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Article

Cultivating future guardians: The role of Saudi preschool teachers in advancing education for sustainable development (ESD)

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Abstract: Sustainable development (SD) is an approach that aims to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. Education for sustainable development (ESD) is a key component in achieving this goal, as it equips young people with the knowledge, skills, and values needed to make sustainable decisions. This study investigated how preschool teachers in Saudi Arabia understood (SD) and the state of (ESD) practices. A survey was used to collect data from 230 Saudi preschool teachers. The findings revealed that 90% of teachers lacked awareness regarding SD. The overall evaluation of ESD practices among participants indicated a weak subpar status, with an average score of 2.49 out of 4. Notably, in ascending order, the following three dimensions had weak mean scores: the content aspect (2.38) had the lowest score, followed by the practice aspect (2.54) and the competencies aspect (2.58). Meanwhile, the values aspect (2.63) had an average outcome. Analysing the mean scores of ESD practices based on teachers' qualifications and school types revealed significant differences, although no variations were observed based on experience. The primary obstacle to ESD implementation in pre-schools was the lack of awareness regarding SD/ESD. The study underscores the significance of expanding teacher training to promote ESD effectively in pre-school settings. The results highlight the need for professional development opportunities to improve ESD implementation in classrooms, educate Saudi preschool teachers about SD, and create instructional materials that align with the principles of ESD.

Keywords: sustainability; Saudi Arabia; early childhood education; obstacles to SD; protocols for introducing ESD

1. Introduction

Sustainable development (SD) has gained significant traction as a vision for building stable communities anchored in social justice, equity, and civic engagement. However, the challenges associated with achieving it have grown increasingly intricate (Cebrian and Junyent, 2015). Identifying strategies to empower individuals to overcome these obstacles and navigate towards sustainable societies has become imperative. In this context, education is a critical cornerstone for achieving sustainability (Bautista et al., 2018). Current economic trajectories are unsustainable, highlighting the urgent need for public awareness and investment in training and education to drive transformative change (Mckeown et al., 2002). Recognising this urgency, the United Nations (UN) General Assembly proclaimed the Decade for Education for Sustainable Development (DESD) in 2005. This initiative aimed to integrate sustainability-related values, activities, and concepts into all forms of education and learning (UNESCO, 2017). The goal was to cultivate a shift in attitudes, behaviours, and values, ultimately leading to a sustainable future in social,

environmental, and economic dimensions. The DESD identified eight core competencies for individuals to become catalysts for sustainability change: normative competency, strategic competency, critical thinking, collaboration, problem-solving, self-awareness, systems thinking, and anticipation (UNESCO, 2017).

This emphasis on education for sustainable development (ESD) has spurred substantial governmental commitments to integrate ESD across all educational levels globally (Kagawa, 2007). The Kingdom of Saudi Arabia (KSA) exemplifies this commitment through its Vision 2030 and National Transformation Program 2020, which outline comprehensive goals for transforming the country into a sustainable entity (Alshuwaikhat and Mohammed, 2017). Further initiatives, such as the Saudi Green Initiative and the Middle East Green Initiative, demonstrate KSA's dedication to reducing carbon emissions, safeguarding the environment, and forging regional collaborations against climate change (AIArjani et al., 2021; Ghanem and Alamri, 2023). KSA's alignment with the UN's Agenda 2030 sustainability goals further underscores its commitment to sustainable development, with a particular focus on goal 4.7. This goal emphasises equipping students of all ages with the knowledge and skills needed to promote sustainability by 2030 (United Nations, 2015). It highlights the importance of instruction about human rights, gender equality, sustainable living, peaceful societies, cultural diversity, global citizenship, and the contribution of culture to sustainability. Notably, the Saudi government recognises the vital role of its youth, the country's true wealth, in fostering and sustaining life in harmony with sustainability principles (Alshuwaikhat and Mohammed, 2017). Consequently, a Royal Order in 2018 mandated the inclusion of Sustainable Development Goals (SDGs) in school curricula (Vision 2030, 2018).

The early years of life hold immense significance in shaping beliefs, abilities, attitudes, habits, and actions, with a lasting impact on individual development (Salonen and Tast, 2013). Recognising this, Abu-Muailiq (2020) advocates initiating desired transformations at the pre-school level. This underscores the pivotal role of high-quality early childhood education and well-qualified teachers in shaping children's educational environments (Furu and Heilala, 2021). Therefore, preschool teachers play a crucial role in fostering abilities, beliefs, attitudes, and behaviours aligned with sustainable development principles (Cheng and Yu, 2022; Salonen and Tast, 2013). The DESD highlights the crucial role of teachers in advancing sustainable development. It emphasises the need for pre-service, in-service, and teacher educators to acquire skills in incorporating SD issues into their curricula and employing pedagogical techniques aligned with quality education for sustainable development (UNESCO, 2005). Despite the acknowledged importance of preschool teachers in ESD, research exploring their understanding and application of ESD principles in practice remains limited (Chung, 2022; Mongar, 2022; Movahedazarhouligh, 2021; Gómez-Marí, 2021). The current study fills in the gap in previous research by exploring the role of Saudi preschool teachers in advancing our understanding of ESD. Consequently, heightened attention needs to be directed towards preschool teachers regarding their understanding, beliefs, and practical application of ESD and to identify the perceived barriers and challenges Saudi preschool teachers face in implementing ESD. This will ensure their ability to effectively integrate and impart ESD principles to their students, laying the foundation for a future generation equipped to navigate

and contribute to a sustainable world.

