Creative Education, 2026, 17(3), 423-447
https://www.scirp.org/journal/ce
ISSN Online: 2151-4771
ISSN Print: 2151-4755

Growing Green Minds: Stakeholders' Perspectives on the Development of Environmental Literacy in Tanzanian Primary Schools

Esther Kibga, Jane Rarieya

Institute for Educational Development, The Aga Khan University, East Africa, Dar Es Salaam, Tanzania
Email: esthger.Kibga@aku.edu

How to cite this paper: Kibga, E., & Rarieya, J. (2026). Growing Green Minds: Stakeholders' Perspectives on the Development of Environmental Literacy in Tanzanian Primary Schools. *Creative Education, 17,* 423-447.
https://doi.org/10.4236/ce.2026.173026

Received: January 27, 2026
Accepted: March 17, 2026
Published: March 20, 2026

Abstract

This study explores the integration of literacy and environmental education in Tanzanian primary schools through the *Growing Green Minds* (*RESCUE*) project. Guided by sociocultural and place-based learning theories, the research aimed to assess stakeholder perspectives, co-design practical models, and evaluate system resilience in supporting literacy-environment innovations. A mixed-methods approach was employed, combining surveys of 597 pupils and 24 teachers, a multi-stakeholder co-design workshop, and administration of the Educational Systems Resilience Scorecard. Quantitative data were analyzed using SPSS, while qualitative reflections, workshop outputs, and discussions were thematically examined with NVivo. Findings reveal strong enthusiasm for integrating environmental themes into literacy practices. Statistically, 72% of pupils preferred nature-related stories, 68% identified lack of outdoor reading spaces as a barrier, and 77% of community leaders expressed willingness to provide resources, though only 40% felt clear about their roles. Teachers emphasized the need for structured materials, with 80% reporting insufficient resources despite their readiness to embed environmental learning. Workshop outputs produced innovative prototypes such as recycled-bottle irrigation systems and nature storytelling models, demonstrating creative, low-cost strategies for linking literacy with environmental awareness. Scorecard results indicated moderate institutional readiness but significant gaps in climate preparedness, inclusivity, gender-sensitive planning, and teacher training, with particularly low scores in aspects addressing school accessibility (avg. 0.925) and gendered impacts on attendance (avg. 1.525). The study concludes that reading gardens and clubs hold substantial promise as catalysts for integrated literacy and environmental education. However, investments in teacher professional

development, community role clarification, inclusive planning, and climate resilience measures are imperative to achieve sustainability. By embedding literacy practices in ecological contexts and aligning them with resilience priorities, the RESCUE model can contribute meaningfully to both SDG 4 (Quality Education), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action) in Tanzania and beyond.

Keywords

Environmental Literacy, Reading Gardens, Reading Clubs, Mixed-Methods, Tanzania, Educational Resilience, Community Engagement

1. Introduction

Education systems everywhere are under pressure to give students the information, abilities, and attitudes they need to act for the benefit of people and the environment. By 2025, nations are urged to make environmental education a mandatory part of their curricula, as part of UNESCO's Education for Sustainable Development (ESD) agenda (UNESCO, 2021). This means integrating community partnerships, school environments, operations, and teaching and learning into a cohesive "whole-school/whole-institution" strategy (Holst et al., 2024). Within this agenda, school/reading gardens and reading clubs provide useful, affordable platforms that foster environmental awareness and literacy at the same time (UNESCO, 2025).

Reading and environmental inquiry can be combined on school grounds to maximize the benefits of nature-based and outdoor learning, which have been shown to increase learner engagement, support academic outcomes, and strengthen social-emotional development (Iyengar & Kwauk, 2021; Meiklejohn et al., 2021). While school-garden programs promote motivation, sustainability awareness, and health, recent systematic reviews show quantifiable increases in socio-emotional well-being and signs of academic benefits when learning takes place in natural settings (Kos & Jerman, 2019). On the other hand, in the context of literacy, reading clubs and group book reading programs have demonstrated potential for enhancing attitudes towards reading and the development of reading skills, particularly when they are based on cultural and contextual factors (Smith et al., 2022). Recent trials and syntheses have shown that literacy-focused, community-engaged programs can produce significant reading improvements in multilingual or resource-constrained contexts, which are common in many African primary schools (Gove et al., 2017).

At the same time, school gardens are becoming increasingly acknowledged as living laboratories for sustainability, where students can read, write, observe, and act on environmental issues and be pedagogical spaces. Garden-based learning has been linked in recent reviews and studies (2019-2025) to enhanced wellbeing, food/climate literacy, and authentic, place-based inquiry (Carter et al., 2024;

Meiklejohn et al., 2021). This reinforces literacy practices (e.g., journaling, informational texts, storytelling) through everyday encounters with ecological phenomena (Gamage et al., 2022). However, rather than relying on extracurricular activities, incorporating these insights into regular school practice calls for a comprehensive approach. To move from isolated projects to system-embedded practice, current guidance stresses whole-school/whole-institution approaches that integrate sustainability into curriculum, pedagogy, campus design/operations, governance, and community links (Holst et al., 2024). New research shows that these methods can be used as process indicators for organizational development and are quantifiable and successful for high-quality sustainability learning (Carter et al., 2024).

Portal Within this global and regional framework, the Growing Green Minds (RESCUE) program addresses a local need: integrating environmental literacy into primary education by combining reading clubs and reading gardens and involving educators, pupils, parents, and community leaders in school-based innovation. The viewpoints of stakeholders gathered around that endeavor are the focus of this paper. Specifically, school actors' perceptions of the opportunities, challenges, and needs for integrating environmental literacy into regular literacy practices and promoting a whole-school approach to sustainability are examined. The study intends to support current initiatives to mainstream environmental literacy in curricula and establish Tanzanian schools as centres of environmental stewardship and literacy by elevating local voices and school-ground experiences.

2. Literature Review

2.1. Environmental Education and Climate Change

In the era of the Fourth Industrial Revolution, characterized by anthropogenic impacts, the urgency to address environmental challenges has grown significantly. As noted by Gupta et al. (2018), environmental education serves as a "cornerstone" in tackling the expected environmental uncertainties of this period. The evolving dynamics of climate change and environmental degradation have further highlighted the importance of integrating environmental education into early learning programs. Smith et al. (2022) emphasized the need to merge environmental education with the climate crisis, underlining how outdoor activities and environmental programs can transform learners into the agents of change the world desperately needs. This approach prepares them not only to understand environmental challenges but also to take proactive steps in mitigating them.

Climate change has long been a topic of conversation, often discussed in the media, but young children are seldom engaged with it directly. As Carter et al. (2024) pointed out, although children may hear about climate change through mass media, they are uniquely affected by its consequences. Therefore, introducing environmental education at an early age is crucial to bridge this gap. Doing so would make climate change education more comprehensible to young learners and encourage participatory, affect-driven approaches to addressing environmen-

tal issues. By involving children early on, we can foster a deeper connection to the environment, which is essential for cultivating lifelong awareness and action.

Meiklejohn et al. (2021) stressed the importance of climate-informed environmental education, recognizing that children are not just growing up in an era of climate change, but are also living through its direct impacts. Therefore, it is critical to involve them in a curriculum that emphasizes environmental stewardship through a climate-focused lens. By making environmental education more relevant to the realities of climate change, children can begin to understand the intricate links between human actions and environmental consequences. This knowledge empowers them to take responsible actions as they grow older. In agreement, Stage et al. (2025) asserted that early exposure to climate change education fosters sustainable behaviours that persist into adulthood. Children who are taught from an early age about the importance of environmental conservation are more likely to adopt environmentally responsible behaviours as adults, contributing to the creation of a more sustainable world. The integration of environmental education in the early years, especially when coupled with a strong emphasis on climate change, ensures that young learners grow into environmentally conscious individuals.

This project aims to assist teachers and learners in addressing environmental issues by encouraging collaboration with the local community. By engaging in the three pillars: teachers, learners, and the community, schools can create a supportive environment for tackling local environmental issues. Collective thinking and action among these groups are essential for generating feasible, long-term solutions to environmental challenges. In doing so, they can build a stronger, more resilient community capable of addressing both local and global environmental concerns effectively.

