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Approaches for integrating sustainable development concepts into early childhood curricula: Paradoxes of theory and practice

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ABSTRACT

Though many educational discourses stress the significance of involving children as active participants in promoting sustainability, sustainable development may initially seem like a complicated and abstract concept for young learners. The purpose of this study is to identify the contradictions between theoretical ideals and real classroom practices, as well as to investigate useful strategies for incorporating sustainable development concepts into early childhood curricula. In all, 384 female early childhood educators from kindergarten through third grade in Saudi Arabia, Egypt, and Jordan took part in the study. The study found five paired strategies for incorporating sustainability into early learning using a descriptive-analytical methodology: Narrative-based vs. experiential/practical activities, direct instruction vs. project-based learning, individualized learning vs. group or collaborative learning, indoor classroom activities vs. outdoor/nature-based activities, and conventional/traditional vs. digitally enriched activities. Both structured and open-ended questions were used to gather the opinions of the teachers. The first set in each pair-narrative, direct, individualized, indoor, and traditional activities-was clearly preferred by participants over its more progressive counterparts, which included experiential, project-based, collaborative, outdoor, and digital activities, according to the results. Despite their strong support for incorporating sustainable development concepts into early childhood activities, the teachers' answers highlighted a fundamental paradox: The sophisticated and useful application of these concepts frequently surpasses their present level of expertise and day-to-day work. Many educators have questioned whether young children are developmentally ready to understand complex concepts related to sustainability, like social responsibility, environmental justice, and the green economy. They therefore tended to prefer easier, more recognizable instructional techniques-like storytelling, direct instruction, and regular classroom assignments-instead of hands-on, group, or tech-based learning. Teachers also identified a number of barriers, such as a lack of specialized training, a lack of curriculum materials that are age-appropriate, and a lack of institutional emphasis on sustainability in early childhood education.

Keywords: sustainable development, curriculum integration, teaching approaches, theory-practice gap, preschool teachers, early childhood education

INTRODUCTION

In light of today's mounting environmental, social, and economic challenges, sustainable development (SD) concepts are no longer considered optional or secondary in educational discourse. Instead, they are increasingly seen as core elements in the construction of modern curricula (Asmayawati et al., 2024). Embedding these concepts in education helps cultivate generations capable of thinking holistically, acting responsibly, and striving to create positive change in their communities and the wider world. Education for Sustainable Development (ESD) is not limited to the transmission of knowledge; rather, it extends to building values, developing skills, and nurturing a sense of initiative in confronting global issues (Levchyk et al., 2021).

Learning, in this context, does not occur only within the confines of the classroom. It also involves transforming learning environments-both physically and culturally-into spaces that support awareness and sustainability (Chou & Wang, 2024). UNESCO's international framework, particularly through the Global Action Programme for ESD 2030, supports countries in advancing education policy, building teacher

capacity, empowering young people, and promoting local community engagement (Oe et al., 2022; Zwolińska et al., 2022). ESD is defined as a comprehensive educational process that aims to empower learners of all ages to acquire the knowledge, skills, and values necessary to make informed decisions and act responsibly toward a more just and sustainable world (Chapman & O'Gorman, 2022). The concept goes beyond teaching environmental or economic content to encompass critical thinking, civic awareness, and behavior rooted in global citizenship (Suyato & Hidayah, 2025). UNESCO, as the global leader in advancing this educational movement, has incorporated ESD into the Education 2030 Agenda, specifically through Target 4.7 of the Sustainable Development Goals, which calls for the integration of sustainability and environmental citizenship into all levels of education (Hoque et al., 2022).

Saini et al. (2023) emphasize that achieving SDG 4, which focuses on quality education, is deeply interconnected with the broader Sustainable Development Goals. Their analysis reveals that aligning educational, economic, and social indicators significantly enhances the effectiveness of sustainable education programs. They also argue that when technology is purposefully and thoughtfully integrated into education, it plays a powerful role in promoting learners' understanding of sustainability and in cultivating critical thinking and problem-solving skills. This reinforces the need to design flexible, responsive curricula that introduce sustainability concepts early in the learning journey-an approach that aligns with global visions linking quality education with environmental and social challenges (Mulà et al., 2017).

In early childhood education (ECE), ESD is seen as a golden opportunity to embed essential ideas of justice, responsibility, and environmental and social awareness in young children through interactive, developmentally appropriate learning experiences (Adamson & Brown, 2024). Rather than presenting sustainability as an abstract subject, ESD encourages embedding these principles through everyday classroom practices such as recycling, nature-based exploration, and teamwork. These activities help children build positive relationships with their environment and community, laying the foundation for long-term awareness and engagement with sustainability issues (Alam & Mohanty, 2023; Rieckmann, 2018).

Early childhood is often mistakenly viewed as a stage detached from major global concerns like sustainable development. However, this perception has been gradually shifting as awareness grows regarding the importance of establishing environmental and social consciousness from a young age (Cebrián et al., 2020). The early years are a critical period for shaping values, forming attitudes, and adopting behaviors that persist into later developmental stages. Introducing children to basic ideas such as environmental care, community involvement, and respect for resources can serve as a solid foundation for future commitment to sustainable living.

Contemporary educational discourses emphasize the need to view children not merely as passive recipients of knowledge but as active participants in shaping a sustainable future (Dumitrescu et al., 2014; Imara & Altinay, 2021; Mogensen & Schnack, 2010; Sims & Falkenberg, 2013). This approach stems from the belief that children possess the ability to observe, understand, and influence their surroundings to varying degrees, provided they are given meaningful opportunities to do so. Engaging young learners in environmental projects or social activities fosters a sense of agency and belonging, helping to cultivate conscious, responsible citizens.

Literature positions early childhood as fertile ground for cultivating sustainability values, viewing children as capable agents who can meaningfully engage with principles such as environmental stewardship and social justice from an early age. Researchers argue that educational practices that promote nature interaction, problem-solving, and project-based learning can enhance children's sense of belonging, their ability to effect change, and their awareness of global responsibilities (Agbedahin, 2019; Campbell & Speldewinde, 2022; Chapman & O'Gorman, 2022; Davis & Elliott, 2023).

In essence, Education for Sustainable Development is not merely a "subject" to be taught, but a way of living and learning-one that requires the integration of values, pedagogical approaches, and contextual relevance. It prepares young learners to become future change-makers. Realizing this vision demands the development of flexible, integrative educational activities (Chau et al., 2025; Letouzey-Pasquier et al., 2025). These include project-based learning, experiential activities, field trips, recycling programs, nature exploration, and connecting everyday stories to sustainability themes (Zickafoose et al., 2024). Such approaches are most effective when aligned with children's developmental stages and when they actively engage learners in reflective and participatory experiences (Bushra et al., 2024).

