

Impact of SDGs Retraining Workshops on Pedagogical Competencies of Primary School Teachers

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Abstract

The qualities of a teacher are the essential factors that influence learners' academic performance. Most of these qualities are acquired through retraining programmes. As a result of this, many in-service training programmes have been on-going. This study was undertaken to ascertain the impact of SDGs retraining workshop on pedagogical competencies of primary school teachers. It is a descriptive survey design guided by four research questions. The population of the study consisted of 3,115 primary school teachers who participated in SDGs retraining workshops. Multistage sampling technique was used to select 360 teachers. The researchers developed a structured questionnaire titled primary school teachers' pedagogical competence questionnaire (PSTPCQ, $r=0.86$). Mean and standard deviation were used to answer the research questions. The results of the data analysis revealed that the SDGs retraining workshops impacted basic science and technology teachers' pedagogical competencies positively in areas of teaching methods, construction of instructional materials and assessment of learning outcomes but negatively on the out-of-class science teaching strategy. It was recommended among others that all primary school teachers should be given opportunity to attend the SDGs retraining workshop and that adequate fund should be made available for regular and consistent retraining programmes to ensure greater and effective instructional delivery of BST lessons.

Keywords: pedagogical competencies, primary school teachers, national teachers' institute, sustainable development goals, retraining workshop

The need to end poverty, hunger, AIDS and discrimination against women and girls brought about the introduction of Sustainable Development Goals (SDGs). The sustainable development goals were adopted by United Nations in 2015 as a blueprint to achieve a better and more sustainable future for all and it is expected to be achieved by 2030 in every country of the world (United Nations, 2015). The SDGs came up with seventeen clearly defined goals and the fourth of the seventeen goals centres on education with mandate to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (Alamin & Greenwood, 2018). Trainings and retraining workshops for teachers is the key for the success of critical goals to sustainable development on quality education (Akogun & Yomi, 2023). And this is what prompted the federal ministry of education of Nigeria through the National Teacher Institute (NTI) to start nationwide retraining workshops for primary school teachers on four core subjects namely, mathematics, English language, social studies and basic science and technology under the SDGs projects. The focus of this study is on basic science and technology (BST). The NTI provides the general guideline for nomination of participants as well as appoint resource persons to facilitate the retraining workshops.

The retraining workshops is a kind of in-service training programme that helps in updating teacher's knowledge and skills for improving teaching and learning in schools. United Nations Educational, Scientific, And Cultural Organization (UNESCO, 2019) defined in-service training as a process by which the teacher engages in refresher course to upgrade their professional knowledge, skills and practices in the course of their employment. Retraining workshops update teachers' competency, knowledge, expertise, positive attitude, practical skills, inquiry abilities and positive attitude towards teaching (Ngwu et al., 2019; Wahyudiati et al., 2022; Wahyudiati, 2023). Thus, the capacity building workshops is focused on enhancing teachers' effectiveness in pedagogical competencies. Ekim and colleagues (2022) defined pedagogy as the principles and methods of teaching or practice of teaching profession. Thus, pedagogy is a professional approach of imparting knowledge and skills on the learners in the classroom. Pedagogically, a teacher should be competent in the knowledge of content areas and arts of teaching to deliver quality instruction. Atsua and Abdullahi (2015) defined teacher competency as the ability of a teacher to do something or perform a task as expected or in line with stipulated standard or the possession of satisfactory level of relevant knowledge and acquisition of range of relevant skills. This, therefore, means that the teachers who implement the curriculum have to be pedagogically competent for the onerous task of guiding the learners through the curriculum content. Not only that teacher's initial training has adequately enabled them to acquire the necessary pedagogical competencies needed for effective implementation of the curriculum, the teacher should be given periodic and constant refresher capacity building workshops that will keep them continually updated in the required pedagogical competencies (Ademola, et al., 2023; Kakarla, 2023; Lubis, et al., 2023).