2. Literature review

This review examines integrating Education for Sustainable Development in Saudi Arabia's pre-school education, highlighting the crucial role of early childhood in promoting sustainability. It emphasises the significance of preschool teachers in embedding ESD principles, aiming to align with Saudi Arabia's Vision 2030 and the Sustainable Development Goals (SDGs).

2.1. Exploring sustainable development education and pre-school teaching

The concept of sustainable development, as articulated by the World Commission on Environment and Development (WCED) in 1987, underscores the imperative of meeting present needs without compromising the ability of future generations to meet their own needs (WCED, 1987). Since then, sustainable development has evolved into a global agenda addressing pressing environmental, social, and economic challenges. UNESCO has emphasised the need for a paradigm shift in thinking and action to achieve sustainable development, advocating for the active involvement of individuals from all sectors of society (UNESCO, 2017).

Education for sustainable development is central to pursuing sustainable development, which aims to empower learners with the knowledge, skills, values, and attitudes necessary to contribute to a more sustainable future. Early childhood is critical for instilling sustainable attitudes and behaviours within education. Research suggests that children, particularly those between birth and six years old, possess a remarkable capacity for understanding and engaging with sustainability issues (Tilbury et al., 2005). During this formative period, children can develop foundational knowledge, values, and attitudes that shape their perspectives on sustainability and environmental stewardship.

Preschool teachers play a pivotal role in fostering sustainability in young learners. They serve as facilitators of ESD, responsible for integrating sustainability principles into their teaching practices and creating learning environments that promote environmental awareness and action. However, despite the importance of their role, there is evidence to suggest that preschool teachers may face challenges in effectively incorporating ESD into their curricula.

One challenge lies in educators' understanding and awareness of sustainability concepts and principles. Research indicates that some early childhood educators may lack familiarity with ESD frameworks and pedagogical approaches, which can hinder their ability to integrate sustainability into their teaching practices effectively (Inoue et al., 2016). Additionally, there may be a lack of support and resources available to preschool teachers for implementing ESD initiatives. Insufficient training opportunities and limited access to relevant teaching materials may further exacerbate these challenges, hindering educators' efforts to incorporate sustainability into their classrooms.

Cultural and contextual factors may also influence educators' perceptions and practices regarding sustainability. Different cultural beliefs and values may shape

educators' attitudes towards environmental issues (Phajane, 2020), affecting the extent to which they prioritise sustainability in their teaching. Furthermore, variations in educational policies and priorities at the national and local levels may impact the degree to which ESD is emphasised in early childhood education curricula. Despite these challenges, there are opportunities to enhance ESD in early childhood education. Professional development programs tailored to the needs of preschool teachers can provide valuable support and resources for integrating sustainability into their teaching practices. Collaborative initiatives involving educators, policymakers, and other stakeholders can foster a supportive environment for ESD implementation, while innovative teaching approaches can engage young learners in meaningful exploration of sustainability issues (Banjarnahor et al., 2023).

2.2. Pre-school education and the promise of sustainable development in Saudi Arabia

Pre-school serves as the initial phase of education in the Kingdom of Saudi Arabia (KSA), although it is not mandatory. It is closely connected to both nursery school and primary education. The Saudi Ministry of Education (MOE) oversees the country's pre-schools. The MOE establishes the curriculum, provides teacher training, and conducts inspections to ensure that pre-schools adhere to the required standards (Aljabreen and Lash, 2016). In Saudi Arabia, two types of pre-schools exist: public and private. Public pre-schools are tuition-free, while private ones require payment (El-Hussein, 2015). Islam is the main theme of the pre-school curriculum in the KSA. Children are taught about Islamic principles, Prophet Muhammad, and the Quran. They are also exposed to the Arabic language, cultural components, and academic disciplines like science, math, and social studies (Aljabreen and Lash, 2016).

Pre-schools support a child's growth across physical, psychological, social, linguistic, and behavioural aspects; they play a critical role in education and upbringing. Additionally, they fulfil various educational purposes, such as fostering a child's independence, uniqueness, and capacity for peer interaction. (Abu-Muailiq, 2020; Aljabreen and Lash, 2016; Hammad, 2021). Viewed in this light, pre-schools have garnered attention within the framework of Saudi Arabia's Vision 2030 (Hammad, 2021). In Saudi culture, children are perceived as the wealth of society and the makers of the future (Aljabreen and Lash, 2016). Children introduced to SD at a young age are more inclined to make sustainable choices as adults.

Moreover, they are more likely to effectively engage in SD activities, a pivotal factor in shaping a more sustainable future (Hammad, 2021). Various methods can be employed to integrate SD into the pre-school curriculum in KSA. One approach involves teaching children about the environment, with gardening, recycling, and composting as effective tools. Children can grasp the importance of energy and water conservation as part of their learning. Another strategy for integrating sustainable development into pre-school education involves teaching children about social justice. By engaging in initiatives such as advocating for combating poverty, gender equality, and defending human rights, children can also comprehend the values of harmony and collaboration (Hammad, 2021).

