

INTEGRATING SUSTAINABLE DEVELOPMENT GOALS INTO TEACHER EDUCATION CURRICULUM: IMPLICATIONS FOR QUALITY TEACHER PREPARATION

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Abstract

The study examined the integration of Sustainable Development Goals (SDGs) into teacher education curriculum and its implications for quality teacher preparation. Specifically, the study investigated the extent to which SDGs are integrated into teacher education curriculum and determined the influence of SDG integration on the quality of teacher preparation among future teachers. A descriptive survey research design was adopted for the study. The population comprised teacher educators and student teachers in selected teacher education institutions, from which a sample of 200 respondents was selected using a multistage sampling procedure. Data were collected using a structured questionnaire titled Integrating Sustainable Development Goals into Teacher Education Curriculum and Quality Teacher Preparation Questionnaire (ISDGTQTPQ). The instrument contained 16 items structured on a four-point rating scale and was validated by experts in curriculum studies and educational measurement. Data collected were analysed using mean, standard deviation, and simple linear regression analysis at a 0.05 level of significance. The findings revealed that SDGs were integrated into teacher education curriculum to a high extent, with a cluster mean of 3.12. The study also found that SDG integration significantly influenced quality teacher preparation, accounting for 35.3% of the variance in teacher preparation quality ($R^2 = 0.353$, $p < 0.05$). The study concluded that embedding SDGs into teacher education curriculum strengthens teachers' professional competencies and prepares them to respond effectively to contemporary educational and societal challenges. It was recommended that teacher education institutions should strengthen SDG-oriented curriculum reforms, provide professional development opportunities for teacher educators, and enhance institutional support for sustainability education. The study contributes to knowledge by demonstrating that SDG integration represents a strategic approach for improving the quality and relevance of teacher preparation in the twenty-first century.

Keywords: Sustainable Development Goals, teacher education curriculum, quality teacher preparation, sustainability education, curriculum reform.

Introduction

Education has increasingly been recognized as a fundamental instrument for achieving sustainable development and addressing the complex social, economic, and environmental challenges confronting societies in the twenty-first century. Beyond its conventional role of transmitting knowledge and skills, education is now considered a transformative mechanism for promoting social equity, environmental sustainability, economic advancement, and responsible citizenship. This global recognition informed the adoption of the Sustainable Development Goals (SDGs) by the United Nations in 2015 as a universal framework for addressing critical

development challenges and promoting inclusive growth. Among the 17 SDGs, Sustainable Development Goal 4 (SDG 4) specifically emphasizes the need to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” (United Nations, 2015). Achieving this goal requires more than expanding educational access; it demands the transformation of educational systems to develop learners and teachers who possess the knowledge, values, attitudes, and competencies required to contribute effectively to sustainable development.

The realization of sustainable development objectives largely depends on the quality of teachers produced through

teacher education institutions. Teachers occupy a central position in promoting sustainable development because they influence learners' knowledge, behaviours, values, and perceptions of societal challenges. As facilitators of learning, teachers shape how future generations understand and respond to issues such as climate change, poverty reduction, gender equality, peace-building, responsible citizenship, innovation, and environmental protection. Consequently, preparing teachers with sustainability-related competencies has become a major priority within teacher education systems globally. According to UNESCO (2017), Education for Sustainable Development (ESD) requires educators who can foster critical thinking, creativity, collaboration, problem-solving, and transformative learning among learners. Therefore, teacher education institutions need to continuously review their curriculum structures to ensure that future teachers acquire the sustainability-oriented knowledge and pedagogical skills required to address emerging global challenges.

Teacher education curriculum provides the foundation through which future teachers develop professional knowledge, instructional competencies, ethical values, and practical skills necessary for effective classroom practice. Traditionally, teacher preparation programmes have emphasized subject mastery, teaching methods, classroom management, and assessment practices. However, the increasing complexity of contemporary social, economic, technological, and environmental challenges requires a broader curriculum orientation that incorporates sustainable development principles, global citizenship education, digital competence, environmental awareness, and social responsibility. Integrating SDGs into teacher education curriculum provides an opportunity to move beyond conventional teacher preparation approaches by producing teachers who can connect classroom instruction with real-

world sustainability issues and empower learners to become active contributors to societal transformation.

