

AWARENESS, ATTITUDES, AND CHALLENGES OF PRE-SERVICE TEACHERS IN INTEGRATING EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)



SCAN ME

Kayode Babatunde OLAWUMI ^{1*} 

Morakinyo AKINTOLU ² 

¹ Universit of South Africa kayode.olawumi1969@gmail.com

² Universit of South Africa akintolumorakinyo@gmail.com

Article history:

Submission 21 May 2025

Revision 24 July 2025

Accepted 26 August 2025

Available online 31 August 2025

Keywords:

Education for Sustainable Development,
Awareness,
Pre-service Teachers,
Attitudes. Challenges.

DOI:

<https://doi.org/10.32936/pssj.v9i2.663>

Abstract

The paper explores pre-service teachers' awareness, attitudes, and challenges in integrating Education for Sustainable Development (ESD) into their future teaching practices. ESD aims to equip learners with the knowledge, skills, attitudes, and values necessary to shape a sustainable future, addressing global challenges such as climate change, resource scarcity, and social inequities. Given the critical role of teachers in fostering sustainable mindsets, this study explores pre-service teachers' awareness of ESD, their attitude toward the concept, and the challenges to implementing it in the classroom. Using a quantitative approach, data were collected through surveys from pre-service teachers in various training programs. The findings reveal diverse levels of awareness, with many pre-service teachers recognizing the importance of sustainable education yet expressing uncertainty about effective integration strategies. The study highlights the need for curriculum adjustments in teacher education programs to ensure that pre-service teachers have the content knowledge and practical skills to incorporate ESD into their teaching confidently. These insights offer valuable implications for educational institutions aiming to strengthen sustainability-oriented teaching frameworks and contribute to global efforts toward a more sustainable future.

1. Introduction

Recently, there has been increased global recognition of the teacher education program as a veritable tool for addressing the effects of climate change and creating a paradigm shift on the need to preserve the environment from disasters occasioned by human and natural causes through educational awareness. The teacher education program is designed to produce teachers capable of providing appropriate knowledge for school-going children. The teaching education program aims for pre-service teachers (student-teachers) to practice the act (theories and practices) of teaching and practice what they have acquired while in actual classroom situations (Mashau, 2012).

As stated in the Education 2030 Framework for Action, teacher policies and regulations should be in place to ensure that teachers and educators are empowered, adequately recruited and compensated, well-trained, professionally qualified, motivated, and distributed equitably and efficiently across the entire educational system, as well as supported within well-resourced, efficient, and effectively governed systems (UNESCO, 2016).

Education for sustainable development is a transformative approach that focuses on transforming the education system through appropriate skills, values, and attitudes necessary to address the problem of global environmental challenges (Raman et al., 2022). Studies, however, indicate that while the Pre-service teacher education role in transforming society toward a sustainable future is noted (Leicht et al., 2018), research findings suggest that though pre-service teachers perceived themselves to be competent in every area of teacher professionalism, they are not equipped with skills and competencies to teach education for sustainable development (Dahl, 2019, Olawumi et al., 2024). Studies also suggest that rather than integrating sustainable development into the pre-service teacher education program, they are supplemented into the training program (Raman et al., 2022; Manasia et al., 2019). Findings from research on integrating ESD into pre-teacher education focus on specific education courses and countries (Martin et al., 2022; Pewkam & Chamrat, 2022) despite its current trends, thereby creating a gap that this study intends to address. This study will explore pre-service teachers' awareness level, challenges, and attitudes in integrating education

for sustainable development in the teacher education program in two federal universities in Nigeria.

1.1 Statement of Problem

Education for Sustainable Development (ESD) is critical for addressing global challenges such as climate change, environmental degradation, social inequality, and economic instability (UNESCO, 2018). As future educators, pre-service teachers play a pivotal role in embedding sustainable practices and fostering awareness among future generations (North, 2010). However, their ability to effectively integrate ESD into teaching depends on their awareness, attitudes, and challenges. Despite the growing emphasis on ESD in educational policies and curricula (García-González et al., 2020; Raman et al., 2022; Nousheen et al., 2024; Olawumi, 2024), there is an emphasis on a lack of understanding about how pre-service teachers are prepared to integrate ESD into their teaching practices. This gives rise to questions such as: Are pre-service teachers adequately informed about the principles and importance of ESD? Do they recognize the relevance of sustainability in their professional roles? What are the attitudes of pre-service teachers toward ESD? Are they motivated and committed to incorporating sustainable practices in their future classrooms? What challenges do pre-service teachers encounter when integrating ESD into their teaching preparation? Hence, the study objectives:

- To assess pre-service teachers' awareness of Education for Sustainable Development (ESD) in the teacher education program
- To examine pre-service teachers' attitudes toward Education for Sustainable Development (ESD).
- To identify pre-service teachers' challenges when integrating Education for Sustainable Development (ESD) into their teaching preparation.

2. Literature Review

2.1 Conceptualizing the pre-service Teacher Education Program

Pre-service teacher education represents all aspects of training that make up a good teacher. The pre-service teacher education program is a teacher training program provided by universities and education institutes that focuses on the training of teachers. Huang and Sang (2023) emphasize the vital role of pre-service teachers in promoting critical thinking among students. In a study titled "Conceptualizing Critical Thinking and Its Research in Teacher Education," the study reiterated the importance of pre-service teachers in assisting students to acquire critical thinking skills (Huang & Sang, 2023). Thus, pre-service teacher education

programs must be structured to assist teachers in acquiring critical thinking skills. They can help students develop and demonstrate critical thinking skills in the classroom.