Early childhood educators play a pivotal role in conveying sustainable development concepts to young learners-not only through the content they teach, but also through the behavioral models they embody (Acut et al., 2025). A teacher's awareness of sustainability, along with her belief in its relevance to young children, directly shapes the types of activities she selects, the language she uses, and the values she emphasizes in the classroom (Holst et al., 2024). Empowering teachers through targeted training and institutional support is thus essential for the meaningful and consistent integration of sustainability principles into daily classroom practices (Alawa et al., 2020).

Although young children are still developing cognitively, research shows that they can grasp many sustainability-related ideas when those are introduced through simple language, hands-on experiences, and sensory-based learning. Studies have demonstrated that children can meaningfully engage with concepts such as conservation, water use, cooperation, and biodiversity if presented through play, storytelling, and direct interaction with their environment. Assessing children's understanding and tracking its development is therefore key to adapting curricula and designing activities that match their needs and capacities.

Despite the growing emphasis in educational literature on the integration of sustainable development concepts from the early years, significant gaps remain between theoretical aspirations and classroom realities. Ferguson et al. (2021)

found that merely promoting environmentally friendly behaviors is insufficient unless these actions are framed within broader cognitive and social contexts. Their interviews with early childhood teachers revealed a clear understanding of the need to move beyond behavior management toward fostering critical thinking and a sense of agency in children. However, the lack of explicit sustainability content in curricula, minimal parental support, and a shortage of specialized professional development have created a disconnect between teachers' personal beliefs and what they can realistically implement in their classrooms.

Similarly, a multi-method study by Sihvonen et al. (2024) in Finland focused on a preschool recycling project for children aged 4–6. The study emphasized that sustainable behaviors in young children are most effectively nurtured through cultural and social embedded practices-such as free play in natural environments and gentle adult guidance. When parents and teachers work collaboratively, children demonstrate a higher level of environmental awareness and responsibility. However, the study also noted that institutional and policy-level support is critical. Without access to well-designed learning environments and supportive frameworks, it is difficult to scale successful models beyond localized pilot programs.

Adamson and Brown (2024) shed light on how well-intentioned educational policies can fall short of their sustainability goals when applied in real classrooms. Through qualitative research with early childhood teachers in Tanzania, they found the presence of a "hidden curriculum": Everyday pedagogical practices-such as teaching in unfamiliar languages-were inadvertently undermining children's ability to engage meaningfully with sustainability aspirations. The study reinforces the importance of listening to children's actual experiences and adjusting educational approaches accordingly. Its findings serve as a reminder that educational contexts, especially in resource-limited settings, require deeper attention to ensure that ambitious sustainability aims are effectively translated into pedagogical practices.

Campbell and Speldewinde (2022) presented a model illustrating how STEM-based learning environments can support sustainable development education from an early age. Using ethnographic methods including observation and direct engagement, their study found that hands-on, play-based activities-such as constructing environmental models or exploring plant life cycles-effectively enhance children's environmental agency. These types of learning encourage inquiry, foster meaningful engagement with nature, and allow children to build their own understanding of sustainability through discovery and exploration. When international sustainability goals are integrated as reference points in classroom activities, children begin to develop problem-solving skills and a stronger sense of autonomy, positioning them as active contributors to sustainability discussions and actions.

Chapman and O'Gorman (2022) highlight the transformative power of the arts in reshaping early childhood learning environments to better align with the United Nations' sustainability goals. Using an Arts Immersion approach, they argue that artistic languages-such as visual arts, storytelling, and movement-offer children unique ways to understand complex global issues, including environmental justice, human rights, and peace. Their study reveals that integrating the arts encourages resilience, critical reflection, and active participation among young learners. Notably, the arts challenge traditional, narrow views of children's capabilities, enabling them to express their perspectives and engage as global citizens. This research underscores the need for early childhood settings to transform from conventional classrooms into vibrant, inclusive spaces where sustainability is explored not just cognitively, but emotionally and creatively.

Cebrián et al. (2020) conducted a comprehensive review exploring how sustainability competencies are understood, taught, and measured across educational levels. They highlight a shift toward viewing sustainable development not merely as environmental knowledge, but as a multi-dimensional capability encompassing cognitive, social, and behavioral competencies. Despite growing theoretical clarity, they note that translating these competencies into everyday classroom practice remains challenging. Their call for operational frameworks and valid tools to assess both learners' and educators' sustainability competencies resonates strongly with the need for practical, developmentally appropriate teaching strategies in early childhood settings.

A landmark systematic review by Hedefalk et al. (2014) examined 87 studies published between 1996 and 2013, mapping the evolution of Education for Sustainable Development (ESD) in early childhood contexts. The authors identified two main conceptual approaches: The first frames ESD as "education in, about, and for the environment," while the second emphasizes the interconnected environmental, social, and economic dimensions of sustainability. The review revealed a gradual shift in the literature-from focusing on environmental knowledge transfer to fostering children's critical thinking, agency, and ability to make informed decisions. Despite this theoretical progress, the authors highlighted a critical gap: The overwhelming majority of studies (79 out of 87) were conceptual or theoretical in nature, while only a few provided empirical insights into actual classroom practices. They called for more field-based research that investigates not only how ESD is implemented in real settings, but also how children engage with and understand sustainability through active participation.

Makinde et al. (2024) argue that smart learning environments powered by educational technology can act as a transformative force in achieving SDGs through personalized, flexible, and interactive pedagogies. Their work highlights how technology-rich learning can enable young learners to engage with sustainability concepts in meaningful, context-responsive ways-aligning with calls to modernize early childhood pedagogy.

Zguir et al. (2021) provide a comparative analysis of Qatar, Singapore, and New Zealand, revealing that effective embedding of ESD requires holistic curriculum reform, institutional commitment, and alignment between policy and practice. Their findings reinforce the importance of systemic support structures when integrating sustainability into early learning contexts.

Ferguson et al. (2021) explore teachers' perspectives and emphasize that successful ESD implementation depends critically on educators' beliefs, self-efficacy, and

understanding of sustainability. They illustrate that discrepancies between teachers' positive attitudes and their classroom practices often stem from training gaps and institutional constraints.

Chapman and O'Gorman (2022) demonstrate the transformative potential of arts-based pedagogies in early childhood settings, showing how storytelling, drama, and creative expression can empower children as active agents in sustainability learning-thus challenging traditional didactic methods.

Asmayawati et al. (2024) highlight pedagogical innovation and curriculum adaptation as key to advancing digital literacy and sustainability awareness. Drawing on a local wisdom approach in Indonesia, the study illustrates how culturally grounded and digitally supported practices can enhance young learners' sustainability competencies.