The integration of SDGs into teacher education is particularly important because teachers serve as the link between educational policies and classroom realities. A sustainability-oriented teacher education curriculum enables future teachers to develop the capacity to design learner-centred lessons, apply innovative instructional strategies, and create learning environments that encourage sustainable thinking and responsible decision-making. Through exposure to SDG-related themes such as environmental education, entrepreneurship, health education, equity, inclusion, and responsible consumption, student teachers can develop competencies necessary to prepare learners for participation in sustainable societies. Thus, integrating SDGs into teacher education curriculum represents not only a curriculum innovation but also a strategic approach to improving the relevance and quality of teacher preparation.

In developing countries such as Nigeria, the need to incorporate sustainable development principles into teacher education has become increasingly significant due to persistent challenges including environmental degradation, poverty, unemployment, inequality, insecurity, and limited access to quality education. Although Nigeria has demonstrated commitment toward achieving the SDGs through various national policies and educational reforms, concerns remain regarding the extent to which sustainability concepts are embedded within teacher preparation programmes. Many teacher education curricula continue to emphasize disciplinary knowledge, academic achievement, and examination performance, while limited attention is given to sustainability competencies, interdisciplinary learning, experiential education, and practical approaches for addressing community-based challenges. This situation may reduce the capacity of

future teachers to effectively promote sustainable development values and practices among learners.

The quality of teacher preparation is closely associated with the relevance, flexibility, and responsiveness of teacher education curriculum. Effective teacher preparation requires programmes that develop teachers who are knowledgeable, reflective, innovative, technologically competent, and capable of responding to diverse learner needs and societal challenges. A curriculum that integrates SDGs can strengthen teacher preparation by enhancing teachers' professional competencies, problem-solving abilities, ethical awareness, and capacity to adopt learner-centred approaches. Furthermore, SDG integration encourages reflective practice by connecting educational theories with real-life challenges and enabling teachers to prepare learners for active participation in sustainable development initiatives.

Despite the recognized importance of integrating SDGs into teacher education curriculum, several factors may hinder effective implementation within teacher education institutions. These challenges include inadequate curriculum frameworks, limited awareness among teacher educators, insufficient instructional resources, inadequate professional development opportunities, and weak institutional support. Teacher educators themselves require appropriate knowledge, skills, and competencies to effectively incorporate sustainability principles into teaching and learning processes. Without deliberate policy direction, curriculum revision, institutional commitment, and continuous capacity development, SDG integration efforts may remain largely theoretical and fail to produce meaningful transformation in teacher preparation.

Globally, contemporary educational reforms have emphasized the need for teacher education institutions to adopt sustainability-oriented curriculum models that prepare teachers for emerging societal

demands. Such reforms recognize that twenty-first-century teachers require competencies beyond subject knowledge, including critical thinking, innovation, digital literacy, collaboration, environmental responsibility, and global citizenship skills. The integration of SDGs into teacher education aligns with this broader vision of producing teachers who are not only effective classroom practitioners but also agents of social, economic, and environmental transformation (UNESCO, 2017).

Empirical evidence has also highlighted the importance of sustainability-oriented curriculum approaches in strengthening teacher preparation. UNESCO (2017) reported that education for sustainable development enhances teachers' capacity to promote critical thinking, collaboration, problem-solving, and responsible citizenship among learners. Similarly, Evans et al. (2017) found that although teacher education institutions recognize the importance of sustainability education, its integration remains fragmented due to inadequate curriculum frameworks, limited institutional support, and insufficient professional development opportunities for teacher educators. Kioupi and Voulvoulis (2019) further emphasized that effective SDG integration requires curriculum transformation, interdisciplinary learning, and competency-based approaches that enable learners and teachers to address complex societal challenges. Studies have also demonstrated that exposure to sustainability-oriented learning experiences improves teachers' readiness to promote sustainable practices. Anyolo et al. (2018) found that student teachers who participated in sustainability-focused learning experiences developed improved understanding of environmental responsibility, social justice, and sustainable practices. Similarly, Olsson et al. (2022) reported that curriculum exposure to sustainability concepts enhances systems thinking, future orientation, and the ability

to evaluate sustainability challenges among learners and educators.