The pre-service teacher education programs in South Africa are provided by universities and other institutions regulated and licensed by the DHET and other accredited agencies of government to provide Bachelor of Education programs. The pre-service teacher education program is a four-year teaching and practical program where students are exposed to both theory and practical aspects of teaching in the classroom and school experience program. Regulations that guide the provision of teacher education in South Africa conceptualize teaching as a knowledge-based professional practice where "principles and theory are emphasized as a basis for entry into a professional teaching career" (Department of Higher Education and Training [DHET], 2015:20; Rusznyak, 2018). A professional approach to the preparation of teachers is contrasted with skills-based approaches that produce "technicians who may be able to replicate performance in similar contexts, but who are severely challenged when the context changes" (DHET, 2015:9; Rusznyak, 2018).

The pre-service teacher education program in South Africa is designed to produce high-quality teachers capable of addressing problems in the teaching profession after their training. Pre-service teachers are expected to acquire training that will enable them to address the problems of high learner drop-out rates and problematic teaching quality (SACE, 2018). However, findings indicate that some of the pre-service teachers, after their training, fail to transform what they have learned from their training to a real classroom situation, thereby creating a problem (Botha & Rens, 2018). This indicates a wide gap between theory and practice regarding pedagogy, content knowledge, and class management. These gaps can be addressed through a mentoring program, integral to the pre-service teacher education program. As part of their training program, pre-service teachers are expected to embark on teaching practices that will expose them to the practical aspect of teaching.

2.2 Integrating ESD into the pre-service teacher education

Integrating Education for Sustainable Development (ESD) into pre-service teacher education is crucial for equipping future teachers with the skills and knowledge to foster sustainability in their classrooms and communities (UNESCO, 2018). During the United Nations Decade of Education for Sustainable Development (DESD) of 2005-2014, Hopkins and McKeown (2005) acknowledged the need for a more holistic approach to

integrating ESD into the curriculum. When translated to practice, this holistic approach focuses on knowledge, methods, and curriculum change, usually manifesting as adding something new. In the past UNESCO 2006, 2009, and 2014) reports, it was highlighted that ESD aims at increasing the relevance of student learning by taking a holistic perspective on content through integrating ecological, social, and economic perspectives, along with transformative approaches in teaching, such as critical thinking and participation through integrating the educational process into the students' daily routines. Steele (2010) supports mainstreaming ESD in pre-service teacher training, arguing that education for sustainable development needs to be mainstreamed within pre-service teacher education and not just added on through teaching single units or marginalized content.

Early efforts to integrate ESD in education have primarily focused on curriculum mainstreaming. Approaches include introducing ESD as a standalone subject, embedding it across existing subjects, using thematic or problem-based learning, and employing participatory teaching methods like field trips (Whitby, 2019 & Ferguson et al., 2022). Additionally, ESD is promoted through co-curricular activities, student clubs, and community engagement projects (UNESCO, 2018). These practices are entry points for achieving a holistic, whole-institution approach to ESD integration.

Many approaches to successful ESD integration are better described as institutional mainstreaming. Both schools and institutions have taken a wholesome approach to ESD (Mathie & Wals, 2022). A whole-school approach to ESD calls for sustainable development to be integrated holistically throughout the formal sector curriculum. (Nevin, 2008).

2.4 Challenges affecting the integration of ESD into pre-service teacher education

Hindrances affecting the effective integration of the ESD into the pre-service teacher education program in higher education institutions have become recurring. In a study on the effect of a course regarding ESD and sustainable development on the pre-service teachers' attitude to sustainable development, Nousheen et al. (2020) reiterated the need to enhance the attitude of teachers. Findings from the study reveal positive pre-service teacher attitudes toward the ESD in the teacher education program. Another survey of strategies that can assist in addressing challenges affecting the integration of ESD into pre-service teacher education was undertaken. The study examines some challenges of integrating ESD into teacher education programs (Manasia et al., 2019). According to the findings, some challenges include weak areas of teacher training and the ability to manage students' disruptive behavior and self-regulate

teaching emotions. The emotions of teachers and the capacity of student teachers to manage students' disruptive behavior in the classroom pose a challenge to the integration of ESD. Pre-service teacher education training must be structured to address these challenges.

In a study conducted by Nguyen et al. (2024) on teacher perception, knowledge, and pedagogy in Vietnam, findings show that pre-service teachers are lacking in the essential dimensions of the ESD, such as content knowledge, learning outcomes, and pedagogy (Nguyen et al., 2024). This shows that teachers lack the theoretical aspect of the ESD, which the pre-service teachers' education program must address. To effectively integrate ESD in Vietnam, the pre-service teacher education program must be structured to address the challenges of poor content knowledge and pedagogy. The ESD, a specialized area that cuts across all subject areas, must be overhauled to produce competent content knowledge, learning outcomes, and pedagogy for teachers. In another study on pre-service teachers' knowledge, perception, and attitude toward ESD in Greece, Maidou et al. (2019) reiterated the need for producing teachers to provide education for future sustainability. The findings from the study indicate that pre-service teachers view ESD as an important knowledge area that helps to sustain the future; therefore, it should be integrated into the pre-service teacher education program in Greece (Maidou et al., 2019; Olawumi & Mavuso, 2024; ; Olawumi & Akintolu, 2025). This shows the importance of producing teachers with specialized skills to teach ESD and address problems associated with a sustainable future.

Khadim et al. (2022) identified challenges that negatively affect ESD integration in pre-service teacher programs. These challenges include insufficient training, lack of resources, limited institutional support, lack of time, and lack of instructional materials.