Currently, preschool teachers' proficiency is emphasised in Saudi Arabia. They

must be certified by the Ministry of Education (MOE) and possess a bachelor's degree in education. This credential is essential since teaching responsibilities include lesson design and operation, evaluation of children's learning, and creating a supportive learning environment. Despite the awareness among Saudi scholars of the potentially impactful role the pre-school phase could play in supporting Saudi Arabia's pursuit of SD, there is a scarcity of investigations on this subject. For instance, Hammad's (2021) study aimed to comprehend the concept of ESD and identify key requirements for its implementation in pre-school education in KSA, as perceived by faculty members at the College of Education in Riyadh. Hammad recommended including programs and activities that appreciate and actively realise an educational plan for sustainable development (Hammad, 2021). Al-Shagrawi et al. (2017) conducted a study from the viewpoint of primary school teachers in the Hail region to investigate the function of sustainable development in socialisation and children's care. The findings underscored the necessity for educational courses for teachers and students, focusing on environmental and personal health. Based on the literature review, there is a limited number of studies exploring the concept and implementation of sustainable development from the viewpoint of Saudi preschool teachers, along with the potential challenges they may face and strategies for overcoming them. To address this knowledge gap, the present study aims to explore the following questions:

1) How do Saudi preschool teachers view sustainable development (SD)?
2) How do Saudi preschool teachers implement the ESD practices? Do these practices differ based on teachers' educational backgrounds, the nature of the educational institutions, and years of teaching experience?
3) What obstacles to ESD do Saudi preschool teachers perceive?

2.3. Conceptual framework

The Sustainable Development Goals (SDGs) set by the United Nations serve as the foundation and context for Education for Sustainable Development. However, they alone are insufficient in equipping educators with the necessary skills for independently applying critical ESD and fostering worldwide citizenship (Vare, 2018). Several initiatives have been undertaken to address this challenge and create ESD competency frameworks. For this current investigation, the researcher has adopted the framework developed by Cheng and Yu (2022), who created the "Early Childhood Educators' Education for Sustainable Development Practices Scale" (ECEESDPS) to assess the ESD practices of early childhood educators in the Chinese context. This framework, rooted in United Nations publications and related research, classifies core ESD concepts into four denominations: values, content, competency, and implementation, and delineates the essential characteristics of each concept (Cheng and Yu, 2022). To enhance the comprehensiveness of the current study, the researcher has incorporated the concept of sustainable development into Cheng and Yu's (2022) analytical framework (refer to **Figure 1** below).

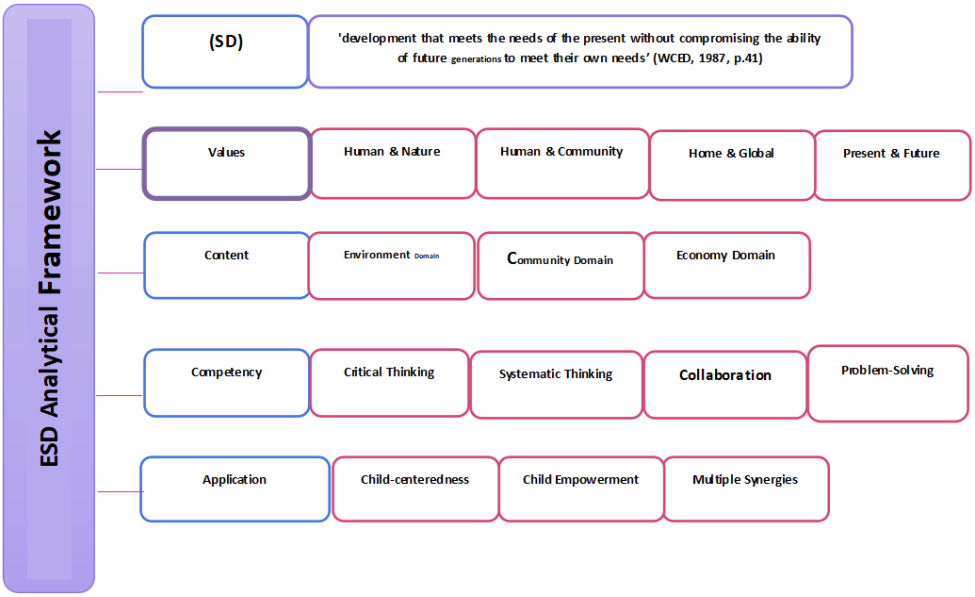

Figure 1. Developed from the ESD analytical framework (Cheng and Yu, 2022).

3. Materials and methods

3.1. Study setting and sample selection

Descriptive survey methodology was used to achieve the study's aims. A survey approach is considered appropriate when the goal is to clarify the intricacies of present situations, provide standards for comparing current conditions, or examine the connections between certain events. (Cohen et al., 2002). It facilitates the gathering of descriptive, inferential, and explicative data. The study included preschool female teachers from public and private pre-schools in a particular Saudi Arabian governorate, totaling 797 female teachers in 2023, as per electronic statistics shared with the researcher via email by the Education Department in the relevant governorate. Convenience sampling was employed, involving the distribution of an electronic link to the target group, allowing a response period of thirty days. The questionnaire was filled out by 230 teachers (28.9%) of the study population. The distribution of the study sample based on years of teaching experience, academic qualification, and pre-school institution type is presented in **Table 1** below.