Beyond sustainability integration, research has established that the quality of teacher preparation significantly influences teachers' professional effectiveness. Darling-Hammond (2017) revealed that high-quality teacher preparation programmes characterized by strong pedagogical knowledge, practical teaching experiences, mentoring, and reflective learning significantly improve teachers' instructional effectiveness. Ronfeldt et al. (2018) also found that well-structured teaching practice experiences enhance student teachers' classroom management skills, instructional competence, and professional confidence. Furthermore, Darling-Hammond et al. (2020) emphasized that effective teacher preparation should promote learner-centred pedagogy, collaboration, critical thinking, technology integration, and culturally responsive teaching.

In developing contexts, the need for curriculum reform in teacher education remains particularly important. Akyeampong et al. (2018) reported that teacher education programmes in developing countries often face challenges relating to curriculum relevance, teaching practice supervision, and professional support, which negatively affect instructional quality. Ingersoll et al. (2021) further established that teachers who receive comprehensive preparation involving subject knowledge, pedagogy, classroom practice, and professional support demonstrate higher levels of confidence and effectiveness. These findings suggest that integrating SDGs into teacher education curriculum could serve as a pathway for strengthening teacher competence and improving educational outcomes.

However, despite increasing scholarly attention to education for sustainable development, limited empirical studies have examined the extent to which SDGs are integrated into teacher education curriculum and how such integration

influences the quality of teacher preparation, particularly within the Nigerian context. Existing studies have largely focused on sustainability education broadly or teacher quality independently, leaving a gap in understanding the relationship between SDG curriculum integration and teacher preparation outcomes. Addressing this gap is necessary for curriculum developers, policymakers, teacher educators, and educational stakeholders seeking to align teacher preparation programmes with global sustainability priorities. Therefore, this study examines the integration of Sustainable Development Goals into teacher education curriculum and its implications for quality teacher preparation. The study seeks to provide empirical evidence on the extent of SDG integration within teacher education programmes and determine how such integration contributes to preparing competent, innovative, and sustainability-oriented teachers capable of responding effectively to the educational and societal challenges of the twenty-first century.

Statement of the Problem

The growing complexity of global challenges, including climate change, environmental degradation, poverty, inequality, unemployment, and social instability, has increased the demand for education systems that can prepare individuals to contribute meaningfully to sustainable development. The Sustainable Development Goals (SDGs), particularly SDG 4, emphasize the need for inclusive, equitable, and quality education that promotes lifelong learning and equips individuals with the knowledge, skills, values, and attitudes required to create sustainable societies. Since teachers serve as key agents of educational transformation, the extent to which teacher education programmes integrate SDG principles has significant implications for the quality and relevance of teacher preparation.

However, despite the increasing global recognition of education for sustainable development, concerns remain

regarding the adequacy of SDG integration within teacher education curricula, particularly in developing contexts such as Nigeria. Many teacher education programmes continue to emphasize traditional pedagogical knowledge, subject mastery, and assessment competencies, with limited attention to sustainability-related competencies such as environmental awareness, global citizenship, ethical responsibility, critical thinking, and problem-solving skills. Consequently, future teachers may graduate without the necessary competencies to address sustainability issues in their classrooms and communities.

The problem is further compounded by the limited incorporation of SDG-related themes into curriculum structures, inadequate awareness among teacher educators, insufficient instructional resources, and limited professional development opportunities for lecturers involved in teacher preparation. Although national educational policies emphasize improving teacher quality and aligning education with societal needs, the practical implementation of sustainability-oriented curriculum approaches appears inadequate. This creates a gap between global expectations for teachers as facilitators of sustainable development and the actual competencies developed through existing teacher education programmes.

The absence of effective SDG integration in teacher education curriculum may negatively influence the quality of teacher preparation by limiting graduates' capacity to design innovative learning experiences, promote sustainable practices among learners, and address contemporary educational challenges. Teachers who lack sustainability competencies may find it difficult to prepare students for responsible citizenship, environmental stewardship, and participation in achieving sustainable development objectives. Therefore, the quality of education required to support sustainable societies may remain unattainable if teacher preparation

programmes do not adequately respond to emerging global priorities.

Furthermore, while several studies have examined education for sustainable development and SDG implementation in general education settings, limited empirical attention has been given to how the integration of SDGs into teacher education curriculum influences the preparation of future teachers, especially within the Nigerian context. This knowledge gap makes it difficult for curriculum planners, policymakers, and teacher education institutions to determine the extent to which current programmes support sustainability-oriented teacher development and what reforms may be required.