2.2. The Role of Reading in Sustaining a Green Environment

Reading is an essential tool in children's learning and development, fostering cognitive, emotional, and social growth and a foundational skill for overall academic achievement (Hamad et al., 2024). Research indicates that by improving learners' linguistic competencies, reading can have a long-lasting and far-reaching impact on the child (Holst et al., 2024). While this is true, reading makes a difference in a person's life when they engage with the text and construct meaning out of it. Reading materials play a big role in promoting environmental conservation and responsible behaviour towards nature (Ly & Vella-Brodrick, 2024; Ochoa et al., 2019). Literature that contains environmental themes ignites critical thinking skills in readers, improving their understanding of the world around them. For this reason, scholars advocate for integrating reading into school culture to increase student engagement and help children apply their knowledge and skills in real-life situations (Barrable et al., 2022; Kos & Jerman, 2019). However, this application of knowledge requires helping learners explore the relationship between their lived experiences and prior knowledge with text information. This is done

through critical discussions, reflections, and connections between theoretical knowledge and practical activism (Bascopé & Reiss, 2021), fostering a deeper understanding of environmental issues. Despite the importance of reading, schools often fail to provide enough time and opportunity for children to read, leading to "*readcide*", the systematic killing of the love of reading (Zelenika et al., 2018). This shows the necessity for teachers to reflect on their practices and create an environment that inculcates a love for reading in learners to promote awareness of environmental preservation. By integrating reading into education and making it a joyful experience, future generations can be empowered to address ecological challenges and sustain a green environment.

2.3. Importance of Reading in Schools

Reading is a key skill in the formation of children's environmental values and attitudes (Li & Zhan, 2022). Despite the numerous challenges the world is faced with resulting from environmental degradation, basically, children have limited access to environmental education as it is not a priority in schools. Much as it is integrated into core subjects like math, science and language, often, the focus is on the subjects and not environmental education. This calls for a deliberate effort to take action to identify opportunities for learners to interact with environmental concepts necessary for them to understand and develop a sense of responsibility for the world around them. Reading presents the best opportunity for children to expand their understanding of environmental concepts and to instill a sense of reverence for the environment. According to Ly and Vella-Brodrick (2024), reading fiction, particularly, influences children's environmental values by fostering connections to nature through storytelling. In this way, narratives possess the capacity to engage children on both emotional and intellectual levels, thus making them relate to environmental issues and understand them more easily.

In today's world, where many children, especially in urban areas, have limited direct experiences with nature, reading can provide a means to engage with nature. Studies suggest that individuals, particularly children, spend less time outdoors due to safety concerns and technological distractions (Chawla & Joshi, 2021). Making a reading garden in a school yard is a good substitute for imparting environmental awareness in children. While a lack of experience in nature presents a deep concern, further studies observe that the decline in biodiversity and green spaces also has a great impact on the mental and physical health of children (Barrable et al., 2022; Holloway et al., 2023). This implies that reading in a specially designated garden offers multiple benefits to the individual reader as well as the community. These benefits are not only limited to the development of literacy skills but also offer opportunities for learners to explore ideas they have never encountered in real life. This provides a perfect feeling for the environment in both the imaginary and the real world, as well as giving them health benefits. Much as reading may not replace the experiences of a live interaction with nature, it can tickle the imagination and trigger curiosity, leading to a desire to explore nature.

Based on the literature above, early exposure to environmental concepts through reading is crucial for developing informed, responsible citizens capable of taking action to solve environmental issues. Experimental studies show that climate fiction can effectively persuade readers to adopt eco-friendly behaviours (Tharrey et al., 2019). Furthermore, Maspul (2024), postulates that informational picture books play a crucial role by providing actionable tasks that encourage critical engagement and personal responsibility towards environmental issues. In the same way, Trott et al. (2023) argues that literary forms not only inform but also inspire readers to take meaningful actions against climate change, creating a culture of environmental stewardship. All these views imply that introducing environmental themes in books in an engaging and accessible way empowers children to make a positive impact on the planet. While reading is essential, it should complement direct experiences with nature, as authentic interactions remain very important in educating the child into a complete environmental understanding. This gap is filled by the creation of a reading garden, which encourages sustainable practices, promoting awareness.

In a nutshell, in the interest of integrating environmental education in teaching and learning, schools must establish ways for students to engage with the natural environment, where learners can actively connect with environmental concepts through experiential learning. The integration of literary exploration and firsthand engagement with the natural world is likely to enrich children's environmental awareness and encourage a more vigorous commitment to taking personal responsibility for the environment around them.

2.4. Theoretical Framework

This study is anchored in Sociocultural Theory, which emphasizes that learning is constructed through social interaction, cultural practices, and the use of shared tools (Vygotsky, 1978). Within the RESCUE project, reading gardens and clubs operate as cultural tools where literacy and environmental knowledge are mediated through dialogue, scaffolding, and collective engagement. Teachers guide pupils in reading and environmental exploration, while parents and community leaders contribute local ecological knowledge, thus situating learning within broader cultural and social contexts. Recent scholarship reinforces that sociocultural approaches strengthen literacy and environmental education by embedding them within community practices and promoting collaborative meaning-making (Pahl & Rowsell, 2020).

Complementing this perspective, Place-Based Learning Theory positions the immediate environment as a dynamic context for authentic, situated learning. By integrating literacy with activities rooted in school gardens and natural spaces, learners not only develop reading and writing skills but also cultivate ecological awareness and stewardship (Gruenewald, 2003; Smith et al., 2022). In the RESCUE initiative, gardens and clubs act as *living classrooms*, where pupils journal plant growth, narrate environmental stories, and engage in collective problem-

solving. Recent research confirms that outdoor, place-based learning enhances academic engagement, socio-emotional development, and environmental literacy, especially in early education settings (Barrable et al., 2022; Chawla & Joshi, 2021). Together, these two theories underscore the project's vision: to foster community-driven, contextually grounded environmental literacy that advances both educational and sustainability goals in Tanzanian primary schools.

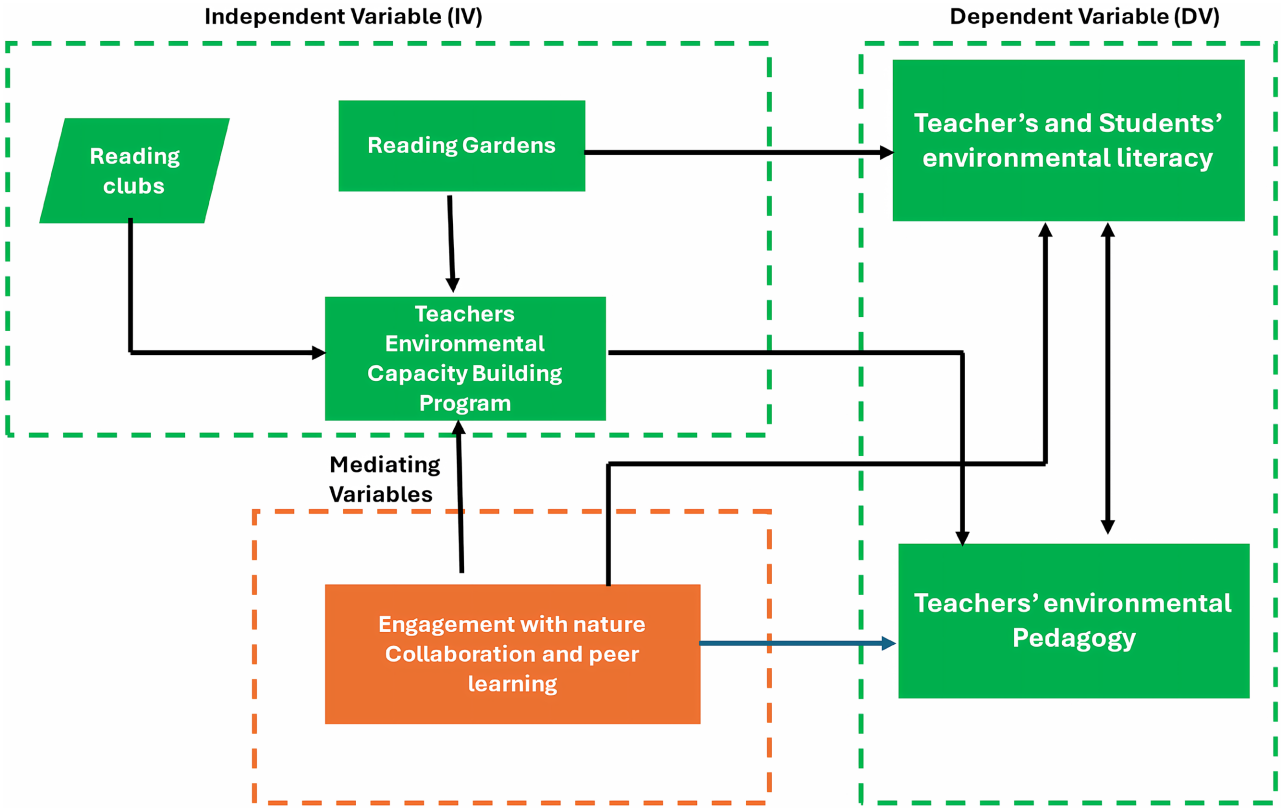

Figure 1. Rescue projects' conceptual framework.