Olawumi & Mavuso (2024) also note that there are several challenges teacher development programs encounter for effective integration of ESD, according to Poghosyan (2015) and Agbedahin (2019) highlight the hindrance to effective implementation of ESD indicating that the integration of ESD into curricula is often inconsistent and lacks coherence across subjects and academic levels. Teacher training remains a challenge, as many educators lack the necessary skills, resources, and support to teach ESD effectively. Resource constraints, including insufficient funding, hinder the development and sustainability of ESD programs. Public awareness and policymaker support for ESD are often limited, leading to its low prioritization in educational agendas. Additionally, the lack of

robust assessment and evaluation frameworks makes it difficult to measure the effectiveness and impact of ESD initiatives.

The variation in dedication, funding, and involvement with ESD among different schools creates challenges in incorporating ESD into the formal education system and could account for these teachers' perspectives (Hamwy et al., 2023). However, Bruder et al. (2023) highlighted that although public-school teachers report less readiness to teach ESD than private school teachers, they perceived fewer challenges than private school teachers in teaching and assessment.

One of the notable ways of responding to some challenges (such as extremism, issues of peace, pollution, and wastage of resources) affecting ESD integration into teacher education programs is through the training of individuals, which is indispensable and can be materialized through capacity building of teachers (Shaukat, 2016; Durrani, 2019). According to the research, teachers' understanding of ESD is limited, and they cannot connect their classroom instruction to the issues plaguing their local context. To raise students' understanding of social and environmental issues, it is vital to improve pre-service teacher education by implementing ESD-based courses (Evans et al., 2012).

3. Theoretical Framework

The study adopted the Ajzen theory of Planned Behaviour (TPB) and supported the sustainability pedagogy framework. The theory of planned behavior was propounded by Ajzen (1991). The proponent of TPB explains how attitudes, subjective norms, and perceived behavioral control influence an individual's intention to perform a behavior, in this case, integrating ESD into a pre-service teacher program. The theory is relevant because it helps analyze the variables featured in this study.

Awareness: How knowledge and understanding of ESD shape pre-service teachers' attitudes.

Attitudes: This considers whether pre-service teachers have a positive or negative attitude toward ESD.

Challenges: It addressed the perceived barriers, such as lack of training or resources, that affect their willingness and ability to implement ESD in their future teaching.

However, the sustainability pedagogy framework supports the theoretical framework. This theory does not have a specific theorist but has been developed through contributions in sustainability education, transformative learning, and pedagogy. Sterling (2001, 2004, and 2010) advocated more for a transformational approach to sustainability education, emphasizing systems thinking and ecological literacy. This

framework emphasizes the need for transformative learning, interdisciplinary approaches, and systems thinking in education. It is a conceptual structure that outlines the key principles and practices for teaching sustainability. It focuses on developing critical thinking, action-oriented learning, and a deep understanding of complex environmental, social, and economic issues.

It provides a foundation for understanding how pre-service teachers engage with ESD and the pedagogical methods they need to implement sustainability in their teaching practices.

The relevance and justification of these theories to this present study, TPB, helps explain behavioral intentions and the factors influencing pre-service teachers' willingness to integrate ESD. On the other hand, the sustainability pedagogy framework ensures that the study remains grounded in best practices for sustainability education, providing insights into effective teaching strategies.

4. Methodology

This paper, being a quantitative paper, utilized the questionnaire as the only instrument to collect data from respondents. The four Likert scale questionnaires (strongly agree, agree, disagree, strongly disagree) were designed and utilized to collect data for the study. The questionnaire was subdivided into two parts to elicit information from selected participants for the study. Part A contains the bio-data information of respondents, and part B was divided into sub-sections to collect data on Pre-service teachers' attitudes towards the integration of ESD, Pre-service teachers' level of awareness of ESD, Impact of a pre-service teacher education program on ESD, availability of resources for teaching ESD, and challenges for teaching ESD. The scale reliability test was conducted to evaluate the internal consistency of the items within the scale and assess how reliable the measurement items were in producing consistent results when repeated. The Cronbach's Alpha values of (a) 0.759 (ATT), (b) 0.738 (AVR), (c) 0.818 (AW), (d) 0.717 (CHA), and (e) 0.761 (IMP) were obtained for all the items in each construct. This indicates that the results for the five constructs are above the recommended threshold value of .700 (Hair et al., 2019).

The population under study includes the undergraduate Bachelor of Education students from two universities in Southwest Nigeria. The study sample consisted of 177 pre-service teachers from two universities in Southwest Nigeria. The samples contain 49 males and 128 females, aged between 15 and 35 years. Their educational disciplines were the largest group of respondents studying Social Studies (59.9%), with smaller proportions studying Political Science (15.3%), Sciences (7.9%), Economics (6.2%), and other subjects such as Technology and Vocational

Skills, Mathematics, Physical Education, Geography, and Technology, each of which represented less than 5% of the sample. The questionnaire was administered to the participants via email through email contacts provided by some lecturers and administrators in the two universities in September and October 2024. Participants were informed of the purpose of the research and the ethical standards to which they adhered. Participants were also informed of their right to withdraw from participating voluntarily in the study. Data collected from respondents was analyzed using the SPSS v. 25 software package to determine the level of awareness of pre-service teachers on integrating ESD in teacher education programs. The analysis was done descriptively.

5. Findings

This study explores pre-service teachers' awareness of integrating Education for Sustainable Development (ESD). Data analysis was performed using SPSS 29.0, employing descriptive statistics.

5.1 Response Rate

The questionnaire was distributed across educational institutions, targeting 200 respondents. An impressive response rate of 89% was achieved, indicating strong engagement and a high willingness among participants to share their perspectives on ESD integration.