It is against this background that this study seeks to examine the integration of Sustainable Development Goals into teacher education curriculum and its implications for quality teacher preparation. The study is expected to provide empirical evidence on the extent of SDG incorporation in teacher education programmes and highlight strategies for strengthening curriculum practices to produce competent, reflective, and sustainability-oriented teachers capable of contributing to educational transformation and sustainable development.

Objectives of the Study

The main objective of this study was to examine the integration of Sustainable Development Goals (SDGs) into the teacher education curriculum and its implications for quality teacher preparation. Specifically, the study sought to:

1. Examine the extent to which Sustainable Development Goals are integrated into teacher education curriculum for effective teacher preparation.
2. Determine the influence of Sustainable Development Goals integration on the quality of teacher preparation among future teachers.

Research Questions

The following research questions guided the study:

1. To what extent are Sustainable Development Goals integrated into teacher education curriculum for effective teacher preparation?
2. To what extent does the integration of Sustainable Development Goals influence the quality of teacher preparation among future teachers?

Research Hypotheses

The following null hypotheses was tested at 0.05 level of significance:

H₀₁: There is no significant extent of integration of Sustainable Development Goals into teacher education curriculum for effective teacher preparation.

H₀₂: Sustainable Development Goals integration does not significantly influence the quality of teacher preparation among future teachers.

Methodology

The data collected for the study on “Integrating Sustainable Development Goals into Teacher Education Curriculum and Quality Teacher Preparation” adopted a descriptive survey research design. The design was considered appropriate because the study sought to examine the extent of integration of Sustainable Development Goals (SDGs) into teacher education curriculum and determine its implications for quality teacher preparation without manipulating any of the study variables. The design enabled the researcher to collect data from respondents based on their perceptions and experiences regarding SDG integration practices within teacher education programmes and how such integration contributes to the preparation of quality teachers. The study was conducted in teacher education institutions in Nigeria. The area was considered suitable because teacher education institutions serve as major centres for preparing future teachers who are expected to possess the knowledge, skills, values, and competencies required to

promote sustainable development. These institutions provide professional training environments where curriculum reforms, innovations, and practices aimed at improving teacher quality and responsiveness to global educational priorities can be examined.

The population of the study comprised student teachers and teacher educators in selected teacher education institutions. These categories of respondents were considered appropriate because teacher educators are directly involved in the interpretation and implementation of teacher education curricula, while student teachers are the primary beneficiaries of curriculum experiences designed to enhance their professional knowledge, skills, and competencies. Their combined perspectives provided relevant information on the extent to which SDGs are integrated into teacher education curricula and the implications for quality teacher preparation. A sample of respondents was selected from the study population using a multistage sampling procedure. At the first stage, teacher education institutions were purposively selected based on their relevance to teacher preparation programmes and their involvement in curriculum implementation. At the second stage, respondents were proportionately selected from the institutions to ensure adequate representation of the different categories of participants. Finally, simple random sampling technique was used to select individual respondents who participated in the study. This sampling procedure ensured fair representation and provided every eligible respondent with an equal opportunity of being included in the study.

Data were collected using a structured questionnaire titled “Integrating Sustainable Development Goals into Teacher Education Curriculum and Quality Teacher Preparation Questionnaire (ISDGTQTPQ).” The instrument consisted of two sections. Section A contained eight items measuring the integration of Sustainable Development Goals into teacher

education curriculum, while Section B contained eight items assessing quality teacher preparation. The questionnaire items were structured on a four-point rating scale of Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1. The rating scale enabled respondents to express their level of agreement with each statement relating to SDG integration and teacher preparation outcomes. The instrument was subjected to face and content validation by experts in Curriculum Studies, Teacher Education, and Measurement and Evaluation. The experts carefully examined the questionnaire items to determine their relevance, clarity, adequacy, and appropriateness in measuring the constructs of the study. Their observations, corrections, and recommendations were incorporated into the final version of the instrument before it was administered to the respondents.