The interaction of variables in the RESCUE project reflects a dynamic relationship between learning environments, pedagogical practices, and community participation Figure 1. The reading club and reading garden (independent variables) provide structured, context-rich spaces where literacy and environmental themes intersect, positioning pupils to develop reading fluency while simultaneously engaging with ecological concepts. These environments stimulate the growth of pupils' environmental literacy and teachers' environmental pedagogical practices (dependent variables) by embedding environmental inquiry within daily literacy tasks, such as journaling, storytelling, or reading nature-focused texts. However, the sustainability and effectiveness of these practices are strongly shaped by community engagement (mediating variable). Parents, school board members, and local leaders supply resources (e.g., books, seedlings, benches), model environmental stewardship, and reinforce cultural relevance, thereby strengthening both the adoption and long-term viability of teacher-led pedagogies. In this way, the inter-

action of these variables illustrates a coherent ecosystem: reading clubs and gardens create the pedagogical platform, teachers and pupils enact environmental learning, and the community anchors these efforts in local realities, ensuring that the integration of literacy and environmental education is both meaningful and sustainable.

3. Methodology

This study is guided by a pragmatic philosophical worldview, which emphasizes the use of multiple methods to best address the research questions (Cameron & Golenko, 2023; Johnson & Christensen, 2017). Pragmatism accepts that no single method is sufficient to capture the complexity of phenomena; instead, it values plurality, practicality, and contextual relevance (Cameron & Golenko, 2023). In the context of this study, pragmatism provided the basis for combining qualitative and quantitative strategies to explore how literacy and environmental education can be integrated within Tanzanian primary schools. A mixed-methods approach was employed to gain a holistic understanding of stakeholders' perspectives. This approach allowed the merging of qualitative insights (teachers' and community leaders' reflections, pupils' voices, and workshop prototypes) with quantitative evidence (scores from the Educational Systems Resilience Scorecard). The integration of these two strands offered both depth and breadth, aligning with the study's focus on contextually grounded innovation.

The study adopted a convergent parallel case study design. Three government primary schools in Dar es Salaam were purposively selected as bounded cases. Within these schools, different categories of participants (teachers, pupils, parents, community leaders, and head teachers) were engaged to generate rich, multi-perspective data. The case study design enabled an in-depth exploration of how local contexts shape opportunities for embedding environmental literacy into school practices. The study population comprised stakeholders in three partner schools. Sampling was purposive for school selection, while stratified purposive sampling was applied to recruit adult participants, ensuring representation of teachers (science and language), head teachers, parents, and community leaders. For the pupil survey, simple random sampling within classes was used to avoid bias. In total, 597 pupils from standard I - IV, 44 adult participants (teachers, head teachers, parents, and community leaders) participated across the three schools.

Three complementary data collection methods were used: Needs Assessment Surveys: Structured questionnaires for teachers and pupils captured perceptions of literacy and environmental education, expectations, and resource availability. Workshop Data: During a three-day workshop, participants engaged in design-thinking exercises, group discussions, and prototyping. Data sources included written reflections, recorded discussions, sketches of reading gardens, and structured feedback. Educational Systems Resilience Scorecard: All participants filled out the scorecard, assessing school resilience across domains such as infrastructure, teaching, community support, and climate preparedness. The process was

sequenced as follows: needs assessment conducted before the workshop; workshop co-design sessions held collaboratively; and the scorecard administered on the final day with multi-stakeholder participation.

Data Analysis

Data from FGDs open-ended surveys, workshop reflections, and prototypes were transcribed, coded, and analyzed thematically using NVivo 14. Codes were first inductively generated, emerging themes such as "integration into curriculum" and "resource gaps", then organized into higher-level categories aligned with the theoretical framework. Trustworthiness was enhanced through peer debriefing and triangulation of multiple qualitative sources. Responses from the Educational Systems Resilience Scorecard were entered into SPSS v28. Descriptive statistics include (means, frequencies, and standard deviations) as well as summarized resilience domains across schools. Exploratory factor analysis was performed to identify underlying dimensions of resilience, while cross-tabulations examined variations between stakeholder groups. The results of qualitative and quantitative strands were merged at the interpretation stage. Themes from NVivo were compared against patterns from SPSS to produce a nuanced account of how reading gardens and clubs influence literacy and environmental literacy, moderated by community engagement and system readiness.

4. Findings

The study's findings are given in line with its objective, emphasizing the opinions of stakeholders regarding the use of reading gardens and reading clubs to introduce environmental literacy into Tanzanian primary schools. To ensure clarity and coherence between the research questions, the data gathered, and the emerging themes, each objective is addressed independently. To determine their expectations, perceived gaps, and opportunities for literacy-environment integration, the first objective focuses on assessing the needs of educators, students, and community leaders. The second goal presents findings from the co-design workshop, including stakeholder-generated prototypes, reflections, and collaborative practices. The third goal looks at the Educational Systems Resilience Scorecard results, which provide quantitative proof of the system's preparedness, as well as its advantages and disadvantages in promoting environmental literacy. Collectively, these findings provide a comprehensive view of both the pedagogical and systemic dimensions influencing the implementation of the RESCUE initiative. The thematic presentation of the findings is as follows:

4.1. Perceptions and Gaps in Environmental Literacy

The needs assessment revealed that teachers, pupils, and community leaders recognized the value of environmental literacy but also acknowledged notable gaps in its practice within schools. Among teachers, there was strong enthusiasm for introducing environmental topics into literacy lessons, with 87% of the pupils

(Figure 2) affirming the importance of environmental education and how it can enhance their learning. However, many highlighted the absence of structured teaching materials and curriculum guidance, which made integration inconsistent and often dependent on individual initiative. Teachers repeatedly stressed that without appropriate resources, environmental education risks being "an add-on rather than a core element" of their practice. Pupils expressed a keen interest in nature-related stories and reading tasks, with nearly three-quarters of those surveyed noting they preferred texts that featured plants, animals, or local climate issues. This preference underscores the natural affinity children have for environmental themes, suggesting that literacy development could be significantly strengthened through ecologically relevant content. At the community level, leaders and parents indicated willingness to support school gardens and reading activities, with 77% affirming readiness to contribute seedlings, tools, or labour. However, only 40% felt confident in their roles, revealing a gap in role clarity and structured participation mechanisms.

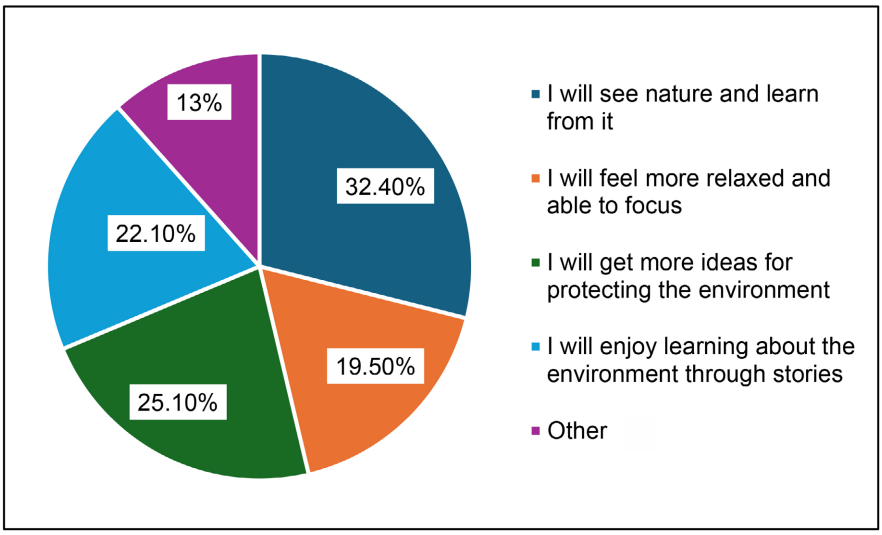

Figure 2. Pupils' views about learning and environment.

These gaps were reinforced during the co-design workshop, where participants openly discussed challenges in integrating literacy with environmental content. Teachers emphasized their struggle to balance curriculum demands with the desire to incorporate environmental issues into daily teaching, echoing the survey's findings on resource scarcity. Pupils, when asked to share their views in group activities, described the lack of designated outdoor reading spaces and the absence of books linking environment to everyday life, reflecting unmet needs for contextual learning. Community members, though enthusiastic, sought clearer frameworks for involvement, noting that while they could provide resources, they were unsure how to align their contributions with school priorities. These reflections, clustered around three dominant categories: *integration challenges*, *learning preferences*, and *community roles*. This triangulation of evidence highlights both

the opportunities for embedding environmental literacy in Tanzanian primary schools and the systemic gaps that must be addressed to ensure sustainable implementation.