5.2 Demographic Variables

In this study, the gender, age, educational level, and subject specialization of respondents were key factors in assessing pre-service teachers' awareness of integrating Education for Sustainable Development (ESD). Table 1 presents a summary of the percentage distribution of these demographic characteristics.

Table 1. Demographic variables statistics

Variable	Category	Frequency	Percentage (%)
Age	15-20 years	60	33.9
	21-25 years	99	55.9
	26-30 years	17	9.6
	31-35 years	1	0.6
Gender	Male	49	27.7
	Female	128	72.3
Level	200 level	37	20.9
	300 level	85	48
	400 level	55	31.1
Subject	Social Studies	106	59.9
	Economics	11	6.2
	Sciences	14	7.9
	Political Science	27	15.3
	Technology and Vocational Skills	5	2.8
	Mathematics	8	4.5
	Physical Education	4	2.3
	Geography	1	0.6
	Technology	1	0.6

Table 1 indicates that most respondents (55.9%) are in the 21-25 age range, indicating that most participants are in their early twenties. A smaller portion falls into the 15-20 age bracket (33.9%), suggesting that the sample predominantly consists of young adults. Only a few respondents are in the 26-30 range

(9.6%), and an even smaller percentage are between 31-35 years (0.6%), highlighting that older pre-service teachers are underrepresented.

There is a notable gender imbalance, with a higher percentage of female respondents (72.3%) than males (27.7%). This may reflect

gender trends within teacher education programs, or the subject specializations selected for the study. In addition, respondents are mostly in their third year of study, with 48% in the 300 level. Those in the 400 level comprise 31.1%, while 200-level students represent 20.9%. This distribution suggests that most participants have progressed through significant portions of their teacher training, potentially enhancing their awareness of Education for Sustainable Development (ESD).

Social Studies is the most common specialization among respondents (59.9%), followed by Political Science (15.3%) and Sciences (7.9%). Other subjects, including Economics, Mathematics, Technology and Vocational Skills, Physical Education, Geography, and Technology, are less represented, each comprising less than 10% of the sample. The predominance of social studies majors may influence the level of awareness of ESD, as topics related to sustainability may be more integrated into these programs than others.

This demographic breakdown indicates a sample of young female pre-service teachers who are advanced in their studies and specialize in Social Studies. These characteristics provide a context for interpreting awareness levels regarding ESD, as the demographic tendencies could reflect specific insights or biases within the data, particularly given the prevalence of Social Studies majors.

5.3 Construct Responses

The study variables were assessed using a 4-point Likert scale, and descriptive statistics for the responses were calculated, including the mean and standard deviation. As outlined by HSRC (Martins & Geldenhuys, 2016), a mean score below 3.20 is regarded as developmental, while a mean score above 3.20 is considered positive. In this research, a baseline threshold of 3.20 was employed to interpret the mean results for the study variables, allowing for a clear distinction between developmental and positive perceptions among respondents.

5.3.1 ESD Awareness Among Pre-Service Teachers

To evaluate pre-service teachers' awareness of Education for Sustainable Development (ESD), Table 2 summarizes the responses, presenting several questions posed regarding the mean scores and standard deviations (SD) for each item. This data provides insight into the participants' overall awareness levels and helps identify areas for further improvement.

Table 2. Descriptive statistics of ESD awareness among pre-service teachers

Items	Mean	SD
Pre-service teachers are aware of the concept of ESD.	2.983	0.670
ESD is part of the teacher training program.	3.011	0.648
Pre-service teachers are assessed on integrating ESD into their school experience program.	2.949	0.659
I have adequate knowledge of ESD and how to integrate it.	2.763	0.666
I encourage other pre-service teachers to be familiar with the ESD pedagogy.	3.073	0.554
I have inadequate knowledge of ESD concepts.	2.565	0.697
I have inadequate knowledge of ESD content.	2.588	0.661
The teacher education program increases my level of awareness of ESD.	3.040	0.606
I attended a program on how to integrate ESD in the classroom.	2.610	0.791

According to Table 2, the mean score of 2.983 for awareness of ESD concepts indicates a developmental level. Meanwhile, 3.011 for ESD's inclusion in teacher training is also below the positive threshold 3.20 established by HSRC (Martins & Geldenhuys, 2016). A concerning mean of 2.763 regarding knowledge of ESD and its integration highlights a critical need for improvement. However, the score of 3.073 for encouraging peers to engage with ESD pedagogy reflects a positive attitude. Notably, the mean scores for inadequate knowledge of ESD concepts (2.565) and content (2.588) emphasize the need for better understanding.

In contrast, a mean of 3.040 for the impact of teacher education programs indicates some positive influence. Lastly, the score of 2.610 for attendance at ESD integration programs shows low engagement in specialized training. Overall, the findings suggest a pressing need for enhanced training and integration of ESD within teacher education programs to equip pre-service teachers better.

5.3.2 Impact of a pre-service teacher education program on integrating ESD

A series of questions was designed to assess the impact of the In-Service Teacher Education Program on the integration of

Education for Sustainable Development (ESD). The summary statistics for these questions are presented in Table 3

Table 3. Impact of in-service teacher education on ESD descriptive statistics

Items	Mean	SD
Pre-service teacher education programs increase my knowledge of ESD.	3.057	0.637
The pre-service teacher education program will enhance my capacity to teach ESD after my degree.	3.085	0.647
Other programs I have participated in are relevant to teaching ESD.	2.915	0.629
The pre-service Teacher Education program will enhance my capacity to teach climate change education and environmental education in my subject.	2.944	0.721

The results in Table 3 show that the mean score of 3.057 for "Pre-service teacher education programs increase my knowledge of ESD" and 3.085 for "The program will enhance my capacity to teach ESD after graduation" indicate a positive perception. Still, both fall below the threshold of 3.20 established by HSRC (Martins & Geldenhuys, 2016).