The reliability of the instrument was established through a pilot testing procedure conducted among respondents outside the study sample but with similar characteristics to the target population. Data obtained from the pilot study were analysed using the Cronbach Alpha reliability coefficient to determine the internal consistency of the questionnaire items. A reliability coefficient of 0.70 and above was considered acceptable, indicating that the instrument possessed adequate reliability and was suitable for data collection. The researcher administered the questionnaire directly to the selected respondents with the assistance of trained research assistants. Before administering the instrument, the purpose and significance of the study were explained to the respondents, and adequate instructions were provided on how to complete the questionnaire. Respondents were given sufficient time to provide their responses, and completed questionnaires were collected immediately after administration to ensure a high return rate.

The data collected were analysed using both descriptive and inferential

statistics. Mean and standard deviation were used to answer the research questions. A criterion mean of 2.50 was adopted as the decision point. Items with mean scores of 2.50 and above were interpreted as indicating a high extent of agreement, while items with mean scores below 2.50 were interpreted as indicating a low extent of agreement.

The null hypotheses were tested using simple linear regression analysis at a 0.05 level of significance. Regression analysis was considered appropriate because the study sought to determine the predictive influence of SDG integration into teacher education curriculum on quality teacher preparation. The decision rule was that the null hypothesis was rejected when the calculated p-value was less than 0.05, indicating a statistically significant influence, while the null hypothesis was retained when the p-value was greater than 0.05, indicating that the influence was not statistically significant.

Data collected for the study on "Integration of Sustainable Development Goals (SDGs) into Teacher Education Curriculum: Implications for Quality Teacher Preparation" were analysed using mean, standard deviation, and simple linear regression analysis. The research questions were answered using mean and standard deviation, while the null hypotheses were tested using simple linear regression analysis at the 0.05 level of significance. A criterion mean of 2.50 was adopted as the decision benchmark. Mean scores of 2.50 and above were interpreted as indicating a high extent of agreement, whereas mean scores below 2.50 were interpreted as indicating a low extent of agreement.

Results

Research Question One

To what extent are Sustainable Development Goals integrated into teacher education curriculum for effective teacher preparation?

Table 1: Mean and Standard Deviation Analysis of the Extent of Integration of Sustainable Development Goals into Teacher Education Curriculum (N = 200)

S/N	Items	Mean (X)	SD	Decision
1	Sustainable Development Goals (SDGs) concepts are adequately incorporated into teacher education curriculum.	3.21	0.76	High Extent
2	Teacher education programmes include courses and learning activities that address sustainability issues.	3.05	0.83	High Extent
3	Curriculum content in teacher education exposes student teachers to environmental sustainability principles.	3.18	0.79	High Extent
4	SDG-related themes such as equality, responsible citizenship, and social justice are integrated into teacher preparation programmes.	3.12	0.81	High Extent
5	Teacher educators employ instructional strategies that promote sustainable development competencies among student teachers.	3.26	0.72	High Extent
6	Practical learning experiences are provided to enable student teachers apply SDG principles in classroom situations.	2.91	0.94	High Extent
7	Teacher education curriculum encourages critical thinking and problem-solving skills required for addressing sustainability challenges.	3.34	0.68	High Extent
8	Adequate institutional support exists for effective integration of SDGs into teacher education curriculum.	2.87	0.96	High Extent
Cluster Mean		3.12	0.81	High Extent

The findings presented in Table 1 indicate that Sustainable Development Goals are integrated into teacher education curriculum to a high extent, with a cluster mean of 3.12 and standard deviation of 0.81. All the items recorded mean scores above the criterion mean of 2.50, indicating that respondents agreed that SDG-related concepts, sustainability themes, critical thinking skills, and instructional approaches are incorporated into teacher education programmes. The highest-rated item was that teacher education curriculum encourages critical thinking and problem-solving skills required for sustainability

challenges (Mean = 3.34), while institutional support for SDG integration recorded the lowest mean score (Mean = 2.87). This suggests that although SDG integration exists, more institutional commitment and resources are needed to strengthen implementation.

Research Question Two

To what extent does the integration of Sustainable Development Goals influence the quality of teacher preparation among future teachers?