4.2. Learning Environments as Catalysts for Integration

The pupils articulated diverse strategies for making reading gardens and clubs vibrant learning environments that blend literacy and environmental education. A majority, approximately 70% in Figure 3, highlighted the importance of *reading stories together* in outdoor settings, noting that shared reading promoted both enjoyment and peer learning. Around 65% emphasized *drawing pictures of what they read about the environment*, suggesting that visual expression reinforced comprehension and stimulated creativity. More than half, about 58%, expressed interest in *learning practical ways to protect nature*, such as watering plants or keeping the school compound clean, linking reading to tangible action. Another 45% underscored the value of *talking about the books they read*, fostering critical reflection and peer-to-peer teaching. Lastly, 40% proposed *playing games related to the environment* as a way of making learning interactive and memorable. These perspectives reveal that pupils view learning environments not simply as spaces for consuming information but as dynamic contexts for collective, playful, and action-oriented literacy practices.

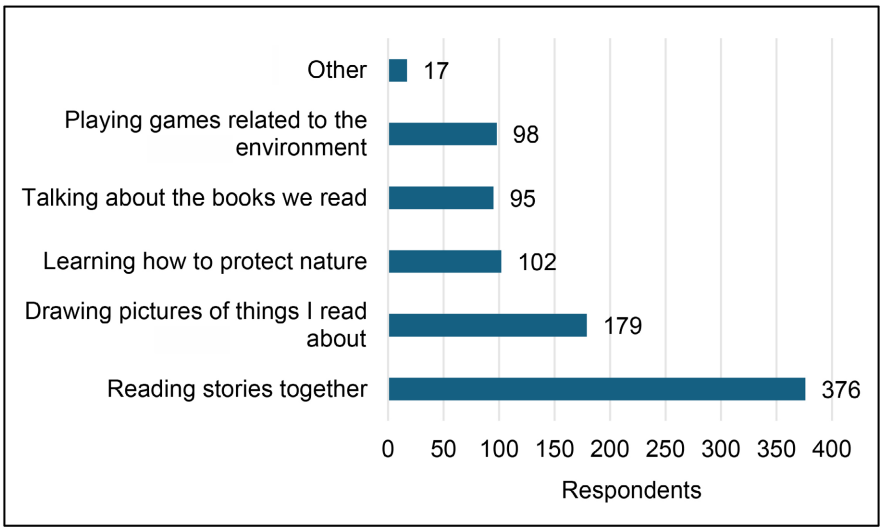

Figure 3. Strategies for making reading gardens and clubs vibrant learning environments.

Teachers similarly recognized the potential of reading gardens and clubs as catalysts for integrating environmental literacy, but their strategies leaned toward structured content and responsible stewardship Figure 4. The majority, about 80%, stressed the importance of *caring for plants and trees in the reading gardens, emphasizing responsibility and modelling* care for the environment. Roughly 75% called for an explicit focus on *reducing pollution and protecting nature*, aligning the literacy spaces with broader sustainability values. A smaller group, around

60%, highlighted the need to introduce *new stories and books about nature*, pointing to the role of diverse reading materials in sustaining interest and broadening environmental understanding. Finally, 50% suggested embedding *fun ways to learn about animals and nature*, for example, through storytelling, riddles, or project-based activities, which could balance enjoyment with knowledge-building. Collectively, these insights reveal that teachers envision reading gardens and clubs as structured, resource-rich platforms for nurturing environmental literacy and shaping eco-pedagogical practices, while also aligning with national curriculum goals.

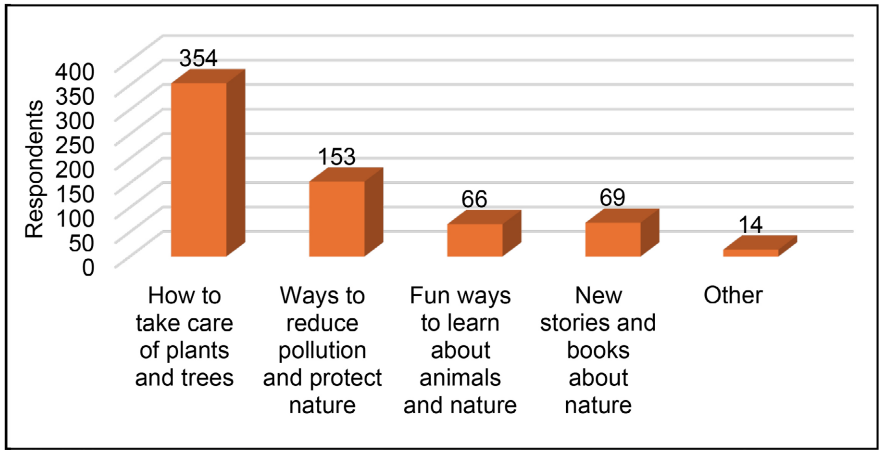

Figure 4. Strategies leaned toward structured content and responsible stewardship.

4.3. Teacher and Pupil Agency

Teachers consistently emphasized that their ability to foster environmental literacy depends on continuous professional learning and adequate pedagogical support. Many teachers noted that agency can be enhanced through ongoing professional development, where they can share practices, access updated resources, and strengthen skills for integrating environmental content into literacy lessons in Figure 5. Within the workshop, over 70% of teachers stressed the importance of having nature-related reading materials to sustain student engagement, observing that such texts motivate learners and provide authentic contexts for literacy. Teachers also highlighted the value of hands-on learning opportunities, such as gardening activities and environmental projects, as strategies for moving beyond rote instruction toward experiential pedagogy. About 65% suggested that dedicating spaces for outdoor lessons under trees or in designated garden areas would help legitimize environmental literacy as part of daily teaching. Furthermore, teachers reported that facilitating outdoor activities could enhance students' connection with nature while also strengthening teacher-learner relationships, as such interactions allow for more relaxed, collaborative forms of engagement. These insights reinforce the importance of investing in teacher capacity-building to ensure that educators are not only confident but also empowered agents of environmental literacy.

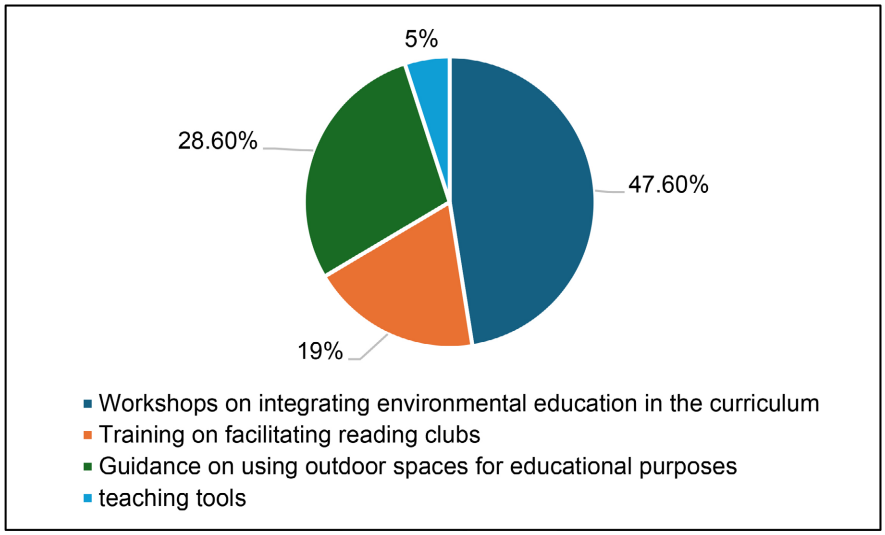

Figure 5. Ways to enhance teacher agency.

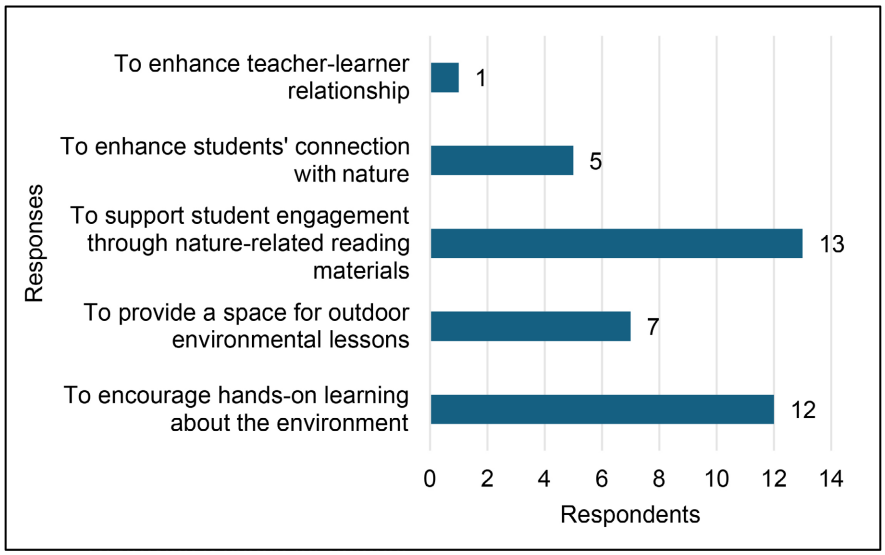

Figure 6. Ways to enhance pupils' agency.