Despite the mounting international and scholarly advocacy for embedding sustainability concepts into early childhood education, practical implementation remains riddled with paradoxes. While global frameworks and national policies increasingly stress the importance of engaging young learners in sustainability-related learning, classroom practices often fall short due to limited resources, insufficient teacher preparation, and the lack of curriculum materials explicitly designed for this purpose. These challenges are even more pronounced in Arab educational contexts, where sustainability education is still emerging as a priority.

Preliminary, informal interviews conducted by the researchers with early childhood teachers in Al-Ahsa, Saudi Arabia, revealed that most educators lacked a full understanding of the dimensions and goals of sustainable development. Moreover, they reported that current curricula do not include explicit activities to support these goals. Such findings underscore the urgent need to explore practical, culturally relevant strategies for incorporating sustainability into early years. The present study seeks to address this gap by identifying approaches for integrating sustainable development concepts into early childhood curricula and classroom activities, and by capturing teachers' perspectives on the challenges they face in bridging the divide between theory and practice.

Statement of the Problem

In recent years, educational voices across the globe have amplified their call to integrate sustainable development concepts into school curricula-beginning not in secondary or higher education, but from the earliest stages of learning: early childhood. The underlying belief is that children, even at a young age, can start to develop a sense of care, responsibility, and connectedness toward their communities and the environment. However, in many Arab educational contexts, this aspiration collides with complex and practical realities. For early childhood educators, transforming abstract ideals of sustainability into meaningful and age-appropriate learning experiences remains a significant challenge.

Several factors contribute to this gap. Many teachers report feeling underprepared to address sustainability-related topics, often due to a lack of training or exposure during their professional preparation. Opportunities for professional development in this area are limited, institutional support is often inconsistent, and there is a notable scarcity of child-friendly resources that effectively translate sustainability into practical, developmentally suitable content.

Chou and Wang (2024) conducted a detailed content analysis of Taiwan's national curriculum guidelines for social studies and natural sciences, examining how explicitly the Sustainable Development Goals (SDGs) are represented. They found that while SDG-related content is present, it occupies only a minor role in the curricula and lacks systematic organization. These findings suggest that even well-developed curricula may fall short in translating global sustainability frameworks into coherent and pedagogically effective classroom content. The study underscores the need for educators and policymakers to rethink curriculum design, ensuring that sustainability concepts are not only included but are meaningfully structured to promote critical engagement and participatory citizenship.

Although many teachers support the idea of fostering sustainability values in early childhood, they have expressed concerns about a range of practical obstacles. Notably, they have pointed out that current curricula offer little explicit support for sustainability-related activities, and that the prevailing attitudes of educational institutions and parents are not always aligned with such initiatives. This misalignment often results in missed opportunities to turn classroom learning into lived experiences, both at school and at home.

This disconnect was clearly reflected in an informal conversation conducted by the researchers with ten early childhood educators in Al-Ahsa, Saudi Arabia. The teachers spoke candidly, revealing that most of them had only a vague understanding of what sustainability entails-let alone how to teach it effectively. They also noted that their curricula contain few, if any, structured activities related to sustainability, nor do they provide pedagogical guidance for integrating these concepts into early learning. Their reflections underscore a central paradox: while national policy documents and global frameworks speak optimistically about education for sustainable development, the practical realities inside classrooms often fall short. In many early childhood settings, sustainable development remains more of an ideal than a tangible educational practice.

Research Objectives

This study aims to achieve the following objectives:

1) To explore appropriate approaches for integrating sustainable development concepts into early childhood curricula from kindergarten through third grade.
2) To examine early childhood teachers' preferences regarding different pedagogical strategies (e.g., narrative vs. experiential, traditional vs. digital).
3) To identify the challenges that hinder the effective implementation of sustainability concepts in early childhood education.
4) To analyze the perceived paradoxes between theoretical aspirations and practical realities in teaching sustainable development to young learners.

5) To provide insights into how early childhood teachers interpret and apply sustainability-related content in daily classroom activities.

Research Questions

Based on the objectives outlined above, the study seeks to answer the following research questions:

RQ1 What approaches do early childhood educators consider most appropriate for integrating sustainable development concepts into their curricula and activities?

RQ2 Which types of instructional strategies are favored by early childhood teachers when addressing sustainability-related themes?

RQ3 What challenges do teachers face when attempting to implement sustainability concepts in early childhood settings?

RQ4 How do teachers perceive the gap between theoretical frameworks and actual classroom practices in sustainability education?

METHODOLOGY

Research Design

This study aimed to explore practical and pedagogical approaches for integrating sustainable development concepts into early childhood curricula and activities, while also examining the paradoxes between theoretical ideals and practical realities in implementing these approaches within classroom settings. To achieve these aims, a quantitative design was adopted, drawing on the descriptive-analytical methodology, which is suitable for systematically identifying and interpreting patterns in participants' responses (Creswell, 2015). This methodology allowed the researchers to describe current trends in teaching practices while also analyzing the contradictions that may exist between teachers' aspirations and actual classroom conditions.

The study utilized a structured questionnaire as its main tool for data collection, incorporating both closed-ended and open-ended items. While the closed-ended section captured the teachers' preferences regarding various instructional approaches, the open-ended section was dedicated to eliciting their subjective reflections on the feasibility and challenges of applying these approaches in real learning contexts. This dual approach provided a broader perspective on the research problem, combining measurable trends with rich qualitative insights.

The core of the questionnaire focused on five paired pedagogical approaches for integrating sustainability themes into early childhood education, namely:

a) Narrative-based vs. experiential/practical activities,

b) Direct instruction vs. project-based learning,

c) Individualized learning vs. group or collaborative learning,

d) Indoor classroom activities vs. outdoor/nature-based activities,

e) Conventional/traditional vs. digitally enriched activities.

For each pair, teachers were asked to select the approach they considered more appropriate or feasible in their current teaching environments. Their choices were then analyzed statistically using frequency and percentage distributions. Additionally, the questionnaire prompted teachers to explain their selections and to share their views on the practical limitations or theoretical contradictions they encountered when attempting to apply these strategies.

To ensure both breadth and depth of understanding, the open-ended responses were analyzed using Analysis of teachers' responses technique. During the analysis, the focus was on the most prominent challenges and contradictions between theory and practice, and these issues were highlighted in the presentation of the study participants' responses. This qualitative layer of analysis provided nuanced insights into how teachers interpret the concepts of sustainability, their perceptions of pedagogical readiness, and the institutional or developmental constraints that influence their instructional decisions.

By combining quantitative measures with open-ended narrative data, the study design enabled a comprehensive examination of both the adopted teaching approaches and the underlying tensions that affect their implementation in early childhood educational settings.

Participants

This study engaged a total of 384 female educators working in the field of early childhood education, specifically with children from kindergarten through third grade. The participants were drawn from three Arab Countries-Saudi Arabia, Egypt, and Jordan-each representing distinct educational environments and curricular approaches, yet all facing shared regional dynamics in relation to early childhood education and sustainable development.