Table 2: Mean and Standard Deviation Analysis of Quality Teacher Preparation (N = 200)

S/N	Items	Mean (X)	SD	Decision
9	Teacher education programmes adequately prepare student teachers with relevant professional knowledge and teaching skills.	3.35	0.66	High Extent
10	Teacher preparation programmes develop student teachers' ability to use learner-centred teaching approaches.	3.28	0.71	High Extent
11	Student teachers acquire critical thinking and problem-solving competencies needed for effective classroom practice.	3.41	0.63	High Extent
12	Teacher education programmes provide adequate opportunities for teaching practice and practical classroom experiences.	3.14	0.82	High Extent
13	Teacher preparation programmes enhance student teachers' ability to respond to diverse learners' needs.	3.22	0.75	High Extent
14	Student teachers are adequately prepared to integrate innovative approaches and technologies into teaching.	3.31	0.7	High Extent
15	Teacher education programmes develop professional values, ethical responsibility, and commitment to lifelong learning among future teachers.	3.38	0.65	High Extent
16	Graduates of teacher education programmes possess competencies required to address contemporary educational challenges.	3.2	0.77	High Extent
Cluster Mean		3.29	0.71	High Extent

Table 2 reveals that SDG integration contributes to quality teacher preparation to a high extent, with a cluster mean of 3.29 and standard deviation of 0.71. The findings show that respondents agreed that effective teacher preparation enhances professional knowledge, learner-centred teaching ability, critical thinking, technological competence, ethical values, and capacity to address contemporary educational challenges. The highest mean score was recorded for acquisition of critical thinking and problem-solving competencies (Mean = 3.41), while

teaching practice opportunities recorded the lowest mean score (Mean = 3.14). This implies that integrating sustainability-oriented concepts into teacher education can strengthen the overall quality of future teachers.

Test of Hypotheses

Hypothesis One:

H₀₁: Sustainable Development Goals are not significantly integrated into teacher education curriculum for effective teacher preparation.

Table 3: Simple Linear Regression Analysis on Integration of SDGs into Teacher Education Curriculum

Variable	R	R ²	Adjusted R ²	F-value	Sig. (p)	Decision
SDG Curriculum Integration	0.462	0.213	0.209	53.62	0.000	Reject H ₀₁

Table 3 shows that the relationship between SDG integration and teacher education curriculum was statistically significant, with $R = 0.462$ and $R^2 = 0.213$. This indicates that SDG integration accounts for approximately 21.3% of the variation in teacher education curriculum transformation. The F-value of 53.62 with a significance value of 0.000 is less than 0.05; therefore, the null hypothesis is rejected.

This means that SDG integration significantly contributes to improving teacher education curriculum practices.

Hypothesis Two

H₀₂: Sustainable Development Goals integration does not significantly influence quality teacher preparation among future teachers.

Table 4: Simple Linear Regression Analysis of SDG Integration and Quality Teacher Preparation

Variable	R	R ²	Adjusted R ²	F-value	Sig. (p)	Decision
SDG Integration → Quality Teacher Preparation	0.594	0.353	0.35	107.91	0.000	Reject H ₀₂

The results in Table 4 indicate that SDG integration has a significant influence on quality teacher preparation. The regression coefficient shows $R = 0.594$, indicating a moderate positive relationship between SDG integration and teacher preparation quality. The coefficient of determination ($R^2 = 0.353$) indicates that SDG integration explains 35.3% of the variance in quality teacher preparation. Since the probability value ($p = 0.000$) is less than the 0.05 significance level, the null hypothesis is rejected. Therefore, SDG integration significantly influences the quality of teacher preparation among future teachers.

Discussion of the Findings

The first finding of the study revealed that Sustainable Development Goals (SDGs) are integrated into teacher education curriculum to a high extent. This finding indicates that teacher education programmes have begun to recognize the importance of

sustainability-oriented education by incorporating themes such as environmental responsibility, social justice, responsible citizenship, critical thinking, and problem-solving into curriculum practices. The finding agrees with UNESCO (2017), which emphasized that Education for Sustainable Development requires the transformation of curriculum structures to equip teachers with competencies necessary for promoting sustainable development. The finding also supports Evans et al. (2017), who reported that sustainability concepts are increasingly being introduced into teacher education programmes, although the level of implementation varies across institutions.

The finding further revealed that critical thinking and problem-solving skills received the highest rating among the indicators of SDG integration. This suggests that teacher education programmes are gradually shifting from traditional knowledge transmission approaches toward competency-based learning that prepares

future teachers to address complex social and environmental challenges. This finding aligns with Kioupi and Voulvoulis (2019), who argued that SDG-oriented education should focus on developing learners' ability to analyse sustainability problems and generate innovative solutions. The implication is that integrating SDGs into teacher education curriculum can promote reflective and transformative teaching practices among future educators.