Likewise, pupils demonstrated agency by articulating how they wish to be engaged in environmental learning in Figure 6. During needs assessment discussions, many pupils expressed a desire to read stories about nature, and to complement reading with creative activities such as drawing and storytelling. The coding of pupil reflections highlighted frequent references to "*trees*," "*plants*," *and* "*games*," pointing to their enthusiasm for combining literacy with play and nature. Pupils also advocated for more time outdoors, indicating that lessons held in gardens or under trees made them feel "closer to the environment" and more eager to participate. In workshop group activities, pupils presented prototypes that positioned them as active contributors rather than passive recipients, for example, by creating environmental slogans and designing club routines around planting and storytelling. This demonstrates that pupils are not merely beneficiaries of the RESCUE

initiative but co-creators of knowledge and practice, capable of driving cultural shifts in how literacy and environment are integrated. Their agency, however, is contingent on teachers' willingness to create enabling conditions and on the broader school system's capacity to sustain outdoor literacy environments.

One of the most tangible outcomes of the workshop was the development of creative prototypes that demonstrated how literacy and environmental education could be blended in school settings. Teachers, pupils, and community leaders worked in mixed groups to design models that were both imaginative and contextually grounded. Among these, Group One sketched pupils reading under trees, linking literacy directly to natural spaces, and named their design "Education and Environment" in Figure 7. Group Two proposed a recycled-bottle irrigation system to sustain reading gardens while teaching about water conservation, which they titled "Environment is Life". Group Three created a colourful storytelling prototype where numbers and colors were used to narrate environmental tales, named "A Beautiful Story of Colours". Group Four presented a model showing thriving and withered plants to spark reflection on how environmental conditions affect growth, linking it to literacy through observation and journaling, which they called "Read with the Environment". Collectively, these prototypes illustrated stakeholders' ability to integrate literacy with environmental themes in innovative ways, grounding abstract ideas in practical, low-cost, and culturally meaningful solutions that could be implemented in Tanzanian schools.

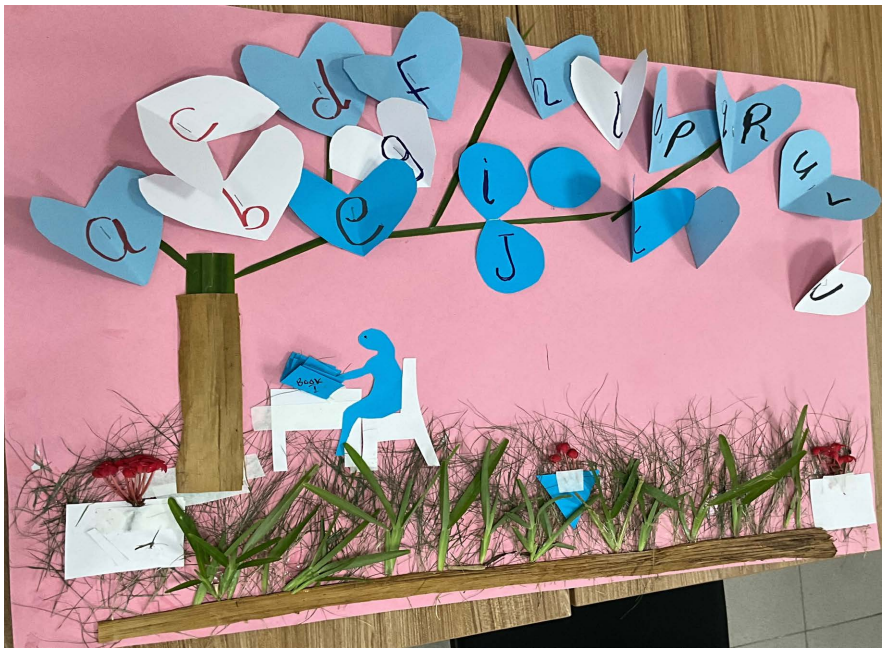

Figure 7. Workshop participants' prototype of a reading garden.

4.4. Community Engagement and Ownership

Community engagement emerged as a cornerstone for sustaining the integration of literacy and environmental education within schools. Parents, school board

members, and local leaders consistently expressed willingness to contribute resources**,** such as seedlings, gardening tools, and even their time, to support the establishment of reading gardens and clubs. During the workshop, community leaders proposed participating in environmental awareness campaigns, storytelling sessions, and maintenance of school green spaces, recognizing their role in reinforcing classroom learning with local practices. However, many highlighted the need for clearer guidance on responsibilities, noting that contributions risk being fragmented or short-lived without structured frameworks. The coding clustered community reflections around themes of *support*, *ownership*, and *role clarity*, underscoring the centrality of coordinated action. Importantly, parents emphasized that children are more motivated to value reading and environmental stewardship when they are visibly engaged in school initiatives. This demonstrates that the success of the RESCUE project hinges not only on teacher and pupil agency but also on community ownership, which provides the continuity, cultural grounding, and resource base necessary for long-term impact.

4.5. System Resilience and Preparedness

The Educational Systems Resilience Scorecard was used to assess how well schools are positioned to maintain education continuity before, during, and after disasters, in line with the 10 Essentials for Making Cities Resilient and the 28 aspects of the scorecard framework. While some domains showed moderate preparedness, six aspects scored particularly low, highlighting priority areas for action. These were:1.3 Avg 1.625; 2.3: Avg 1.675; 3.2: Avg 0.925; 7.4: Avg 1.9; 7.5: Avg 1.525; 9.2: Avg 1.6 in Table 1.

Table 1. The 10 essentials for making cities resilient and the 28 aspects of the scorecard framework.

Essential	Ref	Question	Avg	SDV
Integration of the education system and governance (Essential 1)	1.1	To what extent is climate science, adaptation, and mitigation integrated into the school curriculum?	3.375	1.11
	1.2	To what extent do climate resilience programs in the education system integrate gender equality?	2.925	1.44
	1.3	To what extent do government systems include the perspectives and insights from representatives of education systems (teachers, administrators, etc.) when developing climate resilience actions (including having a say in climate-related curriculum)?	1.625	1.40
Integration of the education system and disaster scenarios (Essential 2)	2.1	How well is school access and specific student needs considered in climate risk plans?	2.4	1.10
	2.2	To what extent does climate and disaster planning include impacts on the education system's logistics, like transport, roads, and supplies?	2	1.14
	2.3	To what extent does the education system take into account meteorological and/agricultural considerations (for example, temperature, precipitation, shading, and building design)?	1.675	1.19

Continued

Integration of the education system and finances (Essential 3)	3.1	To what extent is the education sector considered part of funding for local and provincial climate resilience actions (including disaster risk reduction activities, evidenced-based curriculum, high-quality instructional materials, building/school adaptations, research, etc.)?	2.1	1.22
	3.2	To what extent are schools allocated funds for climate resilience education and curriculum development?	0.925	0.75
Integration of the education system and land use/building codes (Essential 4)	4.1	To what extent are school facilities compliant with land zoning and building codes related to climate and disaster resilience (including considerations around rising temperatures, extreme flooding, air pollution, etc.)?	2	1.30
	4.2	To what extent are housing, roads, and other community needs considered in land management and zoning plans to support school operations after a disaster?	2.40	1.04
Integration of the education system and ecosystem services (Essential 5)	5.1	To what extent are ecosystem and nature-based solutions to mitigate climate and disaster risks included in curriculum (micro-forests, green roofs, rainwater harvesting, etc.)?	2.025	1.29
	5.2	To what extent does the education system protect ecosystems?	2.75	1.15
Integration of the education system and institutional capacity (Essential 6)	6.1	To what extent can educators access opportunities to build their knowledge of climate resilience and how this can be taught?	2.1	1.61
	6.2	To what extent do the education system policies, plans, and strategies align with provincial and national climate resilience actions?	2.8	0.93
	6.3	To what extent do disasters or climate extremes impact the recruitment, retention, and attendance of teachers?	2.575	1.20
Integration of the education system and societal capacity (Essential 7)	7.1	To what extent do climate extremes or disasters affect school attendance for girls?	2.10	0.99
	7.2	To what extent do climate extremes or disasters affect school attendance for boys?	3.125	1.08
	7.3	To what extent does the education system participate or support community-based climate resilience activities (including opportunities for community education, showcasing climate solutions, etc.)?	2.475	1.00
	7.4	To what extent could students explain to others climate risks and how these could be mitigated?	1.9	1.00
	7.5	To what extent is the community equipped to meet the needs of the education system before, during and after a disaster?	1.525	1.38
Integration of the education system and infrastructure resilience (Essential 8)	8.1	To what extent is climate resilient infrastructure in-place at schools?	1.95	1.16
	8.2	To what extent is school infrastructure able to continue providing education before, during, and after a disaster or climate extreme?	2.625	1.59