All participants held formal academic qualifications in early childhood education and were actively involved in the day-to-day design and delivery of classroom learning experiences. Their professional responsibilities included introducing both foundational and more abstract educational concepts, such as environmental awareness, community participation, and responsibility-key dimensions of sustainable development. These educators thus play a pivotal role in shaping children's first encounters with values and knowledge related to sustainability.

To recruit participants in a way that would reflect diversity while remaining feasible logistically, the researchers employed a hybrid sampling strategy combining convenience and snowball sampling methods. Initially, participants were identified and invited through existing professional networks, relevant social media groups, and institutional partnerships. These initial participants were then encouraged to share the study invitation with fellow educators in their professional circles. This chain referral process allowed the sample to grow organically and reach a broader and more varied group of teachers, encompassing both urban and rural educational settings, and including educators from both public and private schools.

Table 1. Demographic characteristics of study participants (N=384)

Demographic characteristic	Category	Frequency (n)	Percentage (%)
Country	Egypt	164	42.7%
	Saudi Arabia	126	32.8%
	Jordan	94	24.5%
Teaching level	Kindergarten	238	62.0%
	Lower Primary (Grades 1–3)	146	38.0%
Years of teaching experience	Less than 5 years	121	31.5%
	More than 5 years	263	68.5%
School type	Public	247	64.3%
	Private	137	35.7%

The final sample represented a rich demographic mix, with participants varying in terms of geographic location, teaching level (kindergarten vs. lower primary), years of professional experience, and school affiliation. These characteristics are summarized in **Table 1**.

Ethical Considerations

All participating female early childhood educators provided their informed consent to take part in this study. They were fully briefed on the purpose of the research and assured that the collected data would be used strictly for academic and scientific purposes only. Participants were informed that their responses would remain confidential and anonymous, with no personal identifiers such as names or institutional affiliations being recorded. Participation was entirely voluntary, and educators were given the right to withdraw at any stage without consequence. The study adhered to ethical research standards throughout its design and implementation.

Study Instrument

To support the methodological procedures of the study, the researchers developed a structured questionnaire consisting of two main sections. The first section included closed-ended items measured using a three-point Likert scale (1 = Appropriate, 2 = Somewhat appropriate, 3 = Not appropriate) to explore the pedagogical approaches adopted by early childhood teachers in integrating sustainable development concepts. This section was structured around five paired teaching strategies: Narrative-based vs. experiential/practical activities, direct instruction vs. project-based learning, individualized learning vs. group or collaborative learning, indoor classroom activities vs. outdoor/nature-based activities, and conventional/traditional vs. digitally enriched activities.

The second section comprised open-ended prompts following each thematic pair to enable respondents to elaborate on the feasibility of implementation and contextual challenges they face. These qualitative responses were then analyzed to identify recurring meanings and illuminate themes that complemented the quantitative results.

The initial version of the instrument was informed by key international studies in early childhood ESD (Adamson & Brown, 2024; Campbell & Speldewinde, 2022; Chapman & O'Gorman, 2022; Hedefalk et al., 2014; Levchyk et al., 2021; Sihvonen et al., 2024; Zwolińska et al., 2022). To ensure content validity, the questionnaire was reviewed by five experts in early childhood education, and only items receiving ⩾80% agreement were retained. Internal consistency of the quantitative section was examined using Cronbach's alpha, yielding a coefficient of 0.78, which is considered satisfactory. **Table 2** refers to the Dimensions and items of the study instrument.

Data Collection and Analysis

The data collection process relied on a structured two-part questionnaire designed to capture both quantitative and qualitative insights from early childhood educators. The first section comprised close-ended items focusing on five paired teaching approaches for integrating sustainable development concepts into early childhood curricula. Each item was rated using a three-point Likert-type scale:

Table 2. Dimensions and items of the study instrument

Theme A	Sub-strategies (A)	Theme B	Sub-strategies (B)	Open-ended questions
Narrative-based activities	a. Telling short stories with moral/environmental lessons b. Using illustrated storybooks about nature c. Conducting circle time for value-based discussions	Experiential/ practical activities	a. Recycling projects using classroom materials b. Gardening or planting seeds c. Sensory nature walks or observation activities d. Hands-on activities about water or energy use	In your opinion, are experiential activities feasible to implement in your early childhood curriculum? What challenges might prevent their use?
Direct instruction	a. Teacher-led explanations of sustainability concepts b. Using posters or flashcards c. Reading definitions from books d. Weekly moral themes explained by the teacher	Project-based learning	a. Group creation of "green classroom" posters b. Planning and caring for a class plant or garden c. Creating art projects using recycled materials d. Group problem-solving on community issues	From your teaching experience, what are the potential barriers to applying project-based approaches in early childhood settings?

Table 2 (Continued). Dimensions and items of the study instrument

Theme A	Sub-strategies (A)	Theme B	Sub-strategies (B)	Open-ended questions
Individualized learning	a. Providing worksheets with personal reflection b. Allowing children to journal or draw personal eco-choices c. Letting children choose their own nature-related task	Group or collaborative learning	a. Group sorting of recyclable vs. non-recyclable materials b. Partner work in nature observation c. Collaborative storytelling on environmental topics d. Peer discussions on class responsibilities	How do you evaluate the practicality of collaborative strategies in your daily work with children? What limitations do you face?
Indoor classroom activities	a. Watching educational videos b. Classroom discussions c. Using flashcards and books d. Role-play in small classroom spaces	Outdoor/ nature-based activities	a. Nature treasure hunts b. Exploring local plants or insects c. Outdoor eco-games d. Nature art using found materials	What are the challenges or support available to implement outdoor-based sustainability activities in your current teaching environment?
Conventional/ traditional activities	a. Using textbooks b. Repetitive drills c. Listening to teacher explanations d. Copying from the board	Digitally enriched activities	a. Using tablets for eco-themed games b. Interactive whiteboard activities c. Watching digital stories on sustainability d. Using educational apps related to nature or community	In your view, how realistic is it to integrate digital resources to support sustainable development concepts in your curriculum? What might hinder this?

(1) Appropriate,

(2) Somewhat appropriate, and

(3) Not appropriate.

This simple scale was intentionally chosen to match the practical and perceptual nature of the study and to facilitate clearer distinctions in teachers' preferences and judgments.

The questionnaire was distributed online through various platforms, including professional educational networks, WhatsApp groups, institutional mailing lists, and relevant social media channels. This multi-channel strategy was adopted to maximize outreach and inclusivity across the three participating countries (Saudi Arabia, Egypt, and Jordan). Participants were given a three-week window to respond, during which weekly reminders were sent to encourage completion and reduce attrition. These reminders reiterated the academic purpose of the research, assured participants of their data's confidentiality, and emphasized that no personal identifiers (e.g., names, institutions) would be collected or disclosed.