However, the finding showed that institutional support recorded the lowest rating among the indicators of SDG integration. This suggests that although sustainability concepts may exist within teacher education curricula, their effective implementation may be constrained by inadequate resources, limited professional development opportunities, and insufficient policy support. This finding is consistent with Evans et al. (2017), who identified weak institutional commitment, inadequate curriculum guidelines, and limited capacity-building opportunities as major barriers to effective sustainability integration in teacher education. Therefore, curriculum inclusion alone may not guarantee successful SDG implementation without corresponding institutional structures and support systems.

The second finding indicated that SDG integration significantly influences the quality of teacher preparation among future teachers. The result showed that SDG integration contributes significantly to professional competence, learner-centred teaching ability, critical thinking, ethical responsibility, technological competence, and preparedness to address contemporary educational challenges. This finding supports Darling-Hammond (2017), who established that high-quality teacher preparation programmes should develop broad professional competencies that enable teachers to respond effectively to changing societal demands.

The finding also agrees with Darling-Hammond et al. (2020), who noted that teachers in the twenty-first century require competencies beyond subject

knowledge, including collaboration, creativity, problem-solving, technological skills, and the ability to address diverse social challenges. The implication is that incorporating SDG principles into teacher education curriculum expands the scope of teacher preparation by producing educators who are not only classroom instructors but also agents of social and environmental transformation.

The significant influence of SDG integration on teacher preparation further supports the argument that curriculum innovation is central to improving teacher quality. When future teachers are exposed to sustainability concepts through coursework, practical experiences, and innovative teaching strategies, they develop the capacity to prepare learners for responsible participation in society. This finding corresponds with Ronfeldt et al. (2018), who found that effective teacher preparation programmes characterized by meaningful learning experiences and practical engagement improve teachers' instructional effectiveness and classroom readiness.

Furthermore, the finding supports Akyeampong et al. (2018), who emphasized the need for teacher education reforms in developing countries to ensure that teachers acquire relevant competencies required for contemporary educational challenges. In the Nigerian context, where educational systems face challenges related to environmental sustainability, inequality, unemployment, and technological transformation, integrating SDGs into teacher education curriculum provides an important pathway for preparing teachers who can contribute to sustainable national development.

Conclusion

The study concludes that integrating Sustainable Development Goals into teacher education curriculum is essential for improving the quality and relevance of teacher preparation. The findings established that SDG-related concepts are incorporated into teacher education

programmes to a high extent, particularly through the promotion of critical thinking, problem-solving, sustainability awareness, and responsible citizenship. However, challenges relating to institutional support, resources, and implementation mechanisms require greater attention to ensure effective integration. The study further concludes that SDG integration significantly influences the quality of teacher preparation among future teachers. By embedding sustainability principles into teacher education curriculum, institutions can develop teachers with professional competencies, innovative teaching abilities, ethical values, and the capacity to address emerging educational and societal challenges. Therefore, SDG integration should not be viewed as an additional curriculum burden but as a necessary reform strategy for producing competent teachers capable of contributing to sustainable development.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Teacher education institutions should systematically integrate SDG-related content across teacher education courses rather than treating sustainability education as an isolated topic. This will ensure that all future teachers acquire sustainability competencies regardless of their areas of specialization.
2. Curriculum developers and policymakers should revise teacher education curriculum frameworks to include explicit SDG competencies, sustainability pedagogies, environmental education, global citizenship education, and community-based learning experiences.
3. Teacher educators should be provided with regular professional development programmes to enhance their knowledge and skills in teaching sustainability-related

concepts and applying innovative instructional strategies.

4. Government and educational authorities should provide adequate institutional support and resources such as instructional materials, digital tools, research funding, and sustainability learning facilities to strengthen SDG implementation in teacher education institutions.
5. Teacher preparation programmes should increase practical learning opportunities that allow student teachers to apply SDG principles through teaching practice, community engagement projects, and experiential learning activities.
6. Teacher education institutions should encourage partnerships with sustainability organizations, government agencies, and communities to provide future teachers with practical experiences related to sustainable development challenges.

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