Continued

Integration of the education system and disaster response (Essential 9)	9.1	To what extent are early warning systems designed to prepare schools to take early action before an event happens?	3	1.63
	9.2	To what extent are education sector representatives integrated with the emergency management system	1.6	1.18
	9.3	To what extent are emergency plans in-place to allow continuation of education for students before, during, and after a disaster?	2.65	1.25
Integration of the education system and recovery/build back better (Essential 10)	10.1	To what extent do mechanisms exist to learn from the performance of the education system before, during and after a disaster?	2.675	1.68
	10.2	To what extent is data on the impact of climate related events on the education sector collected, analyzed, and used to inform mitigation and adaptation actions?	2.175	1.61
	10.3	To what extent do plans and strategies exist to mitigate long-term impacts of disasters and other climate risks on the education sector?	2.875	1.72

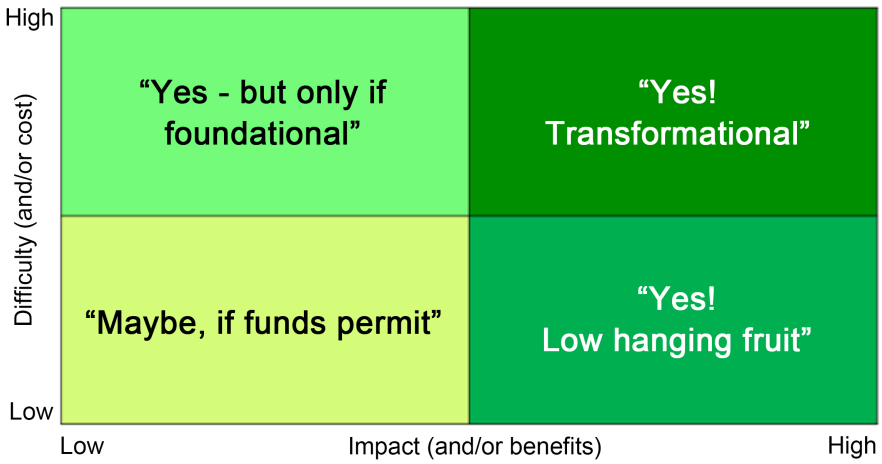

Figure 8. Priority grid.

The priority of action was generated using a priority grid in Figure 8, which helped to systematically rank the six low-scoring aspects of the resilience scorecard according to two main criteria: urgency of the issue (how immediately it affects the continuity of education before, during, and after disasters) and feasibility of intervention (the extent to which schools and communities can realistically take action within their current resources and structures). Each aspect was plotted on the grid, with those rated as both high urgency and high feasibility, such as enhancing climate resilience education funding and improving teacher capacity, being elevated to the top of the action list. Aspects considered highly urgent but less immediately feasible, such as addressing gender-specific impacts and integrating logistics, were also prioritized but framed as requiring stronger institutional and policy-level support. Through this structured approach, the priority grid enabled stakeholders to move beyond general concerns to clear, evidence-informed prior-

ities, ensuring that the action plan focused on interventions most likely to produce tangible and sustainable improvements in resilience.

4.6. Priorities of Action

The findings from the scorecard, especially the low-scoring aspects, were used to generate feasible objectives of implementation using the priority grid in Figure 9. Six clear priorities for strengthening system resilience in the education system emerged:

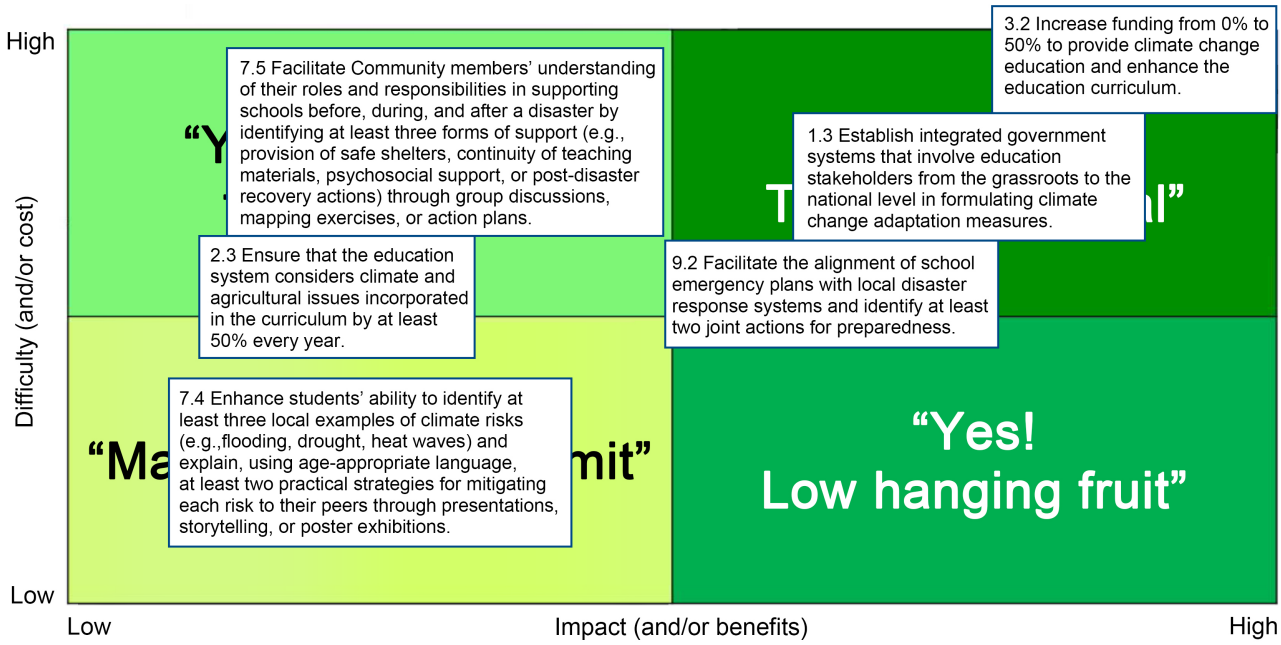

Figure 9. Priorities of action on the Priority grid.

1) Enhance students' ability to identify at least three local examples of climate risks (e.g., flooding, drought, heat waves) and explain, using age-appropriate language, at least two practical strategies for mitigating each risk to their peers through presentations, storytelling, or poster exhibitions. (7.4; Avg 1.9; SD 1.00).

2) Ensure that the education system considers climate and agricultural issues incorporated in the curriculum by at least 50% every year. (2.3; Avg 1.675; 1.19).

3) Facilitate the alignment of school emergency plans with local disaster response systems and identify at least two joint actions for preparedness. (9.2; Avg 1.60; SD 1.18).

4) Facilitate Community members' understanding of their roles and responsibilities in supporting schools before, during, and after a disaster by identifying at least three forms of support (e.g., provision of safe shelters, continuity of teaching materials, psychosocial support, or post-disaster recovery actions) through group discussions, mapping exercises, or action plans. (7.5; Avg 1.525; SD 1.38).

5) Establish integrated government systems that involve education stakeholders from the grassroots to the national level in formulating climate change adaptation

measures. (1.3; Avg 1.625; SD 1.40).

6) Increase funding from 0% to 50% to provide climate change education and enhance the education curriculum (3.2; Avg 0.925; SD 0.75).

5. Discussion

Our findings portray schools as fertile ground for integrating literacy and environmental learning when the work is anchored in authentic spaces (gardens, courtyards, shade trees) and co-owned by teachers, pupils, and community actors. Pupils' strong preference for nature-themed texts and activities (Meiklejohn et al., 2021), teachers' enthusiasm tempered by resource gaps (Mhlongo et al., 2023), and communities' readiness to contribute if roles are clear collectively suggest high latent demand for a whole-school approach to environmental literacy (Sedo, 2011). This aligns with the Education for Sustainable Development (ESD) 2030 agenda and the Greening Education Partnership, which call for mainstreaming sustainability across curriculum, campus, and community rather than treating it as an add-on (Tharrey et al., 2019).

Placing reading in nature-rich settings appears to magnify engagement and comprehension while making environmental concepts concrete (Marzuki et al., 2024). International syntheses of outdoor learning report benefits for engagement, motivation, and ownership of learning, which are precisely the patterns we observed when pupils proposed shared reading, environmental games, drawing, and book talks in the garden. School-garden literature likewise points to gains in motivation and place-based meaning-making and documents common barriers (materials, maintenance, role clarity) that mirror our participants' concerns. Early evidence from multi-outcome evaluations further suggests that garden programs can influence climate/food literacy, school motivation, and health (Darling-Hammond et al., 2020; Gamage et al., 2022; Mhlongo et al., 2023), reinforcing our interpretation that gardens function as "living literacy labs" when coupled with texts and reflective writing. In short, the results are consonant with a growing body of work that positions outdoor spaces as catalysts for integrating reading, inquiry, and stewardship (Carter et al., 2024; Marzuki et al., 2024; Meiklejohn et al., 2021).