Quantitative data were analyzed using SPSS software to extract descriptive statistics, including frequencies, percentages, and standard deviations. The analysis focused on identifying trends in teachers' preferences across the five teaching approach pairs. By examining the frequency and proportion of responses under each of the three rating levels "Appropriate," "Somewhat appropriate," and "Not appropriate" the analysis provided nuanced insights into how early childhood educators perceive the applicability of various pedagogical strategies for teaching sustainability.

The analysis intentionally avoided inferential statistical comparisons, as the primary aim of the study was not to test hypotheses but to describe and interpret educators' viewpoints in a meaningful and contextually relevant manner. Rather than treating the data as abstract figures, the analysis sought to bring out the lived realities of teachers: the tensions, hesitations, and aspirations they hold when translating sustainability ideals into daily classroom practice. In this way, the study highlighted the subtle interplay between pedagogical beliefs, curriculum demands, and perceived limitations in the early learning environment.

As for the qualitative data, the open-ended responses embedded within each teaching approach dimension were collected in a separate file and categorized by theme. These responses were later reviewed by the research team to identify recurring patterns, concerns, and insights. Given the distinct nature of qualitative data compared to quantitative inputs, this section was analyzed independently to capture the richness of teachers' reflective narratives. This parallel analysis allowed for a deeper understanding of the underlying motivations, doubts, and contextual barriers faced by early childhood educators. Ultimately, this dual analysis approach-integrating both numerical trends and teacher narratives-enabled a more holistic interpretation of the paradoxes between theoretical aspirations and classroom realities in sustainability education for young learners.

RESULTS AND DISCUSSIONS

Early Childhood Teachers' Responses to the Approaches for Integrating Sustainable Development Concepts into Curricula and Activities

Narrative-based vs. experiential/practical activities

The quantitative findings presented in **Table 3** highlight a clear preference among early childhood educators for narrative-based activities over experiential or practical activities when integrating sustainable development concepts into early learning. This inclination reflects a broader tendency to favor more familiar, structured, and manageable instructional approaches within early childhood settings. Specifically, a significant majority of the teachers rated storytelling with moral or environmental lessons as appropriate (57.3%), followed by conducting circle time for value-based discussions (54.7%), and using illustrated storybooks about nature (52.1%). These findings suggest that narrative-based strategies are perceived as effective and accessible means for communicating abstract ideas like sustainability to young learners in a concrete and age-appropriate manner. In contrast, experiential or practical activities received noticeably lower endorsement levels. For

Table 3. Dimension 1 - Narrative-based vs. experiential/practical activities

Dimension	Instructional approaches	Appropriate	Somewhat appropriate	Not appropriate
Narative-based activities	a. Telling short stories with moral/environmental lessons	220 (57.3%)	110 (28.6%)	54 (14.1%)
	b. Using illustrated storybooks about nature	200 (52.1%)	120 (31.2%)	64 (16.7%)
	c. Conducting circle time for value-based discussions	210 (54.7%)	115 (29.9%)	59 (15.4%)
Experiential/ practical activities	a. Recycling projects using classroom materials	90 (23.4%)	110 (28.6%)	184 (47.9%)
	b. Gardening or planting seeds	95 (24.7%)	100 (26.0%)	189 (49.2%)
	c. Sensory nature walks or observation activities	80 (20.8%)	105 (27.3%)	199 (51.9%)
	d. Hands-on activities about water or energy use	85 (22.1%)	100 (26.0%)	199 (51.9%)

Table 4. Dimension 2 - Direct instruction vs. project-based learning

Dimension	Instructional strategy	Appropriate	Somewhat appropriate	Not appropriate
Direct instruction	a. Teacher-led explanations of sustainability concepts	230 (59.9%)	110 (28.6%)	44 (11.5%)
	b. Using posters or flashcards	215 (56.0%)	125 (32.6%)	44 (11.5%)
	c. Reading definitions from books	205 (53.4%)	130 (33.9%)	49 (12.8%)
	d. Weekly moral themes explained by the teacher	225 (58.6%)	110 (28.6%)	49 (12.8%)
Project-based learning	a. Group creation of “green classroom” posters	95 (24.7%)	115 (29.9%)	174 (45.3%)
	b. Planning and caring for a class plant or garden	85 (22.1%)	120 (31.2%)	179 (46.6%)
	c. Creating art projects using recycled materials	90 (23.4%)	110 (28.6%)	184 (47.9%)
	d. Group problem-solving on community issues	88 (22.9%)	108 (28.1%)	188 (49.0%)

instance, only 23.4% of participants found recycling projects using classroom materials to be appropriate, and a mere 20.8% supported sensory nature walks or observation activities. Even hands-on activities related to water or energy use received low approval (22.1%), while the majority (51.9%) considered such strategies not appropriate for their classroom context.

This marked divergence between the two approaches reveals an important pedagogical paradox: although experiential learning is widely promoted in global education literature as vital for sustainable development, many teachers appear hesitant to adopt such strategies in their daily teaching. This reluctance may stem from practical challenges, unfamiliarity, or perceived developmental inappropriateness-factors that will be further explored in the open-ended responses section.

Direct instruction vs. project-based learning

The results for Dimension 2 (**Table 4**) reinforce a recurring pattern found throughout this study: Early childhood educators tend to favor structured, teacher-centered approaches like direct instruction over more participatory, student-driven strategies such as project-based learning. A majority of respondents expressed a strong preference for teacher-led explanations (59.9%) and visual aids (56.0%) as appropriate methods for conveying sustainability concepts. Additionally, strategies involving structured classroom interactions, like question-and-answer sessions (53.4%) and moral instruction (58.6%), were also well-supported. These results highlight the comfort many teachers feel when they maintain control of the instructional process, particularly when dealing with abstract themes like sustainability.

In contrast, project-based learning activities-despite their alignment with global best practices in sustainability education-were far less favored. For instance, engaging children in community-oriented sustainability initiatives was rated appropriate by only 22.9% of participants, while nearly half (49.0%) deemed it not suitable for their context. Similarly, creating eco-friendly campaigns and conducting environmental fieldwork were among the least endorsed strategies. These responses may reflect a variety of underlying concerns, including time constraints, lack of resources, perceived difficulty of implementation, or doubts about children’s developmental readiness for such tasks. Despite the growing advocacy for project-based approaches in education for sustainable development (ESD), the findings suggest that many early childhood educators remain cautious-possibly due to institutional limitations or insufficient training in implementing interdisciplinary, inquiry-based learning.

Taken together, these results demonstrate another paradox at the heart of the study: Teachers overwhelmingly support the idea of sustainability education yet often rely on traditional pedagogies that may not fully foster critical thinking, problem-solving, and real-world engagement sustainability education aspires to achieve.