Table 1. Distribution of study sample (Source: Author).

Variable	**Category**	***F***	**%**
Experience	(1–5) Years	103	44.8
	(6–10) years	87	37.8
	More than 10 years	40	17.4
Qualification	Bachelor	202	87.8
	Postgraduate	28	12.2
Type of pre-school	Public	102	44.3
	Private	128	55.7
Total		230	100

3.2. Study instrument: Development and administration

The study aimed to find out how preschool teachers in one KSA governorate understood SD and how they incorporated it into their classroom instruction. The questionnaire was created based on analysing earlier research and drawing inspiration from the works of Cheng and Yu (2022) and Park et al. (2016). The initial segment gathered basic information about female teachers, encompassing their educational qualification (bachelor or postgraduate), years of teaching experience, and the type of pre-school institution (public or private). The second section delved into teachers' understanding of sustainable development. This part comprised four statements serving as definitional prompts elucidating sustainable development: "Protection of the Environment", "maintaining social, environmental, and economic factors in balance whilst respecting the boundaries of the Earth's ecosystem", "Development that meets the needs of the present without compromising the future", and "ongoing economic growth while keeping the environment priority". The third section pertained to ESD implementation in pre-schools. It comprised 52 items distributed across four fundamental dimensions, assessed on a five-point Likert scale (always, often, sometimes, rarely, never), with corresponding grades (5, 4, 3, 2, 1). The four core dimensions were as follows: Values (10 items, $\alpha = 0.90$), content (17 items, $\alpha = 0.89$), competencies (14 items, $\alpha = 0.93$), and application (11 items, $\alpha = 0.88$). The fourth and final section of the questionnaire included closed-ended questions examining obstacles to incorporating ESD in pre-school education. This section further explored the crucial steps for ESD incorporation in pre-school institutions and the perceived importance of fostering ESD in pre-school institutions. Additionally, the questionnaire featured one open-ended question, inviting teachers to provide any comments or additions they believed might enhance the development of ESD in pre-school settings.

The questionnaire was designed to be completed within 8–10 min. To ensure face validity, the questionnaire was reviewed by two expert jury members specialising in the pre-school area, and subsequent modifications were made based on their suggestions. The research instrument was further tested on an exploratory sample comprising 20 preschool teachers. Pearson's method computed the correlation coefficient between the overall education practices score and the dimensions of ESD practices in pre-schools. The analysis revealed statistically significant Pearson correlation coefficients between the dimensions of education practices for sustainable development in pre-schools and the total education practices score at a significance level of 0.01 or 0.05. The Pearson correlation coefficients ranged between 0.478* and 0.841**, all deemed statistically significant at the 0.01 or 0.05 level, as displayed in **Table 2**.

Table 2 below shows that the Pearson correlation coefficients between the dimensions of education practices for sustainable ESD were significant at the significance level (0.01). The Pearson correlation coefficients ranged between (0.961**–0.972**) and all functions at (0.01). In terms of reliability, the stability coefficient Cronbach's alpha for the overall degree of education for sustainable development (ESD) practices exceeded 0.7 (0.95), indicating the high reliability of the research instrument. The reliability coefficients on the dimensions of education practices for sustainable development in pre-schools ranged between 0.88 and 0.93,

which are high-reliability coefficients appropriate for the study aims. The current research was approved by the King Faisal University Research Ethics Committee [KFU-REC-2022-DEC-ETHICS385]. Subsequently, the researcher initiated formal communication with the Governorate's "Education Department" to secure authorisation for the study and ascertain the sample population's size. The questionnaire was then e-mailed to the pre-school leaders by "the education department" to be distributed to the teachers. The BERA Ethical Guidelines (2018) were followed. The goal of the research and the respondents' freedom to withdraw from the study at any time and for any reason were explained to the respondents. The teachers' participation was voluntary. Additionally, preschool teachers were informed of their rights to privacy, anonymity, confidentiality and the secondary use of data.

Table 2. Relationship between dimensions of pre-school ESD practices and overall score (Pearson's *r*) (Source: Author).

No.	Dimensions	Correlation coefficient	*p*-value
1	First dimension: Values	0.961**	0.000
2	Second dimension: Content	0.972**	0.000
3	Third dimension: Competencies	0.965**	0.000
4	Fourth dimension: Application	0.963**	0.000

** Correlation is significant at the (0.01) level.

3.3. Data analysis

Statistical package for social sciences (SPSS) version 23 was used to evaluate the gathered data and investigate the study inquiries. Pearson's correlation coefficient was utilised to assess the validity of consistency. At the same time, Alpha Cronbach was employed to ascertain the reliability of the research instrument. Chi-tests, ratios, and frequencies were used to address the first study question. Mean scores, standard deviations, and rank were used to respond to the second study question. Multiple variance analysis was conducted to examine the significance of differences across variables, and frequencies and ratios were employed to address the third and fourth research questions. Additionally, the following grading was adopted for the degree of achieving the items, dimensions, and areas of the current situation of education practices for sustainable development among preschool teachers in one of the governorates in the Kingdom of Saudi Arabia to determine the degree of agreement based on the range equation, as illustrated in **Table 3** below.