Teachers in our study voiced confidence in the value of environmental literacy but highlighted a lack of structured materials and guidance for routine integration, leading at times, to "add-on" activities. This echoes recent African and Tanzanian scholarship urging curriculum-embedded, practice-oriented approaches to ESD (AlAli et al., 2023) and calling for teacher capacity-building that blends pedagogy with contextually relevant content. The workshop experience suggests that design-thinking routines (empathize-define-ideate-prototype-test) can translate enthusiasm into concrete, locally viable practices (e.g., recycled-bottle irrigation, talking compounds, nature storytelling). The broader K-12 design-thinking literature reports similar affordances of creativity, empathy, and iterative problem-solving, while also cautioning that impact depends on supports such as time, facilitation, and resources, all of which teachers in our context requested (Li &

Zhan, 2022).

From a literacy standpoint, structured pedagogy and reading-enrichment efforts in sub-Saharan Africa continue to show that improvements hinge on materials + training + practice (Holst et al., 2024). While many interventions target classroom decoding and comprehension, our results suggest an adjacent, complementary pathway: pairing reading materials with place-based environmental experiences to deepen relevance and motivation. Evidence from recent randomized and quasi-experimental work on literacy programming in the region underscores that teacher training and community components can strengthen uptake, an insight that supports our emphasis on professional development and family engagement as levers for sustained change (Chimbutane et al., 2026).

Pupils' proposals shared reading, drawing what they read, environmental games, and practical stewardship tasks reflect an appetite for co-creating literacy experiences that are active, social, and embodied. Reviews of outdoor and student-centered learning associate these features with improved academic and affective outcomes, and our NVivo analysis captured similar themes (ownership, joy, collaboration). According to Mann et al. (2022), these results support treating pupils not just as beneficiaries but as co-designers of reading clubs and garden routines (e.g., pupil librarians, eco-monitors, peer storytellers). Such roles can nurture environmental identity and transferable skills while amplifying reading volume and talk, cornerstones of literacy growth (Carter et al., 2024).

Community willingness to provide seedlings, tools, time, and storytelling emerged as a decisive moderator: where roles and routines are explicit, gardens and reading clubs are more likely to be established and maintained; where they are not, efforts stall. This finding dovetails with UNESCO's call to extend ESD beyond the classroom to families and local organizations and with resilience guidance emphasizing community school compacts for preparedness and continuity (UNESCO, 2021, 2025). Notably, our stakeholders asked for simple agreements clarifying who contributes what (e.g., watering schedules, book donations, weekend access), a low-cost governance move likely to stabilize fledgling initiatives (UNESCO, 2021).

Scorecard results pinpoint systemic bottleneck funding for climate-resilient education (1.3), community readiness across disaster phases (2.3), inclusive access (3.2), education logistics within DRR planning (7.4), gendered impacts on attendance (7.5), and educator training on climate resilience (9.2). These align closely with the UNDRR education scorecard's ten essentials and the broader "all-hazards" Comprehensive School Safety Framework (2022-2030), which stresses governance, safe learning facilities, risk-aware education, and effective preparedness/response mechanisms (UNDRR, 2025). Practically, our data suggest that even highly motivated schools struggle to protect continuity of learning during climate shocks without: 1) micro-budgets for outdoor spaces and materials; 2) explicit inclusion plans (paths, seating, accessible texts); 3) contingency logistics (shelter use, learning kits, comms); 4) gender-responsive measures (safe routes,

Menstrual Hygiene Management (MHM) supplies, flexible attendance); and 5) ongoing teacher training on climate-risk pedagogy. Addressing these gaps converts gardens and clubs from vulnerable projects into resilience assets that can host reading and psychosocial routines during disruptions (Bikos & Papadimitriou, 2017; Stage et al., 2025).

Taken together, the findings support a pivot from discrete activities to whole-school mainstreaming: mapping curriculum links; codifying routines (weekly club agendas, garden literacy journals); aligning operations (watering schedules, shaded seating, signage); and formalizing community roles. This trajectory reflects international guidance that ESD works best when learning, campus, and partnerships are woven together and monitored progress tracked, for example, under SDGs 4.7.1 on policy, curriculum, teacher education, and assessment (UNESCO, 2025). Recent cases of integrated garden programs also show cross-domain benefits (attendance, engagement, confidence, even literacy/numeracy signals) (Iyengar & Kwauk, 2021; Ly & Vella-Brodrick, 2024), reinforcing the plausibility of our stakeholders' aspirations if supports are in place.

Implications

For schools and districts, the immediate implication is to treat reading gardens and clubs as core literacy infrastructure: budget for starter kits (shade, benches, native seedlings, age-level texts), protect time for outdoor reading, and embed simple monitoring (reading logs, participation). For teacher development, create iterative professional learning communities that pair lesson-planning with design-thinking tasks and short "try-reflect-adapt" cycles in the garden; teachers repeatedly asked for materials and collegial support, consistent with regional evidence on what moves practice (Hoadley, 2024). For communities, enact light-touch agreements specifying contributions and schedules; visible community co-ownership correlates with durability. For resilience actors, use the scorecard results to prioritize high-urgency/high-feasibility actions (micro-budgets, inclusion fixes, teacher training), while advocating policy support for harder items (gender-responsive transport and logistics, district-level coordination). These steps align with UNDRR/INEE frameworks and position schools to deliver literacy and continuity during climate stress (INEE, 2022).

In sum, our evidence from the needs assessment, workshop co-design, and scorecard resilience appraisal converges with recent literature: when learning environments are greened and roles are clarified, teachers and pupils can co-construct powerful literacy experiences that also cultivate stewardship; and when systems align policy, resources, inclusion, and training, these experiences are not merely engaging but durably resilient. This is the promise and the work of the "Growing Green Minds" project in Tanzanian primary schools.

6. Conclusion

The RESCUE initiative demonstrates the potential of integrating reading gardens

and clubs as catalysts for both literacy development and environmental literacy in Tanzanian primary schools. Findings from the needs assessment, workshop co-design, and resilience scorecard highlight strong enthusiasm among teachers, pupils, and communities, coupled with critical gaps in resources, role clarity, and systemic preparedness. Teachers identified professional development and materials as central to their agency, while pupils expressed eagerness for interactive, nature-based reading activities that link texts with lived experiences. Community members affirmed willingness to contribute resources but require structured guidance to ensure sustained engagement.

At the system level, resilience gaps related to funding, inclusivity, logistics, and gendered impacts underscore the importance of integrating environmental literacy within broader disaster preparedness frameworks. Addressing these gaps not only supports literacy and stewardship but also strengthens schools' ability to withstand climate-related disruptions.

In conclusion, the project highlights the transformative role of community-driven, place-based, and socially mediated learning environments**.** By embedding literacy practices in ecological contexts, fostering teacher and pupil agency, and aligning with system-level resilience measures, Tanzanian primary schools can be positioned as hubs of literacy, environmental stewardship, and educational continuity. With targeted investment, policy support, and sustained collaboration, the RESCUE model has the potential to be scaled and adapted across the region, contributing to both SDG 4 (Quality Education), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Actions).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Al Hamad, N. M., Adewusi, O. E., Unachukwu, C. C., Osawaru, B., & Chisom, O. N. (2024). A Review on the Innovative Approaches to STEM Education. *International Journal of Science and Research Archive, 11,* 244-252. https://doi.org/10.30574/ijsra.2024.11.1.0026

AlAli, R., Alsoud, K., & Athamneh, F. (2023). Towards a Sustainable Future: Evaluating the Ability of Stem-Based Teaching in Achieving Sustainable Development Goals in Learning. *Sustainability, 15,* Article 12542. https://doi.org/10.3390/su151612542

Barrable, A., Touloumakos, A., & Lapere, L. (2022). Exploring Student Teachers' Motivations and Sources of Confidence: The Case of Outdoor Learning. *European Journal of Teacher Education, 45,* 356-372. https://doi.org/10.1080/02619768.2020.1827386

Bascopé, M., & Reiss, K. (2021). Place-Based STEM Education for Sustainability: A Path Towards Socioecological Resilience. *Sustainability, 13,* Article 8414. https://doi.org/10.3390/su13158414

Bikos, G., & Papadimitriou, P. (2017). Reading Clubs: Current Trends and the Case of Greece. In A. Kavoura, D. P. Sakas, & P. Tomaras (Eds), *Strategic Innovative Marketing* (pp. 735-740). Springer International Publishing. https://doi.org/10.1007/978-3-319-33865-1_90

Cameron, R., & Golenko, X. (Eds). (2023). *Handbook of Mixed Methods Research in Business and Management.* Edward Elgar Publishing. https://doi.org/10.4337/9781800887954

Carter, J., Podpadec, T., Pillay, P., Babayiğit, S., & Gazu, K. A. (2024). A Systematic Review of the Effectiveness of Reading Comprehension Interventions in the South African Multilingual Context. *Educational Research and Evaluation, 29,* 69-103. https://doi.org/10.1080/13803611.2024.2314522