Basic science and technology (BST) is one of the subjects offered at primary and junior secondary schools and it plays a key role in shaping how the students acquire the spirit and methods of science as well foster learners' interest in science subjects. Through experimentation and practical activities in basic science and technology, the learners develop critical and logical thinking as well as scientific attitudes. In order to achieve this, the teacher

should be able to possess high pedagogical competencies that will ensure effective and efficient teaching of the innovated curriculum (Seth, 2020; Usman et al., 2023). The consistent and periodic development of the BST teachers for effectiveness in their classroom responsibilities becomes imperative. Without retraining the BST teachers to enhance their capacities they would most likely fail to understand and/or adopt the expected teaching strategies needed for effective implementation of the innovated basic science and technology curriculum. NTI has in the last seven years (2016–2022) embarked on massive teachers' capacity building workshops to retrain primary school BST teachers in line with Goal Four (quality education) of SDGs. Having been made an annual event since 2016, there is the need to determine the impact of SDGs retraining workshops on primary school teachers in terms of enhancing their pedagogical competencies in teaching basic science and technology in primary schools. The concern of this study, poised as a question, is *What is the impact of SDGs retraining workshop on pedagogical competencies of primary school BST teachers?* Therefore, the objective of the study is to determine the impact of SDGs retraining workshops on the pedagogical competencies of primary school teacher in basic science and technology. To achieve this objective, four research questions were raised.

- a. What is the impact of the SDGs retraining workshops on the competencies of primary school teachers in the teaching methods to deliver basic science and technology (BST) lessons?
- b. What is the impact of SDGs retraining workshops on the competencies of primary school teachers in constructing basic instructional materials to deliver BST lessons?
- c. What is the impact of SDGs retraining workshops on the competencies of primary school teachers in the use of out-of-class science activities to deliver BST lessons?
- d. What is the impact of SDGs retraining workshops on the competencies of primary school teachers in assessing learning outcomes in BST lessons?

Literature Review

The review of related literature were treated under three main theme of this study: Sustainable Development Goals (SDGs) and Education for Sustainable Development (ESD), teacher's Competencies and teaching activities and impact of refraining workshops programmes and teachers' pedagogical competencies.

Sustainable Development Goals (SDGS) and Educational for Sustainable Development

Education for Sustainable Development (ESD) and the SDGs were found to have a causal relationship in research by Diemer, Khushik, and Ndiaye (2020). Their research examined the causation with a focus on Pakistan and other emerging nations. The two researchers stated that SDG4's definition of excellent education as a means to improve people's quality of life is at the heart of education for sustainable development and the SDGs. Due to its dynamic character; Pakistan's SDG implementation is crucial and can serve as a case study for ESD and SDG research. Neither the Human Development Index (HDI) nor the Multidimensional Poverty Index (MPI) gives Pakistan a particularly high score. While Pakistan, Kenya, and Bangladesh

all share the same MPI, the disparity between the two countries is twofold in Pakistan and one-fold in Kenya and Bangladesh, respectively. Reviewing the Human Development Index and other indices helps us make sense of the connection between SDG-1 and SDG-4, which is crucial for realising the goals of both the national and global agendas. The work done here emphasizes the significance of and connection between various SDGs, policies, quality education, and ESD. It is determined that the quality of education in Pakistan may be enhanced by prioritising the SDGs in light of the country's specific circumstances and working towards the goals of education for sustainable development.

The lack of Education for Sustainable Development (ESD) focus has led to two issues, say Kalsoom, and colleagues (2018). There is a shortage of research on ESD-related concerns, and (i) preservice teachers' awareness of sustainability issues and attitudes and behaviours towards sustainability fall short of expectations. Kalsoom and colleagues (2018) examined a trove of Pakistani-authored academic literature on ESD. Springer, Taylor & Francis, and four national education publications were used as databases. More than 2,500 articles on ESD were located, but no research was conducted. Moreover, the scientists analysed 353 articles published in national journals between 2004 and 2016 and found that no articles pertaining to ESD were among them. There appears to be a severe lack of familiarity among Pakistani academics with the literature around sustainable development and education for sustainable development.