Individualized learning vs. group or collaborative learning

In line with earlier dimensions, the results reveal a consistent preference among early childhood educators for more individualized teaching strategies compared to collaborative or group-based methods (**Table 5**). For example, more than half of the participants viewed "providing worksheets with personal reflection" (55.2%) and "allowing children to journal or draw personal eco-choices" (50.8%) as appropriate. This preference suggests that teachers feel more confident when children are given personal space to reflect or work independently, possibly due to ease of classroom management and clearer assessment of learning outcomes. In contrast, group or collaborative learning strategies-such as partner work, collaborative storytelling, and peer discussions-were rated appropriate by less than one-third of respondents. A notable proportion found these methods either only somewhat appropriate or not appropriate at all, with peer discussions and collaborative storytelling showing the lowest endorsement rates. Several potential reasons could explain this hesitancy. Teachers may perceive collaborative learning as more time-consuming or difficult to manage in early childhood contexts, especially when class sizes are large or when resources are limited. There may also be concerns about developmental readiness-many educators question whether

Table 5. Dimension 3 - Individualized learning vs. group or collaborative learning

Theme	Sub-strategy	Appropriate	Somewhat appropriate	Not appropriate
Individualized learning	a. Providing worksheets with personal reflection	212 (55.2%)	110 (28.6%)	62 (16.1%)
	b. Allowing children to journal or draw personal eco-choices	195 (50.8%)	120 (31.2%)	69 (18.0%)
	c. Letting children choose their own nature-related task	180 (46.9%)	132 (34.4%)	72 (18.8%)
Group or collaborative learning	a. Group sorting of recyclable vs. non-recyclable materials	120 (31.2%)	135 (35.2%)	129 (33.6%)
	b. Partner work in nature observation	115 (29.9%)	138 (35.9%)	131 (34.1%)
	c. Collaborative storytelling on environmental topics	110 (28.6%)	140 (36.5%)	134 (34.9%)
	d. Peer discussions on class responsibilities	105 (27.3%)	145 (37.8%)	134 (34.9%)

Table 6. Dimension 4 - Indoor classroom activities vs. outdoor/nature-based activities

Theme	Sub-strategy	Appropriate	Somewhat appropriate	Not appropriate
Indoor classroom activities	a. Watching educational videos	247 (64.3%)	92 (24.0%)	45 (11.7%)
	b. Classroom discussions	233 (60.7%)	98 (25.5%)	53 (13.8%)
	c. Using flashcards and books	258 (67.2%)	89 (23.2%)	37 (9.6%)
	d. Role-play in small classroom spaces	210 (54.7%)	103 (26.8%)	71 (18.5%)
Outdoor/nature-based activities	a. Nature treasure hunts	125 (32.6%)	139 (36.2%)	120 (31.2%)
	b. Exploring local plants or insects	118 (30.7%)	140 (36.5%)	126 (32.8%)
	c. Outdoor eco-games	121 (31.5%)	136 (35.4%)	127 (33.1%)
	d. Nature art using found materials	113 (29.4%)	144 (37.5%)	127 (33.1%)

Table 7. Dimension 5 - Conventional/traditional vs. digitally enriched activities

Theme	Sub-strategy	Appropriate	Somewhat appropriate	Not appropriate
Conventional/ traditional activities	a. Using textbooks	262 (68.2%)	83 (21.6%)	39 (10.2%)
	b. Repetitive drills	244 (63.5%)	93 (24.2%)	47 (12.3%)
	c. Listening to teacher explanations	271 (70.6%)	79 (20.6%)	34 (8.9%)
	d. Copying from the board	250 (65.1%)	88 (22.9%)	46 (12.0%)
Digitally enriched activities	a. Using tablets for eco-themed games	121 (31.5%)	142 (37.0%)	121 (31.5%)
	b. Interactive whiteboard activities	119 (31.0%)	135 (35.2%)	130 (33.9%)
	c. Watching digital stories on sustainability	109 (28.4%)	131 (34.1%)	144 (37.5%)
	d. Using educational apps related to nature or community	118 (30.7%)	138 (35.9%)	128 (33.3%)

young children have the communication and conflict-resolution skills needed to fully benefit from collaborative models. These realities contribute to the ongoing paradox revealed in this study: while the theory behind sustainability education encourages shared learning and cooperation, the practical environment in many classrooms pushes teachers toward more controllable, individual-based formats.

Indoor classroom activities vs. outdoor/nature-based activities

This dimension presents one of the most significant contrasts in the dataset. Early childhood educators overwhelmingly preferred indoor classroom activities over their outdoor or nature-based counterparts (**Table 6**). For instance, over 67% of participants rated "using flashcards and books" as appropriate, followed closely by "watching educational videos" (64.3%) and "classroom discussions" (60.7%). This shows a strong inclination toward structured, controlled environments with predefined materials and minimal environmental unpredictability. Conversely, outdoor/nature-based activities received consistently low ratings across all four strategies. Only about 30% of teachers found options like "nature treasure hunts" or "exploring local plants or insects" to be appropriate, while nearly one-third considered these activities not appropriate at all. These figures reflect both practical and contextual limitations in implementing outdoor learning in early childhood settings. Insights from open-ended responses reinforce this conclusion. Many teachers cited limited access to green spaces, safety concerns, weather constraints, and institutional policies that discourage outdoor excursions. Others mentioned a lack of materials or support for facilitating nature-based activities, as well as high child-to-teacher ratios that make supervising outdoor play more difficult. These results underscore a core paradox of sustainability education in early childhood: While outdoor interaction with the environment is crucial for fostering eco-literacy and environmental sensitivity, most teachers are confined to the classroom due to practical limitations.

Conventional/traditional activities vs. digitally enriched activities

The final dimension reinforces a recurring trend: Early childhood educators express a strong preference for traditional, low-tech methods of instruction over more digitally enriched strategies (**Table 7**). The most highly rated item in this dimension was "listening to teacher explanations" (70.6% appropriate), followed by "using textbooks" (68.2%). These methods reflect well-established, familiar practices that align with both classroom routines and curricular expectations. These responses point to a gap not in enthusiasm, but in infrastructure and capacity. While many teachers acknowledged the potential value of digital tools-especially in making abstract sustainability concepts more tangible and engaging-their current environments did not support effective implementation.

