The novelty of this study lies in presenting a systematic and replicable model for integrating Circular Economy principles into Islamic co-curricular education at the elementary level. This model enriches the literature on Islamic education and sustainability by positioning environmental stewardship as both an ethical and spiritual mandate. Future research is recommended to examine the long-term impact of this model in different institutional contexts and to develop instruments for assessing Islamic-based sustainability learning outcomes.

V. REFERENCES

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