The mean score of 2.915 for the relevance of other programs to ESD and 2.944 for enhancing capacity to teach climate change and environmental education suggests only developmental awareness, highlighting a need for improvement. While participants recognize some benefits of the pre-service teacher

education program, there is a significant need for enhanced training and resources to integrate ESD into their future teaching effectively.

5.3.3 Attitudes of Pre-Service Teachers Towards Integrating ESD

Respondents were surveyed regarding their attitudes towards integrating Education for Sustainable Development (ESD). Table 4 presents summary statistics of their responses.

Table 4. Attitudes towards integrating ESD descriptive statistics

Awareness items	Mean	SD
I have developed a positive attitude toward integrating ESD into teacher education programs.	2.977	0.593
Pre-service teachers are indifferent to integrating ESD.	2.644	0.741
I have developed an interest in learning to integrate ESD.	3.028	0.625
It is interesting to integrate ESD into teacher education.	3.124	0.540
I think it is not important to integrate ESD into teacher education.	2.384	0.804
I am interested in having the content knowledge to teach ESD.	3.158	0.541
The teacher education program motivates me to learn different strategies for teaching ESD.	3.124	0.609

Table 4 indicates that the mean score of 2.977 for "I have developed a positive attitude towards the integration of ESD in teacher education programs" indicates a developmental awareness, falling short of the 3.20 threshold established by HSRC (Martins & Geldenhuys, 2016). The statement "Pre-service teachers are indifferent to integrating ESD" received a mean score of 2.644, confirming a prevailing indifference. However, the mean of 3.028 for "I have developed an interest in learning to integrate ESD" and 3.124 for "It is interesting to integrate ESD into teacher education" reflects some positive engagement, albeit still below the threshold.

Notably, the mean of 2.384 for "I think it is not important to integrate ESD in teacher education" suggests participants reject

the idea that ESD is unimportant. Furthermore, the scores of 3.158 for "I am interested in having the content knowledge to teach ESD" and 3.124 for "The teacher education program motivates me to learn different strategies for teaching ESD" indicate a strong desire for knowledge and skills related to ESD. While there is some interest in ESD, the overall attitudes of pre-service teachers highlight the need for enhanced efforts to foster positive engagement and integration of ESD in teacher education programs.

5.3.4 Availability of Resources for Teaching ESD

Respondents were asked about the availability of resources for teaching Education for Sustainable Development (ESD). Table 5

presents the summary statistics, including their responses' mean and standard deviations.

Table 5. Availability of resources for teaching ESD

Items	Mean	SD
Lectures are provided educational resources to teach the concept of ESD.	2.893	0.661
My lecturers improvise resources in teaching the concept of ESD in teacher education programs.	2.932	0.590
Sometimes, I learn the concept of ESD from familiar resources in our environment.	3.045	0.542
There are human resources available to teach the concept of ESD.	3.045	0.592

According to the results in Table 5, the mean score of 2.893 for "Lecturers are provided educational resources to teach the concept of ESD" indicates that the availability of such resources is below the 3.20 threshold established by HSRC (Martins & Geldenhuys, 2016), suggesting insufficient support for lecturers in this area. Similarly, the mean score of 2.932 for "My lecturers improvise resources in teaching the concept of ESD in the teacher education program" reflects a reliance on improvised materials rather than dedicated resources, again falling short of the desired threshold.

In contrast, the mean scores of 3.045 for both "Sometimes I learn the concept of ESD through familiar resources in our environment" and "There are human resources available to teach

the concept of ESD" indicate a slight improvement, suggesting that while there are some available resources, they still do not meet the threshold for adequate support. The findings indicate a need for improved availability and provision of resources for teaching ESD in teacher education programs, as the current levels do not sufficiently support the effective integration of ESD into the curriculum.

5.3.5 Challenges for Teaching ESD

Respondents were asked about their challenges in teaching Education for Sustainable Development (ESD). Table 6 presents the summary statistics based on their responses, including the mean and standard deviation.

Table 6. Challenges for teaching ESD descriptive statistics

Items	Mean	SD
There are inadequate resources for teaching the concept of ESD.	2.751	0.670
There is insufficient training for lecturers to teach the concept of ESD.	2.650	0.716
Lack of interest by pre-service teachers to learn the concept of ESD.	2.791	0.654
There is limited time in the curriculum to teach the concept of ESD.	2.887	0.647
There is a lack of institutional support.	2.955	0.706
Lack of government support in promoting ESD in teacher training programs.	2.819	0.692

The mean score of 2.751 for "There are inadequate resources for teaching the concept of ESD" indicates a significant challenge, falling below the 3.20 threshold established by HSRC (Martins & Geldenhuys, 2016), highlighting a critical gap in necessary teaching materials. Similarly, the mean score of 2.650 for "There is insufficient training for lecturers to teach the concept of ESD" underscores the need for better professional development opportunities for educators. This is echoed by the mean score of 2.791 for "Lack of interest by pre-service teachers to learn the concept of ESD," which further emphasizes the necessity to engage and motivate future educators.

The mean score of 2.887 for "Limited time in the curriculum to teach the concept of ESD" suggests that curriculum constraints hinder effective ESD instruction. Additionally, the mean score of 2.955 for "There is a lack of institutional support" indicates that institutional barriers may impede ESD integration into teacher training programs. Lastly, the mean score of 2.819 for "Lack of government support in promoting ESD in teacher training programs" reflects a broader systemic challenge that impacts the effective implementation of ESD initiatives.