Table 3. Classifying mean scores using the range equation: interpretation criteria (Source: Author).

Degree of agreement	Very weak	Weak	Medium	large	Very large
Mean	1–1.80	More than 1.80–2.60	More than 2.60–3.40	More than 3.40–4.20	More than 4.20–5.00

4. Results

4.1. Preschool teachers' conceptions of sustainable development

The initial research question investigated preschool teachers' understanding of sustainable development. Analysis of teachers' responses revealed 23 correct answers on sustainable development (10.0%), in which participants defined SD as "the development that meets the needs of the present without compromising the future," and there were 207 incorrect answers (90.0%). The results favoured incorrect answers, as indicated by the chi-square value (144.31) and the significance level (0.00), highlighting a lack of understanding and knowledge of sustainable development among preschool teachers. Refer to **Table 4** below.

Table 4. Percentages and frequencies of responses from preschool teachers regarding the concept of (SD), along with the Chi-square test to indicate the significance of differences between correct and incorrect responses (Source: Author).

Alternatives to sustainable development concept responses (frequency) (ratio)				**Observed value**				**Expected value**	χ^2	**df**	***p*-value**
Protection of the Environment	maintaining social, environmental, and economic factors in balance whilst respecting the boundaries of the Earth's ecosystem	Development that meets the needs of the present without compromising the future	ongoing economic growth while keeping the environment a priority	Number of correct answers	Percentage of correct answers	Number of wrong answers	Percentage of wrong answers				
(11) (4.80)	(140) (60.8)	(23) (10.0)	(56) (24.4)	23	10.0	207	90	113.5	144.31	1	0.000

4.2. Investigating preschool teachers' approaches to ESD

With a mean score of (2.49 ± 0.267), the examination of preschool teachers' implementation of education for sustainable development revealed a weak overall score for the current ESD activities level, as shown in **Table 5** below.

The data presented in **Table 5** indicates that the first dimension, values, achieved a moderate score with a mean of (2.63 ± 0.254). Mean scores for values ranged from 2.60 to 2.67, with all subareas falling within the moderate range. Meanwhile, the other three dimensions received low mean scores: competencies received a weak score with a mean of (2.58 ± 0.296). Mean scores for competencies varied between 2.55 and 2.62, all registering as weak. The application dimension ranked third, securing a mean score of (2.54 ± 0.319) and a weak rating. Application areas demonstrated mean scores ranging from 2.48 to 2.57. The content dimension occupied the last position, with a mean score of (2.38 ± 0.333) and a weak rating. Mean scores for content areas ranged from 2.21 to 2.45, all reflecting a weak degree.

Additionally, the survey aimed to investigate whether preschool teachers' ESD practices differ based on their experience, academic qualifications, and the type of educational institution. The mean scores for education status for sustainable development practices among preschool teachers were analysed for years of teaching experience, academic qualification, and type of pre-school institution (refer to **Table 6**).

Table 5. Pre-school ESD practices: Teacher responses (mean, SD, grade) (Source: Author).

No	Dimension	Mean	Std. deviation	Grade
	I: Values	2.63	0.254	Average
1	Human & Nature	2.60	0.348	Weak
2	Human & Community	2.67	0.301	Average
3	Home & Global	2.63	0.323	Average
4	Present & Future	2.61	0.346	Average
	II: Content	2.38	0.333	Weak
1	Environment Domain	2.45	0.371	Weak
2	Community Domain	2.42	0.334	Weak
3	Economy Domain	2.21	0.472	Weak
	III: Competencies	2.58	0.296	Weak
1	Critical Thinking	2.58	0.33	Weak
2	Systematic Thinking	2.57	0.366	Weak
3	Collaboration	2.55	0.379	Average
4	Problem-Solving	2.62	0.358	Average
	IV: Application	2.54	0.319	Weak
1	Child-Centredness	2.57	0.372	Weak
2	Child Empowerment	2.48	0.367	Weak
3	Multiple Synergies	2.54	0.387	Weak

Table 6. ESD practices in pre-school: Effect of teacher background (experience, qualification, institution) (Source: Author).

Variable	Variable dimensions	Mean scores &std. deviation	I: Values	II: Content	III: Competencies	IV: Practice	Total grade
Experience	(1–5) years	Mean score	2.66	2.37	2.58	2.55	2.52
		Number	103	103	103	103	103
		Standard deviation	0.255	0.378	0.314	0.320	0.282
	(6–10) years	Mean score	2.6	2.35	2.56	2.5	2.49
		Number	87	87	87	87	87
		Standard deviation	0.284	0.334	0.315	0.352	0.286
	More than 10 years	Mean score	2.59	2.43	2.57	2.54	2.52
		Number	23	23	23	23	23
		Standard deviation	0.274	0.331	0.298	0.278	0.278
Qualification	Bachelor	Mean score	2.66	2.39	2.61	2.56	2.54
		Number	202	202	202	202	202
		Standard deviation	0.246	0.354	0.303	0.326	0.276
	Postgraduate	Mean score	2.43	2.31	2.38	2.33	2.35
		Number	28	28	28	28	28
		Standard deviation	0.312	0.264	0.275	0.302	0.245

Table 6. (*Continued*).