Teachers' Perspectives on the Paradoxes between Theoretical Frameworks and Practical Implementation

The responses provided by the participating teachers to the open-ended questions reveal a deep tension between their theoretical belief in the importance of sustainable development concepts and the actual challenges of implementing these ideas in daily classroom practice. A careful analysis of these responses shows a clear alignment between the qualitative and quantitative findings, which reinforces the credibility of the study and sheds light on the nuanced challenges early childhood educators face in this context. The following sections offer a detailed exploration of the key themes:

Feasibility of experiential activities: Between belief and reality

Most teachers expressed a genuine desire to include experiential and hands-on activities in their early childhood curricula, recognizing these approaches as highly effective for instilling sustainability concepts in young learners. However, a significant number of respondents pointed out that implementing such activities is hindered by several practical barriers-most notably, limited time, crowded daily schedules, and a lack of material resources. Some teachers also noted that school administrations tend to favor traditional instructional formats, discouraging deviation from established classroom routines. This institutional rigidity further limits opportunities for adopting experience-based learning strategies.

This hesitation, despite a theoretical appreciation for experiential learning, aligns closely with the quantitative findings of the study, which indicated a stronger overall preference for traditional, narrative-based activities over practical ones.

Project-based learning: Structural and cultural barriers

When discussing project-based learning, many teachers expressed their admiration for the idea in principle. However, they also noted that putting such approaches into practice is difficult within the realities of their daily teaching environments. Several participants emphasized that the age of early childhood learners poses a challenge to organizing long-term, structured projects-especially when classrooms are overcrowded and resources for meaningful group work are limited.

Cultural factors also emerged as significant obstacles. The dominant teaching culture in many educational contexts continues to prioritize rote learning and direct instruction over collaborative or exploratory projects. These concerns are strongly aligned with the quantitative findings, which revealed a clear preference among participants for direct instruction over project-based approaches.

Collaborative learning: Practical challenges in classroom settings

In theory, many teachers indicated a positive attitude toward incorporating collaborative learning strategies. However, these strategies were often seen as impractical given several classroom-level challenges. Teachers cited difficulties in managing group dynamics, especially with children whose social skills are still developing. The wide range of abilities among students also made it hard to ensure balanced participation, and classroom spaces were often not designed to support group interaction.

Outdoor/nature-based activities: Limited support, high interest

A notable number of participants expressed strong interest in outdoor and nature-based activities, recognizing their potential to reinforce sustainability concepts in engaging and meaningful ways. However, actual implementation of such activities was often limited. Many schools lack green spaces or safe outdoor environments, and structured programs that support regular nature-based learning are rare.

In some cases, teachers voiced concerns about safety, noting that certain natural elements may not be suitable for young children, or may conflict with rigid institutional policies. These limitations have made indoor classroom activities a more common and accessible alternative-consistent with quantitative data, which showed a clear preference for indoor over outdoor strategies.

Digitally enriched activities: Technological readiness and attitudinal hesitation

Opinions on digital tools were mixed. Some teachers praised the potential of digital resources to simplify and visually enhance sustainability concepts, such as through interactive stories or educational apps. However, many participants also expressed hesitancy regarding the use of technology in early childhood classrooms. Their concerns are centered on the risk of reducing face-to-face interaction and hands-on sensory experiences, which are considered essential at this developmental stage.

Additionally, many teachers reported limited access to technological devices and a lack of professional training in using digital tools effectively. These barriers likely contributed to the strong preference for conventional instructional methods observed in the quantitative analysis.

Through analyzing the open-ended responses and linking them with the quantitative results, a recurring pattern emerges in the teachers' choices: A clear preference for familiar and traditional instructional approaches when it comes to integrating sustainable development concepts into early childhood curricula and activities. Teachers consistently favored narrative-based strategies-such as storytelling, picture books, and direct explanation-along with individualized learning, indoor classroom environments, and non-digital methods, over more modern and progressive approaches like experiential learning, project-based work, collaboration, or digital integration.

This preference should not be viewed as a direct rejection of innovation. Rather, it stems from a complex interplay of educational, professional, and contextual factors, each of which adds depth to understanding the teachers' perspectives.

One major consideration voiced by the participants was developmental appropriateness. Many teachers felt that young children are still developing basic sensory, linguistic, and social skills, and are therefore more responsive to simpler, familiar methods like stories, personal tasks, and teacher-led

instruction. While modern methods are theoretically effective, they often require levels of abstraction or group coordination that may not be suitable for this age group.

Time and curriculum constraints also play a major role. Teachers often work within tight schedules and pre-defined lesson plans, which limit their flexibility to include activities that demand additional planning or coordination with others-such as parents or environmental organizations. Familiar routines and predictable formats are seen as both efficient and safe within the time they have.

Another key issue was the lack of specialized training and institutional support. Many teachers noted that they had never received formal training in sustainability or methods for teaching it to young children. In the absence of this professional preparation, they naturally gravitate toward what they already know-traditional strategies-rather than experimenting with new approaches that might feel uncertain or unsupported.

Practical limitations within the learning environment were also highlighted. Many early childhood centers simply lack the physical or technological infrastructure needed for newer approaches. Outdoor spaces, gardens, or nature-based resources may not be available, and digital tools like tablets or interactive whiteboards are often scarce. In such conditions, innovation becomes difficult, if not impossible.

There is also a natural tendency to stick with tried-and-true methods. Given the pressures of assessments and institutional oversight, teachers often rely on techniques that have proven effective in the past. Even when they are open to change, fears of failure or misunderstandings by school administrators or parents can suppress creativity and experimentation.

Taken together, these findings suggest that the gap between theoretical ideals and classroom practice does not stem from a lack of awareness or educational resistance. Rather, it reflects a broader set of environmental, institutional, and professional constraints. Teachers are not opposing the integration of sustainability-they are seeking realistic and safe ways to do so that aligns with the developmental needs of their students and the constraints of their school environments.

Therefore, supporting this group of educators requires more than theoretical guidelines. It calls for meaningful professional development, flexible and inclusive curricula, and enabling school environments that allow teachers to gradually shift from traditional approaches to more innovative ones-without feeling pressured, isolated, or unsupported.

A closer look at teachers' preference for traditional methods-such as storytelling, direct instruction, and individual work-reveals that this tendency is not merely rooted in pedagogical habits but also reflects the practical realities of early childhood education settings in the Arab context. Classrooms are often overcrowded, resources are limited, and available time is constrained. These conditions make traditional methods feel safer and easier to implement under the pressure of administrative expectations and daily workload. Moreover, the culturally embedded image of the teacher as the "main transmitter of knowledge" leads many educators to feel unprepared or unsupported in adopting more interactive or innovative methods, such as project-based learning or outdoor activities. These approaches are perceived to require specific skills, equipment, and training resources that many teachers have not yet received. This suggests that transitioning toward more modern and sustainability-oriented teaching practices requires not only curricular reform, but also institutional support and a gradual, confidence-building approach that empowers teachers and prepares the learning environment accordingly. Additionally, the preference for traditional methods is not necessarily due to a lack of belief in modern approaches, but rather to the practical constraints of the school context. Interactive or digital activities often demand more time, materials, preparation, and classroom management skills. Such requirements are not consistently available in kindergartens or early primary classrooms. Teachers, often responsible for large numbers of young children, tend to gravitate-quite understandably-toward teaching strategies that are easier to manage, such as storytelling and direct instruction.