Nakidien and colleagues (2021) conducted a study examining the role of teachers and teacher education in South Africa in relation to the attainment of Sustainable Development Goal 4. The authors argue that despite the passage of a decade towards the realisation of the Sustainable Development Goals by 2030, African nations continue to grapple with issues of poverty and underdevelopment. The majority of children in Africa are unlikely to achieve Sustainable Development Goal (SDG) 4. Based on the findings of two interconnected empirical studies, one examining citizenship and social cohesion in high schools and the other investigating the implementation of assessment for learning in primary schools, it was determined that schools are inadequately prepared to deliver the high-quality education outlined in Sustainable Development Goal 4. Furthermore, it was revealed that teachers require further training in order to effectively embody the principles and objectives of Sustainable Development Goal 4. For the purpose of ensuring comprehensive resolution, it is imperative that all relevant parties, including government entities, businesses, and non-governmental organisations (NGOs), are actively engaged. To begin, it contends that issues of health, environment, and child nutrition are intrinsically related to the implementation of education for sustainable development. Therefore, the Sustainable Development Goals (SDGs) could help Pakistan enhance its educational system. Second, it presumes that "education quality" (SDG 4) and "poverty" (SDG 1) are intrinsically linked.

United Nations Development Programme (UNDP) (2018) found that 39% of Pakistanis, mostly in rural areas, were poor using the Multidimensional Poverty Index (MPI), which was based on government social statistics and derived using 15 criteria. Extreme poverty exists in Pakistan, with 50.9% of the country lacking access to even the most fundamental amenities. A

positive feedback loop suggests that raising the bar on educational quality can help alleviate poverty, and that doing so in turn raises the bar on educational quality across the board.

Teacher's Competencies and Teaching Activities

Effiong and colleagues' (2018) study of the whole quality management principles of education in elementary schools revealed that these teachers were ineffective in their classroom management and teaching activities. This is true because the vast majority of elementary school teachers hardly ever use the guided discovery technique that is suggested in the national curriculum for primary schools. As a result, educators who use the BST curriculum still require ongoing capacity building. The Sustainable Development Goals provide developing nations, such as Nigeria, with an opportunity to enhance the quality of life for their citizens by facilitating access to quality education and achieving other objectives related to Education for Sustainable Development (ESD). To effectively address local and global objectives, this international agenda emphasises the engagement of nations in establishing problem priorities that align with their respective domestic contexts. Poverty stands as a prominent issue in Nigeria. The implementation of the Sustainable Development Goals (SDGs) can effectively address this issue, particularly in terms of enhancing educational provisions to improve Human Development Index (HDI) indicators and mitigate the underlying factors contributing to poverty. The findings of this study have the potential to inform more informed policy decisions in subsequent periods, ensuring that the Sustainable Development Goals (SDGs) align with the long-term objectives and ambitions of the country. If no action is taken in the present, the challenges anticipated in the year 2030 will likely be significantly exacerbated. When examining the development and economic well-being of a nation, the consideration of education emerges as a key factor.

A study on the critical thinking abilities of basic science teachers and students for global economic growth was undertaken by Solomon and colleagues (2018). The study found that students and teachers of fundamental science and technology have poor critical thinking abilities. A teacher of fundamental science and technology should possess the fundamental knowledge and abilities necessary to influence students' behavior and critical thinking through instruction. But little will be accomplished for the students if a teacher is unsuccessful because of poor critical thinking. The teacher needs ongoing in-service teacher training programs in order to be able to demonstrate a certain level of competencies that will assure a quality standard in educating the students. The level of education inside a country significantly contributes to its overall significance. Training teachers is a crucial component inside India's comprehensive education system. In contemporary times, the concept of a training course has evolved beyond its traditional institutional framework, assuming a broader significance as a means for societal and national rejuvenation. The establishment of an effective teacher training methodology holds significant importance for India. In order to enhance students' educational achievements, there is a growing consensus among scholars that a key strategy for instructors is to enhance their instructional competencies, with a particular emphasis on cultivating student motivation and fostering a drive for learning.

In an effort to improve the writing abilities and motivation of undergraduate students, Meletiadou (2021) conducted research employing Padlets as electronic portfolios. According to the study's findings, students were able to considerably improve their writing abilities and increase their motivation for writing and learning in general. In their focus group discussion, the student teachers (pre-service teachers) requested assistance in honing their writing and reflective skills as well as extra help when using e-portfolios. In order to foster greater creativity in their students, teachers should accept the usage of cutting-edge teaching strategies to make sure that classroom interactions are student-centered. The Sustainable Development Goals (SDGs) are incorporated into educational contexts, which offer educators significant opportunities to foster critical thinking and problem-solving skills in both themselves and their students. These goals can be used by educators to promote discussions and activities that help students conduct critical analysis of complex global issues. Teachers who actively incorporate the Sustainable Development Goals (SDGs) into their pedagogical practices are more likely to cultivate cultural sensitivity and inclusivity in their lessons. Teachers will recognise the value of taking into account a variety of viewpoints and backgrounds, improving the fairness and inclusion of their teaching methods. Since active learning practices encourage student participation and engagement, they are commonly used in the context of SDG-related topics.