6. Discussion of findings

This quantitative study explored pre-service teachers' awareness of integrating ESD into teacher education programs. The participants' responses suggest a pressing need for enhanced training and integration of ESD within teacher education programs to equip pre-service teachers. Primarily, in support of the participant's response, Durrani (2019) concluded that it is necessary to enhance the capacity of teachers through pre-service teacher education by introducing courses based on ESD to create awareness in students about the social and environmental problems (Evans et al., 2012).

A strong relationship between the present study of pre-service teachers' ESD awareness and Waltner et al. (2018) has reported that the primary purpose of pre-service teachers' training is to study those pragmatic techniques that are beneficial for future teachers and students in the classroom. Therefore, ESD's essential skills, knowledge, and attitudes can be shifted through community teacher training (Waltner et al., 2018).

It is encouraging to compare this finding with that of Sahoo (2023), who found that awareness of sustainable development among pre-service teachers in India also revealed that pre-service teacher educators had moderate awareness of sustainable development, with no significant differences based on gender. Although this finding differs from some published studies (Jo, 2024; Kim et al., 2024), they show that pre-service teachers in early childhood have a relatively high awareness of ESD principles, particularly in environmental and social aspects.

However, the current study's findings do not support the previous research. The awareness of ESD among pre-service teachers in Namibia, Kanandjebo (2024), established that most of the pre-service teachers appear aware and knowledgeable of the role of ESD in the teacher education program, subject-based mathematics.

The findings on availability highlight a critical gap in resources and provision of resources for teaching education for sustainable development in teacher education programs. The participant identified that materials allocation, lack of training tools, and institutional support limit the effective integration of ESD into the

teaching program. This finding agrees with Munasi's (2024) findings, which showed that a lack of guidelines, insufficient support, and limited resources impede the effective integration of ESD into the school curriculum. However, the author suggested that support and resource allocation enable successful ESD. Without adequate resources, pre-service teachers struggle to acquire the necessary knowledge, skills, and confidence to implement sustainability concepts in their future classrooms.

The current study's findings are consistent with those of Khadim et al. (2022), who indicated that implementing ESD in teacher education programs faces many challenges, such as a lack of commitment from students, a lack of time, a lack of support from management, and a lack of instructional resources. Additionally, limited access to materials to teach ESD and experiential learning opportunities are constraints to practically applying the principle of ESD in pre-service. These challenges align with previous research (Miao & Nduneseokwu, 2025; Riess et al., 2022 & Zhao et al., 2023).

7. Conclusion

The study investigates pre-service teachers' awareness, attitudes, and challenges in Integrating Education for Sustainable Development (ESD). The resource gaps require a multi-faceted approach, including increased investment in ESD materials, capacity-building programs for pre-service teachers/teachers, and collaboration with external organizations to provide sustainability-focused learning opportunities. Integrating digital resources and interactive pedagogies may also enhance the delivery of ESD content. Strengthening resource provision will improve ESD integration in teacher education and equip pre-service teachers with the tools to promote sustainability in their classrooms and communities.

Understanding these sustainability dimensions (social, economic, and environmental) is noteworthy for identifying gaps in teachers' education programs and developing strategies to enhance pre-service teachers' preparedness for ESD integration. Proffering a solution to this problem, stakeholders in education can ensure that teacher education programs align with global sustainable development goals (SDGs) and empower future teachers to lead transformative changes in society.

References

1. Agbedahin, A. V. (2019). Sustainable development, Education for Sustainable Development, and the 2030 Agenda for Sustainable Development: Emergence, efficacy, eminence, and future. *Sustainable Development*, 27(4), 669-680
<https://doi.org/10.1002/sd.1931>
2. Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*. 50, 179-211