Variable	Variable dimensions	Mean scores &std. deviation	I: Values	II: Content	III: Competencies	IV: Practice	Total grade
Educational institution	Public	Mean score	2.59	2.34	2.52	2.5	2.47
		Number	102	102	102	102	102
		Standard deviation	0.286	0.343	0.335	0.358	0.299
	Private	Mean score	2.67	2.41	2.63	2.57	2.55
		Number	128	128	128	128	128
		Standard deviation	0.243	0.346	0.276	0.306	0.257

The researcher also conducted multiple variance analyses to show the significance of variations in preschool teachers' mean scores regarding the state of ESD practices based on experience, academic background, and type of educational institution. Refer to **Table 7** below.

Table 7. Pre-school ESD and teacher profile: A multiple variance analysis of mean scores across experience levels, qualifications, and institution (Source: Author).

Variable	Dimension	Sum squares	df	Mean scores of squares	*F*	*p*-value
Experience	I: Values	0.151	2	0.075	1.192	0.306
	II: Content	0.303	2	0.152	1.304	0.273
	III: Competencies	0.115	2	0.058	0.691	0.502
	IV: Application	0.165	2	0.083	0.807	0.448
	Total grade	0.160	2	0.080	1.119	0.329
Qualification	I: Values	1.280	1	1.280	20.260	0.000
	II: Content	0.215	1	0.215	1.851	0.175
	III: Competencies	1.372	1	1.372	16.428	0.000
	IV: Application	1.371	1	1.371	13.390	0.000
	Total grade	0.877	1	0.877	12.287	0.001
Educational institution	I: Values	0.183	1	0.183	2.892	0.090
	II: Content	0.264	1	0.264	2.271	0.133
	III: Competencies	0.571	1	0.571	6.841	0.010
	IV: Application	0.181	1	0.181	1.765	0.185
	Total grade	0.304	1	0.304	4.260	0.040
Error	I: Values	14.148	224	0.063		
	II: Content	26.043	224	0.116		
	III: Competencies	18.702	224	0.083		
	IV: Application	22.942	224	0.102		
	Total grade	15.985	224	0.071		
Total	I: Values	1744.900	230			
	II: Content	1453.571	230			
	III: Competencies	1683.934	230			
	IV: Application	1633.670	230			
	Total grade	1601.917	230			

Concerning years of teaching experience, **Table 7** revealed no significant differences at the 0.05 significance level between the mean scores of the status of education for sustainable development (ESD) practices among preschool teachers based on the experience variable. However, data analysis indicated significant differences at the 0.05 significance level between the mean scores of the current status of education practices for ESD among preschool teachers based on the qualification variable, encompassing the total degree and all dimensions except for the second dimension. The differences favoured those with a bachelor's degree. Regarding the educational institution variable, **Table 7** displayed significant differences at the 0.05 significance level between the mean scores of the current situation of practices for ESD among preschool teachers based on the educational institution variable, encompassing the total degree and the third dimension. The differences favoured private pre-schools, encompassing the total degree and the third dimension. The differences favoured private pre-schools.

4.3. Obstacles to applying sustainable development education

Table 8 below summarises the examination of participant viewpoints on the obstacles to education for sustainable development.

Table 8. Obstacles or difficulties in ESD from the perspective of preschool teachers (Source: Author).

No.	Rank	Barriers	*F*	%
1	1	Insufficient knowledge of the concept of sustainable development	97	47.1
2	4	Deficiency of knowledge of educational content	28	12.1
3	2	Deficiency of learning and teaching materials	46	20
4	3	The disinterest of parents in ESD	37	16.08
5	5	The school administrator's disinterest in ESD	14	6.0
6	6	Lack of interest among teachers in ESD	8	3.04

Based on the analysis, the most significant obstacle to ESD in pre-schools, according to teachers, is insufficient knowledge of the concept itself (47.1%). Conversely, teacher disinterest ranked as the least prevalent barrier (3.04%). These findings suggest prioritising professional development on both theoretical understanding and practical implementation strategies.

4.4. Proposal protocols for introducing ESD into pre-schools

The study further explored preschool teachers' perspectives on potential procedures to apply ESD in the pre-school context. Refer to **Table 9** below.

Preschool teachers identified expanding pre-service and in-service teacher training (60.86%) as the most crucial step for ESD implementation, followed by developing learning and teaching materials (48.26%). Conversely, establishing connections with the community and family (35.65%) was perceived as the least impactful measure. This suggests prioritising resources and efforts towards teacher capacity building and resource development for effective ESD integration in pre-school settings.

Table 9. Key actions for implementing ESD in pre-school (Source: Author).

No.	Rank	Key actions for implementing ESD in pre-school	*F*	%
1	1	Expansion of pre-service and in-service teacher training	140	60.86
2	2	Development of learning and teaching materials	111	48.26
3	3	Integrating ESD into the curriculum	102	44.34
4	4	Developing schools' interest in sustainable development	87	37.82
5	5	Connecting with family and community	82	35.65

The study also explored preschool teachers' viewpoints on the significance of developing ESD in pre-school settings, as presented in **Table 10** below.

Table 10. Preschool teachers' perspectives on ESD importance: frequencies and percentages (Source: Author).