IMPLICATIONS OF THE STUDY

This study holds both theoretical and practical implications for the field of early childhood education, particularly in relation to integrating sustainable development concepts into young learners' curricula. Theoretically, the findings contribute to a growing body of literature that questions the assumption that progressive or globally endorsed approaches are automatically transferable to early childhood settings. By revealing the paradox between theoretical ideals and daily teaching realities, the study invites scholars and curriculum designers to re-examine what "developmentally appropriate" sustainability education truly means for young children. Practically, the results offer valuable insights for policymakers, curriculum developers, and teacher educators. The clear preference among teachers for traditional methods-despite their support for sustainability principles-highlights the need for more grounded, context-sensitive training programs and resources. Providing early childhood educators with targeted professional development, hands-on materials, and realistic examples of sustainability practices can bridge the gap between aspiration and application. Additionally, school systems need to create supportive environments-both structurally and culturally-that allow teachers to experiment with new methods without fear or institutional resistance. Ultimately, the study underscores the importance of listening to teachers' voices, not just as implementers, but as co-creators of pedagogical change. Their experiences, constraints, and reflections should inform future efforts to make sustainability education more accessible, meaningful, and effective in early learning environments.

CONCLUSION

This study sets out to investigate both the practical realities and pedagogical preferences of early childhood educators in integrating sustainable development concepts into early learning curricula. By engaging 384 female teachers across Saudi Arabia, Egypt, and Jordan, the study illuminated not only the paradoxes between theory and practice but also

the preferred educational strategies that shape daily teaching experiences.

A major contribution of the study was the identification of five paired pedagogical approaches-each representing a spectrum between traditional and progressive methods. These included: Narrative-based vs. experiential/practical activities, direct instruction vs. project-based learning, individualized learning vs. collaborative learning, indoor vs. outdoor activities, and traditional vs. digitally enriched activities. Through these dimensions, the study offered a clear framework for understanding how sustainable development concepts may be introduced, adapted, or resisted in early childhood contexts.

The results showed a consistent pattern: teachers were more comfortable with the more conventional methods in each pair, such as storytelling, direct instruction, and indoor classroom routines. These preferences were grounded in both pedagogical concerns-such as children's cognitive readiness-and structural limitations, including lack of training, curricular resources, or institutional support. At the same time, the teachers' written reflections revealed an underlying enthusiasm for the values of sustainability, even if the methods for teaching these values felt out of reach.

Open opinions from teachers' responses confirmed that the gap between aspirations and implementation is not rooted in resistance to sustainability itself, but in the constraints of professional capacity and contextual readiness. The study underscores the need for early childhood education systems to move beyond policy rhetoric and provide practical support for teachers-including professional development, curriculum alignment, and parent-community engagement-so that the goals of sustainable development can be meaningfully translated into early learning experiences.

While early childhood educators demonstrate a willingness to contribute to global sustainability goals, their ability to do so depends on targeted support, realistic teaching strategies, and a curriculum environment that acknowledges both developmental appropriateness and cultural context. Bridging this gap will require intentional collaboration among educators, curriculum designers, and policymakers-ensuring that the first steps children take toward understanding sustainability are both meaningful and feasible.

RECOMMENDATIONS

Developing Flexible Early Childhood Curricula that Embed Sustainability Gradually and Playfully

Early childhood curricula should be redesigned to include sustainability concepts in ways that respect children's developmental stages and teachers' working conditions. This can be achieved by integrating sustainability themes through play, storytelling, classroom routines, and discovery-based activities-rather than treating them as separate units or topics. Embedding such concepts into existing domains (language development, arts, social-emotional learning) can ensure children's gradual exposure to sustainability values without overwhelming teachers or disrupting the flow of early childhood programs.

Embedding Sustainability Gradually into Early Childhood Curricula

Curriculum developers are encouraged to integrate flexible, developmentally appropriate sustainability indicators within early childhood programs. Rather than adding new, overloaded content, sustainability can be gently embedded into existing learning areas (language, arts, life skills) through themes such as care, sharing, nature, and community - ensuring alignment with the realities of local classrooms.

Supporting Teachers with Simple, Feasible Strategies

Teachers should be provided with practical, low-cost ideas to weave sustainability concepts into everyday classroom routines such as storytelling with moral-environmental messages, recycling corners using available materials, or class responsibilities related to caring for plants or conserving water. These strategies require minimal resources but can build children's early awareness and responsibility.

Providing Continuous, Bite-Sized Professional Development

Educational supervisors can play a key role by offering short, ongoing training sessions (micro-workshops) and practical mentoring to teachers on how to implement sustainability using the tools they already have. Peer-exchange meetings where teachers share simple success stories can also foster confidence and innovation.

Building Partnerships with Families and Local Communities

Engaging parents in simple activities such as sending recyclable materials from home or discussing sustainability messages can amplify the classroom impact. Collaboration with local community partners (parks, environmental clubs, municipalities) - even in small, symbolic ways - helps reinforce the values children learn at school.

Encouraging A Culture of Gradual Change and Creativity

Finally, ministries and school leaders are encouraged to adopt a supportive mindset that values small steps and creative efforts from teachers - even if the available infrastructure is modest. Recognizing and celebrating innovative attempts builds momentum and helps sustainability become a natural, lived part of early childhood education rather than an external burden.

LIMITATIONS OF THE STUDY

This study has certain limitations that should be acknowledged. To begin with, the sample was composed entirely of female early childhood educators from three Arab Countries-Saudi Arabia, Egypt, and Jordan. While this focus offers culturally meaningful insights, it naturally restricts the broader applicability of the findings to other geographic or gender-diverse populations. Moreover, the study relied on self-reported data collected through a questionnaire, which, although it included open-ended items, may not fully reflect the depth and complexity of teachers' classroom practices, personal beliefs, or the subtle dynamics influencing their

choices. Observational methods or in-depth interviews could have offered richer, more contextualized understanding. It is also important to note that the study investigated a selected set of instructional strategies rather than an exhaustive list. While the chosen strategies were grounded in literature and validated by experts, they do not represent the full range of possible pedagogical approaches to sustainability in early childhood education.

Additionally, the instrument was distributed online, which may have unintentionally excluded participants without reliable internet access or those less comfortable with digital tools-potentially skewing the sample toward more tech-savvy respondents. Lastly, while the study explored teachers' perceptions and preferences regarding sustainability-related approaches, it did not assess how these strategies influence children's understanding or behaviors. Exploring the child-level outcomes of different approaches remains a valuable avenue for future research.

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