- [https://doi.org/10.1016/0749-5978\(91\)90020-t](https://doi.org/10.1016/0749-5978(91)90020-t)
3. Botha, C. S., & Rens, J. (2018). Are they really 'ready, willing and able'? Exploring reality shock in beginner teachers in South Africa. *South African Journal of Education*, 38(3)
<https://doi.org/10.15700/saje.v38n3a1546>
 4. Bruder, J., Hamwy, N., Sellami, A., & Romanowski, M. H. (2023). Examining Qatar's private and public-school teachers' readiness for teaching about sustainability. *Globalisation, Societies and Education*, 1-17
<https://doi.org/10.1080/14767724.2023.2262404>
 5. Dahl, T. (2019). Prepared to teach for sustainable development? Student Teachers' beliefs in their ability to teach for sustainable development. *Sustainability*, 11(7), 1993 <https://doi.org/10.3390/su11071993>
 6. Department of Higher Education and Training (DHET) 2015. National Qualifications Framework Act (67/2008): Revised policy on the minimum requirements for teacher education qualifications. *Government Gazette*, 596(38487). 19 February. Available at http://www.dhet.gov.za/Teacher%20Education/National%20Qualifications%20Framework%20Act%2067_2008%20Revised%20Policy%20for%20Teacher%20Education%20Qualifications.pdf Accessed 17 July 2018.
 7. Durrani, R., Malik, S., & Jumani, N. B. (2019). Education for sustainable development (ESD) in pre-service teachers education curriculum at Pakistan: Current status and future directions. *PJDOL*, 5(2).
 8. Evans, N., Whitehouse, H., & Hickey, R. (2012). Pre-service teachers' conceptions of education for sustainability. *Australian Journal of Teacher Education* (Online), 37(7), 1-12
<https://doi.org/10.14221/ajte.2012v37n7.3>
 9. Ferguson, T., Roofe, C., Cook, L. D., Bramwell-Lalor, S., & Gentles, C. H. (2022). Education for sustainable development (ESD) infusion into curricula: influences on students' understandings of sustainable development and ESD. *Brock Education Journal*, 31(2), 63– 84
<https://doi.org/10.26522/brocked.v31i2.915>
 10. García-González, E., Jiménez-Fontana, R., & Azcárate, P. (2020). Education for sustainability and the sustainable development goals: Pre-service teachers' perceptions and knowledge. *Sustainability*, 12(18), 7741
<https://doi.org/10.3390/su12187741>
 11. Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, 31(1), 2-24
<https://doi.org/10.1108/ebrev-11-2018-0203>
 12. Hamwy, N., Bruder, J., Sellami, A., & Romanowski, M. H. (2023). Challenges to Teachers Implementing Sustainable Development Goals Frameworks in Qatar. *Sustainability*, 15(15), 11479
<https://doi.org/10.3390/su15111479>
 13. Hopkins, C., & McKeown, R. (2005). Guidelines and recommendations for reorienting teacher education to address sustainability. (Technical Paper N° 2), Paris, UNESCO, p.13. Available at: <http://unesdoc.unesco.org/images/0014/001433/143370e.pdf>
 14. Huang, J., & Sang, G. (2023). Conceptualising critical thinking and its research in teacher education: A systematic review. *Teachers and Teaching*, 29(6), 638-660
<https://doi.org/10.1080/13540602.2023.2212364>
 15. Jo, H. Y. (2024). Analysis of ESG Differences and Educational Needs Based on ESG Awareness among Pre-Service Early Childhood Teachers. 28(2), 65–99.
<https://doi.org/10.22590/ecce.2024.28.2.65>
 16. Kanandjebo, L. N. (2024). Mathematics as a driver for sustainable development: Pre-service teachers' perspectives on awareness, challenges, and implications for teacher training. *Interdisciplinary Journal of Education Research*, 6, 1-17
<https://doi.org/10.38140/ijer-2024.vol6.26>
 17. Khadim, M., Qureshi, N., & Khan, A. M. (2022). Challenges of Implementing Education for Sustainable Development: University Teachers' Perspectives. *PJE*, 39(1)
<https://doi.org/10.30971/pje.v39i1.876>
 18. Kim, J. S., Jo, H., & Han, J. W. (2024). The Structural Relationship between ESG Awareness, Consumer Behavior, Environmental Issues, and Environmentally Friendly Actions: Focusing on Pre-Service Early Childhood Teachers. *Korean Association For Learner-Centered Curriculum And Instruction*.
<https://doi.org/10.22251/jlcci.2024.24.5.27>
 19. Leicht, A., Heiss, J., & Byun, W. J. (Eds.). (2018). Issues and trends in education for sustainable development. UNESCO
<https://doi.org/10.54675/yelo2332>
 20. Maidou, A., Plakitsi, K., & Polatoglou, H. (2019). Knowledge, Perceptions and Attitudes on Education for Sustainable Development of Pre-Service Early

- Childhood Teachers in Greece. *World Journal of Education*, 9(5), 1-15
<https://doi.org/10.5430/wje.v9n5p1>
21. Manasia, L., Ianos, M. G., & Chicioreanu, T. D. (2019). Pre-service teacher preparedness for fostering education for sustainable development: An empirical analysis of central dimensions of teaching readiness. *Sustainability*, 12(1), 166
<https://doi.org/10.3390/su12010166>
 22. Martin, A. J., Slade, D. G., & Hodges, L. D. (2022). Pre-Service Teacher Training: Professional Preparation and Work-Integrated Learning Pedagogy. *International Journal of Work-Integrated Learning*, 23(3), 347-357.
 23. Martins, N. and Geldenhuys, D. (2016), *Fundamentals of Organisation Development*, 1st ed., Juta Academic, Johannesburg.
 24. Mashau, T.S. (2012) Pre-Service Teacher Training in South Africa: Are Student Teachers Offered Adequate Training About the South African Education System? *American International Journal of Contemporary Research* 2(5) pp 55-59
 25. Mathie, R. G., & Wals, A. E. J. (2022). Whole school approaches to sustainability: Exemplary practices from around the world. Wageningen University
<https://doi.org/10.18174/566782>
 26. Miao, Q., & Nduneseokwu, C. (2025). Advancing Environmental Leadership: Education, Development, and Training. *Environmental Leadership in a VUCA Era: An Interdisciplinary Handbook*, 467-538
https://doi.org/10.1007/978-981-96-0324-4_10
 27. Munasi, K. R. (2024). Evaluating the Integration of Education for Sustainable Development in the Life Sciences Curriculum: A Case Study of Grade 11 Teachers in Vhembe East District. *Sustainability*, 16(24), 10918
<https://doi.org/10.3390/su162410918>
 28. Nevin, E. (2008). Education and sustainable development. In (Ed) *Policy & Practice-A Development Education Review*, (6).
 29. Nguyen, T. P., Hoang, T. T., Trinh, T. Q., Muñoz Solari, O., Nguyen, A. N., Schrüfer, G., ... & Ni Nguyen, T. H. (2024). Beyond perception. Do pre-service geography teachers understand education for sustainable development?. *International Research in Geographical and Environmental Education*, 1-17
<https://doi.org/10.1080/10382046.2024.2417501>
 30. North, J. (2010). Mainstreaming Education for Sustainability in Pre-service Teacher Education in Australia: enablers and constraints.
 31. Nousheen, A., Zai, S. A. Y., Waseem, M., & Khan, S. A. (2020). Education for sustainable development (ESD): Effects of sustainability education on pre-service teachers' attitude towards sustainable development (SD). *Journal of Cleaner Production*, 250, 119537
<https://doi.org/10.1016/j.jclepro.2019.119537>
 32. Nousheen, A., Zia, M. A., & Waseem, M. (2024). Exploring pre-service teachers' self-efficacy, content knowledge, and pedagogical knowledge concerning education for sustainable development. *Environmental Education Research*, 30(3), 321-333
<https://doi.org/10.1080/13504622.2022.2128055>
 33. Olawumi, K. B., & Mavuso, M. P. (2024). In-service teacher training programmes that promote education for sustainable development: A review of emerging literature. *Interdisciplinary Journal of Education Research*, 6, 1-20
<https://doi.org/10.38140/ijer-2024.vol6.35>
 34. Olawumi, K. B. (2024). In-Service Teachers' Awareness of Integrating Ubuntu Values in Teaching Environmental Education
<https://doi.org/10.57125/fed.2024.12.25.17>
 35. Olawumi, K. B., & Akintolu, M. (2025). Education for sustainable development in higher education institutions: a structural equation modeling on pre-service teachers' awareness. *EUREKA: Social and Humanities*, (4), 65-77
<https://doi.org/10.21303/2504-5571.2025.003807>
 36. Olawumi, K. B., Mavuso, M. P., & Duku, N. S. (2024). Situating Ubuntu Philosophy in Pre-service Teacher Education. *International Journal of Learning, Teaching and Educational Research*, 23(8), 605-623
<https://doi.org/10.26803/ijlter.23.8.31>
 37. Pewkam, W., & Chamrat, S. (2022). Pre-service teacher training program of STEM-based activities in computing Science to develop computational thinking. *Informatics in Education*, 21(2), 311-329
<https://doi.org/10.15388/infedu.2022.09>
 38. Poghosyan, G., Gasparyan, A., Grigoryan, M., & Poghosyan, S. (2015). Competence raising through teaching of ESD environmental key topics implementing "project technology". *Envigogika*, 10(2)
<https://doi.org/10.14712/18023061.460>
 39. Raman, F. I., Hutagalung, F. D., & Rahman, M. N. A. (2022). Preparing pre-service teachers for integration of education for sustainable development in school: A