No.	Response	*F*	%
1	Very important	160	69.6
2	Somewhat important.	64	27.8
3	Not important	6	2.6

Table 10 shows the participants' perceived importance of implementing ESD at the pre-school level, with a frequency of 160 and a percentage of 69.6%.

5. Discussion

Childhood years are crucial for laying the groundwork for attitudes and ideals connected to education for sustainable development, underscoring the significance of early childhood education in the broader framework of sustainable development (Cheng and Yu, 2022; Park et al., 2016). Teachers working with young children, including preschool teachers, influence educational practices and shape children's long-term development (Cheng and Yu, 2022). Preschool teachers must possess the requisite knowledge and skills to effectively implement ESD and convey its principles to their students (Taimur, 2020). The primary objective of this study was to explore preschool teachers' comprehension of SD and their integration of ESD into their classroom practices. The study's results revealed a prevalent misunderstanding among most preschool teachers of sustainable development. This result is consistent with another study, where only 14% of surveyed early childhood teachers understood sustainable development concepts well (Park et al., 2016). The limited comprehension of SD among preschool teachers may be attributed to the relatively recent emergence of the sustainable development concept, first introduced in the 1980s (World Commission on Environment and Development, 1987). ESD has gained prominence in recent decades (UNESCO, 2005).

Consequently, many preschool teachers may not have sufficient opportunities to learn about SD or ESD during their pre-service or in-service training. This interpretation is reinforced by teachers' responses citing the insufficient knowledge of sustainable development as the most common barrier to applying ESD in pre-school. Additionally, some teachers might not perceive SD or ESD as a top priority, potentially leading to reluctance to teach sustainability-related topics (Inoue et al.,

2016). The focus of certain preschool teachers on delivering essential academic skills, such as writing, reading, and math, which receive more attention from educational leaders, could contribute to this perspective (Bautista et al., 2018; Stevenson et al., 2017). According to the study, raising preschool teachers' knowledge of SD is critical to preparing the future generation to handle sustainability issues.

Education for sustainable development aims for a comprehensive and transformative learning strategy, emphasising teaching methods, environments, content, and outcomes (Leicht et al., 2018). Yet, its adoption in pre-school classrooms remains limited, aligning with findings that many teachers have yet to integrate ESD effectively (Park et al., 2016). Commonly, SD-related activities are introduced through circle time discussions. A significant barrier to ESD's broader implementation is the teachers' limited understanding of SD/ESD, posing a considerable challenge in weaving it into their teaching methodologies (Park et al., 2016). Moreover, the lack of adequate training in SD and ESD during teachers' professional development is notable (Maidou et al., 2019), with a substantial portion of respondents advocating for expanded pre-service and in-service training as a critical step for integrating ESD in pre-schools. The need for training programs in SD and ESD was also underscored in open-ended responses. Additionally, preschool teachers may struggle to access essential resources for ESD implementation, such as professional development opportunities, curriculum materials, or support from school administrations (Park et al., 2016), with a notable reported obstacle being resource scarcity. Addressing these gaps in knowledge and resources is vital for enhancing ESD implementation in early childhood education settings.

The study found that while preschool teachers scored moderately on understanding the value of sustainable development (SD), with 69.6% showing positive appreciation, their grasp on other ESD aspects was lacking. This discrepancy suggests that appreciating SD's value doesn't guarantee a deep understanding or effective ESD teaching practices (Choi et al., 2010). In Saudi Arabia, despite an educational focus on continuous learning and critical skills (Iqbal and Zenchenkov, 2014; Alosaimi, 2013), the study revealed a weak application of ESD competencies among preschool teachers. This weakness could stem from insufficient training and comprehension of ESD competencies, especially in critical thinking, cooperation, and problem-solving (Urrea-Solano et al., 2021; Vásquez et al., 2020; Straková and Cimemanova, 2018; Cebrián and Junyent, 2015). The study calls for enhanced didactic strategies and in-depth SD training (Urrea-Solano et al., 2021; Straková and Cimemanova, 2018; Cebrián and Junyent, 2015) and integrating these competencies into teacher education programs (Vásquez et al., 2020; Cebrián, 2015). The content dimension scored lowest, possibly due to SD's complexity, encompassing economic, environmental, and social justice issues (Leicht et al., 2018). This complexity makes it challenging for teachers to fully grasp SD's varied facets. The findings highlight the need for curriculum improvements in pre-schools to better teach SD, thereby equipping teachers to effectively impart SD principles to students.

Based on participants' years of teaching experience, findings revealed no significant differences in the current status of ESD education practices among preschool teachers. This suggests that teachers with varying experience levels are equally inclined to implement ESD practices in their classrooms, provided they

possess the requisite knowledge and skills. Additionally, the integration of ESD into pre-school education might be influenced by whether the Ministry of Education mandates it and if it is incorporated into the educational goals for the pre-school stage. Based on their academic background, preschool teachers' mean scores on the current state of ESD practices showed statistically significant variances. Teachers holding a bachelor's degree stated that they implemented ESD more frequently than those holding a postgraduate degree. This result may be explained by the small percentage of female participants in the study—just 12.2% of the total sample size—who held academic degrees higher than a bachelor's.