Retrainings and Pedagogical Competencies

Ekim and colleagues (2022) assessed how an in-service training program affected secondary mathematics teachers' pedagogical skills and use of technology. They found that while the program had a significant impact on teachers' pedagogical skills, their ability to use technology had not significantly improved. The results of this study have made it possible for teachers' capacity building to be centered on their ability to use ICT in the classroom in order to assure increased job performance. The association between in-service training and teaching skills was studied by Norwani and colleagues (2017). The study discovered a marginally significant link between teaching abilities and in-service trainings. The findings imply that teachers need to receive more thorough training in teaching techniques. The act of educating a girl has a profound impact on the entire family unit. When one imparts knowledge to an educator, the entire community is educated. According to the national curriculum plan for teacher education in 2009, a key objective of teacher education is to foster students' ability to perceive the world through the lens of equitable and sustainable development. It is evident that educators serve as a valuable source of ideas for promoting equitable and sustainable development across all sectors of society. As a result of these circumstances, individuals necessitate comprehensive training across several domains, including but not limited to the cultivation of respect for the rights of all individuals, the promotion of gender equality, and the fostering of peace.

The study on the effect of professional development activities on teachers' perceived proficiency in teaching English was carried out by Omar (2017). The findings showed that participation in professional development activities boosted instructors' teaching competencies. This demonstrates the necessity of providing instructors with frequent, ongoing training in order to improve their competencies. The results of a study conducted by Ngwu and colleagues (2019) on evaluating the professional development needs of junior secondary school

basic science teachers showed that the study area's professional development programs do not adequately address teachers' needs and that basic science and technology teachers are not taken into account when planning professional development programs. It is crucial to determine which pedagogical abilities the instructors need the most based on this result in order to plan and organize capacity building activities specifically for them. Osei-Owusu (2022) conducted research on how professional development programs affect teachers' knowledge and senior high school students' academic performance in Nigeria. The study's findings demonstrated a strong positive association between professional development and professional knowledge and Competencies. This suggests that the professional development programs are intended to accomplish the general objectives of professional development programs, which include familiarizing instructors with contemporary trends that enliven their ideas and make them more relevant in the achievement of educational goals. Therefore, those involved in education should give frequent and constant retraining of instructors more attention. The correlation between a student's academic achievement and the competence of their instructor underscores the significance of providing teachers with the necessary training to effectively inspire and engage their pupils in the learning process. It is imperative for the instructor to establish a positive example for the students to emulate. This intervention is expected to facilitate the cultivation of enhanced moral values among the students. The fundamental components of sustainable development encompass the formulation and implementation of these guiding principles, fostering social consciousness, recognising economic considerations, and advancing environmental preservation, among various other facets. It can be reasonably inferred that those employed as educators has a certain level of concern for sustainable development, as they are likely to possess knowledge regarding the issues associated with it. The training of teachers is a highly effective mechanism, thereby rendering it one of the most optimal approaches for attaining the objectives of sustainable development. Professional development programmes for educators aim to ensure that students are provided with competent teachers who will facilitate their lifelong learning. The quality of instructors is significantly influenced by the training they get, (Nkomo & Abdul, 2023).

Mak (2019) looked into how a professional development program affected teachers' assessment skills. The results showed that the professional development initiatives improved instructors' knowledge of assessment. This indicates that their assessment abilities have improved as a result of the retraining seminars. Therefore, it is important to support the teachers' professional development programs so that teachers can continue to strengthen their evaluation abilities. Teachers who participate in workshops centred on the evaluation and assessment, Sustainable Development Goals (SDGs) are more likely to pick up cutting-edge pedagogical techniques that encourage active participation and student engagement. Enhancement of Assessment and Feedback: by trained teachers create authentic assessments that are in line with the Sustainable Development Goals (SDGs), educators have the chance to improve their assessment and feedback skills. The deployment of more thorough feedback and evaluation procedures may arise from these evaluations, forcing students to analyse, evaluate, and develop solutions for actual situations.