- systematic review (2013-2022). *Geografia*, 18(3), 153-169 <https://doi.org/10.17576/geo-2022-1803-10>
40. Riess, W., Martin, M., Mischo, C., Kotthoff, H. G., & Waltner, E. M. (2022). How can education for sustainable development (ESD) be effectively implemented in teaching and learning? An analysis of educational science recommendations of methods and procedures to promote ESD goals. *Sustainability*, 14(7), 3708 <https://doi.org/10.3390/su14073708>
 41. Rusznyak, L. (2018). What messages about teacher professionalism are transmitted through South African pre-service teacher education programmes? *South African Journal of Education*, 38(3) <https://doi.org/10.15700/saje.v38n3a1503>
 42. Sahoo, P. K. (2023). Teacher-Learner Autonomy for Sustainable Development: Challenges for Indian Teacher Education. *Education@ ETMA*, 2(1), 1-12.
 43. Shaukat, S. (2016). Prospective teachers' attitudes towards social and environmental aspects of education for sustainable development. *Pakistan Journal of Social and Clinical Psychology*, 14(1), 36.
 44. South African Council of Educators (SACE), (2018). SACE professional teaching standards (PTSs). <https://www.sace.org.za>
 45. Steele, F. (2010). Mainstreaming Education for Sustainability in Pre-Service Teacher Education in Australia: Enablers and Constraints. Canberra: Australian Research Institute in Education for Sustainability (ARIES) for the Australian Government Department of the Environment, Water, Heritage and the Arts.
 46. Sterling, S., & Orr, D. (2001). *Sustainable education: Re-visioning learning and change* (Vol. 6). Totnes: Green Books for the Schumacher Society.
 47. Sterling, S. (2004). Higher education, sustainability, and the role of systemic learning. In *Higher education and the challenge of sustainability: Problematics, promise, and practice* (pp. 49-70). Dordrecht: Springer Netherlands https://doi.org/10.1007/0-306-48515-x_5
 48. Sterling, S. (2010). Sustainable education. In *Science, society and sustainability* (pp. 127-140). Routledge <https://doi.org/10.4324/9780203875124-18>
 49. UNESCO. (2006). Framework for the DESD international implementation scheme. Paris: UNESCO Education Sector. <http://unesdoc.unesco.org/images/0014/001486/148650E.pdf>.
 50. UNESCO. (2009, March-April). Bonn Declaration on Education for Sustainable Development. UNESCO World Conference on Education for Sustainable Development, Bonn, Germany. Bonn: German Commission for UNESCO.
 51. UNESCO. (2014). Roadmap for implementing the global action programme on education for sustainable development. <https://unesdoc.unesco.org/ark:/48223/pf0000230514>
 52. UNESCO. (2018). Integrating education for sustainable development (ESD) in teacher education in South-East Asia: A guide for teacher educators. <https://unesdoc.unesco.org/ark:/48223/pf0000265760>
 53. Waltner, E. M., Rieß, W., & Brock, A. (2018). Development of an ESD indicator for teacher training and the national monitoring for ESD implementation in Germany. *Sustainability*, 10(7), 2508 <https://doi.org/10.3390/su10072508>
 54. Whitby, A. (2019). Advancing education for sustainable development: key success factors for policy and practice [policy handbook].
 55. Zhao, Y., Zhao, M., & Shi, F. (2023). Integrating moral education and educational information technology: A strategic approach to enhance rural teacher training in universities. *Journal of the Knowledge Economy*, 1-41 <https://doi.org/10.1007/s13132-023-01693-z>