Furthermore, there were differences in preschool teachers' mean scores about the current state of education practices for ESD based on the kind of school, favouring private schools, at the significance level of 0.05. Teachers in private pre-schools demonstrated a higher likelihood of implementing ESD practices than their public pre-schools counterparts. This aligns with previous findings highlighting the association between the type of early childhood institution and sustainable development education (Korkmaz and Yildiz, 2017). The results suggest that private pre-schools might be more conducive to ESD implementation than public ones. Several factors could contribute to this observation. Private pre-schools may have more abundant resources, providing better access to materials and information related to ESD. Additionally, the autonomy enjoyed by private pre-schools might play a role. Their greater flexibility in decision-making about curriculum and pedagogy may make it more feasible for them to integrate ESD practices into their educational approach (Korkmaz and Yildiz, 2017).

The study's findings align with prior research by identifying common obstacles to implementing ESD in pre-schools and educational institutions. Insufficient knowledge of SD emerged as a predominant hindrance, consistent with findings in previous studies (Park et al., 2016; Sagdic and Sahin, 2016). This obstacle may be exacerbated if teachers are not adequately exposed to sustainable development concepts during training (Corney, 2006; Summers et al., 2005). Insufficient teaching and learning resources were also identified as a significant barrier to ESD, echoing concerns raised in previous research (Sagdic and Sahin, 2016). While some resources for teaching sustainable development exist, they may be costly and challenging.

Additionally, participants highlighted other factors hindering ESD, such as a lack of interest among school administrators and teachers (Sagdic and Sahin, 2016). These constraints might discourage educators from integrating ESD into their teaching methodologies. The study underscores the importance of providing support to teachers through training initiatives, programs, resource allocation, curriculum enhancements, and financial backing to encourage the incorporation of ESD into their instructional practices. This finding is ESD in pre-school institutions. These critical actions encompass the expansion of pre-service and in-service teacher training. Development of learning and teaching materials, Incorporating ESD into the pre-school curriculum, fostering schools' interest in sustainable development, and strengthening connections with community and family (Maidou et al., 2019; Park et al., 2016; Siraj-Blatchford et al., 2010).

6. Conclusion

Early childhood education, particularly in pre-school, plays a crucial role in instilling values and beliefs related to ESD. Education for sustainable development is a comprehensive educational approach that equips students with the knowledge, skills, and values necessary for fostering a future with greater sustainability. This study delved into the existing state of ESD practices among preschool teachers within a specific governorate in KSA. The results revealed that preschool teachers possess an insufficient knowledge of sustainable development (SD), and the overall implementation of ESD practices among them is characterised as weak. Notably, a prominent obstacle to incorporating ESD in pre-school institutions is the insufficient awareness of SD or ESD. Therefore, enhancing the understanding of SD among Saudi preschool teachers is imperative. This can be achieved through targeted initiatives such as professional development programs to equip teachers with the knowledge and skills necessary to effectively implement ESD in their classrooms. Additionally, developing suitable learning and teaching materials aligned with ESD principles, integrating ESD into the pre-school curriculum, and cultivating pre-school institutions' interest in sustainable development are crucial. Together, these efforts assist in educating preschoolers to be active contributors to creating a more sustainable future and tackling sustainability-related issues.

6.1. Limitations and suggestions for future research

This study has notable limitations that warrant consideration. Firstly, its scope is confined to a single governorate in Saudi Arabia, potentially limiting the generalizability of findings to other regions within the country or beyond its borders. Secondly, reliance on self-reported surveys introduces social desirability bias, as participants may be inclined to present a more favourable picture of their ESD practices. Thirdly, the study lacks data on the actual implementation of ESD in pre-school institutions, impeding a comprehensive assessment of the effectiveness of ESD teaching in Saudi Arabian pre-schools. Fourthly, selection bias: the method used to select participants could introduce bias. For example, if only teachers who volunteered to participate were included, the sample might not be representative of the entire population. Fifthly, timeframe: the study only captures a snapshot of ESD practices at a specific time. Finally, focus on teachers; the study solely focuses on the perspective of preschool teachers. Despite these limitations, the study contributes significantly by being among the first to explore the current utilisation of ESD practices among Saudi preschool teachers. It sheds light on the challenges and obstacles associated with implementing ESD in pre-school, emphasising the urgent need for heightened attention to ESD in early childhood education. This awareness is crucial for ensuring that forthcoming generations are adequately equipped to tackle sustainability issues and challenges.

Several avenues for future research on ESD in pre-school education emerge from this study. Firstly, replication of this research in various regions of Saudi Arabia and different countries would provide insights into the generalizability of the study's findings. Comparing outcomes across diverse settings can offer a more comprehensive understanding of the status of ESD practices in pre-school education. Secondly, a

qualitative research approach could deepen the exploration of obstacles to applying ESD in pre-school institutions. Qualitative methods, such as interviews or focus groups, enable a nuanced examination of challenges and facilitate the identification of specific strategies to address these obstacles. Moreover, longitudinal research would provide a more comprehensive understanding of how these practices evolve over time; and including, the perspectives of parents, administrators, or even preschool students (through appropriate methods) could provide a more holistic view of ESD implementation. Lastly, future research could explore the effect of ESD on children's attitudes, behaviours, and knowledge concerning sustainability. Investigating how ESD initiatives influence young children's understanding and actions related to sustainability can contribute valuable evidence on the effectiveness of ESD in fostering a sense of responsibility and awareness among the youngest learners.

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