Chawla, D., & Joshi, H. (2021). Importance-performance Map Analysis to Enhance the Performance of Attitude Towards Mobile Wallet Adoption among Indian Consumer Segments. *Aslib Journal of Information Management, 73,* 946-966. https://doi.org/10.1108/ajim-03-2021-0085

Chimbutane, F., Karachiwalla, N., Herrera-Almanza, C., Leight, J., & Lauchande, C. (2026). The Effect of Teacher Training and Community Literacy Programming on Teacher and Student Outcomes. *Journal of Development Economics, 178,* Article ID: 103578. https://doi.org/10.1016/j.jdeveco.2025.103578

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for Educational Practice of the Science of Learning and Development. *Applied Developmental Science, 24,* 97-140. https://doi.org/10.1080/10888691.2018.1537791

Gamage, K. A. A., Ekanayake, S. Y., & Dehideniya, S. C. P. (2022). Embedding Sustainability in Learning and Teaching: Lessons Learned and Moving Forward—Approaches in STEM Higher Education Programmes. *Education Sciences, 12,* Article 225. https://doi.org/10.3390/educsci12030225

Gove, A., Brunette, T., Bulat, J., Carrol, B., Henny, C., Macon, W. et al. (2017). Assessing the Impact of Early Learning Programs in Africa: Assessing the Impact of Early Learning Programs in Africa. *New Directions for Child and Adolescent Development, 2017,* 25-41. https://doi.org/10.1002/cad.20224

Gruenewald, D. A. (2003). The Best of Both Worlds: A Critical Pedagogy of Place. *Educational Researcher, 32,* 3-12. https://doi.org/10.3102/0013189x032004003

Gupta, R., LaMarca, N., Rank, S. J., & Flinner, K. (2018). The Environment as a Pathway to Science Learning for K-12 Learners—A Case Study of the E-STEM Movement. *Ecopsychology, 10,* 228-242. https://doi.org/10.1089/eco.2018.0047

Hoadley, U. (2024). How Do Structured Pedagogy Programmes Affect Reading Instruction in African Early Grade Classrooms? *International Journal of Educational Development, 107,* Article ID: 103023. https://doi.org/10.1016/j.ijedudev.2024.103023

Holloway, T. P., Dalton, L., Hughes, R., Jayasinghe, S., Patterson, K. A. E., Murray, S. et al. (2023). School Gardening and Health and Well-Being of School-Aged Children: A Realist Synthesis. *Nutrients, 15,* Article 1190. https://doi.org/10.3390/nu15051190

Holst, J., Grund, J., & Brock, A. (2024). Whole Institution Approach: Measurable and Highly Effective in Empowering Learners and Educators for Sustainability. *Sustainability Science, 19,* 1359-1376. https://doi.org/10.1007/s11625-024-01506-5

INEE (2022). *Comprehensive School Safety Framework 2022-2030 for Child Rights and Resilience in the Education Sector.* https://inee.org/sites/default/files/resources/The-Comprehensive-School-Safety-Framework-2022-2030-for-Child-Rights-and-Resilience-in-the-Education-Sector.pdf?utm_source=chatgpt.com

Iyengar, R., & Kwauk, C. T. (2021). *Curriculum and Learning for Climate Action: Toward an SDG 4.7 Roadmap for Systems Change.* BRILL. https://doi.org/10.1163/9789004471818

Johnson, B., & Christensen, L. B. (2017). *Educational Research: Quantitative, Qualitative,*

and Mixed Approaches (Sixth Edition). SAGE Publications, Inc.

Kos, M., & Jerman, J. (2019). Gardening Activities at School and Their Impact on Children's Knowledge and Attitudes to the Consumption of Garden Vegetables. *Problems of Education in the 21st Century, 77,* 270-291. https://doi.org/10.33225/pec/19.77.270

Li, T., & Zhan, Z. (2022). A Systematic Review on Design Thinking Integrated Learning in K-12 Education. *Applied Sciences, 12,* Article 8077. https://doi.org/10.3390/app12168077

Ly, V., & Vella-Brodrick, D. A. (2024). Effects of School-Led Greenspace Interventions on Mental, Physical and Social Wellbeing in Children and Adolescents: A Systematic Review. *Educational Psychology Review, 36,* Article No. 133. https://doi.org/10.1007/s10648-024-09963-1

Mann, J., Gray, T., Truong, S., Brymer, E., Passy, R., Ho, S. et al. (2022). Getting Out of the Classroom and into Nature: A Systematic Review of Nature-Specific Outdoor Learning on School Children's Learning and Development. *Frontiers in Public Health, 10,* Article 877058. https://doi.org/10.3389/fpubh.2022.877058

Marzuki, O. F., Lih, E. T. Y., Zainol @ Abdullah, W. N. Z., Khairuddin, N., Inai, N. H., Md Saad, J. B. et al. (2024). Innovating Education: A Comprehensive Review of STEM Education Approaches. *International Journal of Academic Research in Progressive Education and Development, 13,* 614-631. https://doi.org/10.6007/ijarped/v13-i1/20490

Maspul, K. A. (2024). Exploring STEM Education for Real-World Climate Change Concerns to Empower Students as Change Agents. *Journal of Physics Education and Science, 1,* 1-12. https://doi.org/10.47134/physics.v1i2.249

Meiklejohn, C., Westaway, L., Westaway, A. F. H., & Long, K. A. (2021). A Review of South African Primary School Literacy Interventions from 2005 to 2020. *South African Journal of Childhood Education, 11,* a919. https://doi.org/10.4102/sajce.v11i1.919

Mhlongo, S., Mbatha, K., Ramatsetse, B., & Dlamini, R. (2023). Challenges, Opportunities, and Prospects of Adopting and Using Smart Digital Technologies in Learning Environments: An Iterative Review. *Heliyon, 9,* e16348. https://doi.org/10.1016/j.heliyon.2023.e16348

Ochoa, J., Sanyé-Mengual, E., Specht, K., Fernández, J. A., Bañón, S., Orsini, F. et al. (2019). Sustainable Community Gardens Require Social Engagement and Training: A Users' Needs Analysis in Europe. *Sustainability, 11,* Article 3978. https://doi.org/10.3390/su11143978

Pahl, K., & Rowsell, J. (2020). *Living Literacies.* The MIT Press. https://doi.org/10.7551/mitpress/11375.001.0001

Sedo, D. R. (2011). An Introduction to Reading Communities: Processes and Formations. In D. R. Sedo (Ed.), *Reading Communities from Salons to Cyberspace* (pp. 1-24). Palgrave Macmillan UK. https://doi.org/10.1057/9780230308848_1

Smith, A. H., Grupp, L. L., Doukopoulos, L., Foo, J. C., Rodriguez, B. J., Seeley, J. et al. (2022). Taking Teaching and Learning Seriously: Approaching Wicked Consciousness through Collaboration and Partnership. *To Improve the Academy: A Journal of Educational Development, 41,* 38-67. https://doi.org/10.3998/tia.453

Stage, A., Vermund, M. C., Bølling, M., Otte, C. R., Oest Müllertz, A. L., Bentsen, P. et al. (2025). The Impact of a School Garden Program on Children's Food Literacy, Climate Change Literacy, School Motivation, and Physical Activity: A Study Protocol. *PLOS One, 20,* e0320574. https://doi.org/10.1371/journal.pone.0320574

Tharrey, M., Perignon, M., Scheromm, P., Mejean, C., & Darmon, N. (2019). Does Partic-

ipating in Community Gardens Promote Sustainable Lifestyles in Urban Settings? Design and Protocol of the Jardins Study. *BMC Public Health, 19,* Article No. 589. https://doi.org/10.1186/s12889-019-6815-0

Trott, C. D., Lam, S., Roncker, J., Gray, E., Courtney, R. H., & Even, T. L. (2023). Justice in Climate Change Education: A Systematic Review. *Environmental Education Research, 29,* 1535-1572. https://doi.org/10.1080/13504622.2023.2181265

UNDRR (2025). *Disaster Resilience Scorecard for Cities: Addendum for Education System Resilience for Extreme Weather Events.* https://mcr2030.undrr.org/media/109299/download?startDownload=20250919

UNESCO (2021). *Integrating the Environment into School Programmes by 2025.* https://www.unesco.org/en/articles/integrating-environment-school-programmes-2025?utm_source=chatgpt.com

UNESCO (2025). *Sustainable Development: Education for Sustainable Development-Learning to Act for People and Planet.* https://www.unesco.org/en/sustainable-development/education/esd-net

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes.* Harvard University Press.

Zelenika, I., Moreau, T., Lane, O., & Zhao, J. (2018). Sustainability Education in a Botanical Garden Promotes Environmental Knowledge, Attitudes and Willingness to Act. *Environmental Education Research, 24,* 1581-1596. https://doi.org/10.1080/13504622.2018.1492705