Evidence from the literature analysis mentioned above revealed inconsistent reports on how professional development programs for teachers affected the thinking and pedagogical skills that instructors need to have in order to provide high-quality education. The result that instructors' classroom interaction patterns remain learner-centered rather than teacher-centered after teachers' capacity building programs (Ngwu et al., 2019) further reinforces the cause for concern. In light of this, the current study was carried out to ascertain how the SDGs retraining workshops affected the pedagogical abilities of primary school teachers.

Methodology

The study employed descriptive survey design. It is a research design that observes, collects and describes data in a systematic manner of the characteristics feature of population (Lawrant, 2018). The design is considered most appropriate because the study would select a sample from the population from which generalization would be made. Furthermore, there would be no manipulation of variables rather appropriate information would be collected from teachers of basic science and technology on the levels of competencies needed for effective implementation of BST curriculum. The population for the study comprised of all teachers in public primary schools in Kogi State that participated in the SDGs capacity building workshops since its inception in 2016. There are 3,115 teachers. This number represented the number of teachers who participated in SDGs retraining workshops in Kogi since 2016. The sample size of 360 for this study was determined using Krejice and Morgan (1970) method. Multistage sampling technique was used in selecting the research sample. Multi-stage was used because the sample were drawn at different stages. Firstly, simple random sampling technique (balloting by replacement) was used to select three local government areas from each of the three educational zones of Kogi State, giving a total of 9 local government areas out of the 21 local government areas of Kogi State, Nigeria. Secondly, purposive sampling technique was used to draw 4 primary schools based on the population of primary school teachers (10 and above) who participated in SDGs retraining workshops giving a total of 36 primary schools. Thirdly, simple random sampling technique was carried out through the use of balloting with replacement to select 10 primary school teachers who participated in the SDGs retraining workshops from each of 36 primary schools already sampled. The names of the primary school teachers were written on pieces of paper, folded and put in transparent container, shuffled and researchers drew the teachers with replacement. Since 10 teachers were drawn from 36 sampled primary schools, the total of 360 teachers participated as the sample of the study. The NTI office Lokoja and head teachers at the sampled schools supplied the information of the SDGs workshops participants, from which the sample was drawn.

The instrument used for data collection was a structured questionnaire developed by the researchers titled primary school teachers' pedagogical competencies questionnaire (PSTPCQ). It was divided into two sections (A and B). Section A was made up of biodata, which made up of gender, school location and participation in SDGs workshops. Section B was divided into four clusters tagged I, II, III and IV clusters that were used to solicit information on primary school teachers' effectiveness in teaching basic science and technology on: use of teaching methods, construction of basic instructional materials, use of out of class activities in

teaching and assessment of learning outcomes. Questions that were posed to the participants according to the clusters as follows:

Cluster 1: How effective are you in using the following teaching methods and strategies to deliver BST lesson?

Cluster 2: How effective are you in constructing basic instructional materials/equipment? Cluster 3: How effective are you in carrying out-of-class-science activities and programmes while teaching topics in BST curriculum?

Cluster 4: How effective are you in the assessment of learning outcomes while preparing to teach and actually teaching topics in the BST curriculum?

Each of the item in the different cluster ranked on a five points scale of very effective (VE = 5), effective (E = 4), moderately effective (ME = 3), somehow not effective (SNE = 2), not effective (NE = 1).

The instrument was validated by presenting it to three experts, two in chemistry education and one in measurement and evaluation all from University of Nigeria, Nsukka. The experts were requested to scrutinize the instrument for the purpose of ensuring the suitability and appropriateness in addressing the research purpose of the study. Consequently, suggestions for improvement were strictly implemented which resulted to the final draft of the instrument. The validated instrument was administered to 40 primary school teachers who were not part of the sample as a pilot study. Data obtained from their various responses on the questionnaire were used in determining the reliability, using Cronbach Alpha formula. The final Cronbach Alpha reliability coefficient of 0.86 was obtained for the instrument. Data collection was carried out by 30 research assistants (10 per zone) who were properly trained in their zones on the administration of the instrument and later assigned to their respective educational zones for the administration of the questionnaires. The choice of large number of research assistants is to ensure that the research work was carried out simultaneously in various zones at the same period of time. This was necessary as the questions were not reshuffled or modified for teachers in different zones or areas. The questionnaires were served and retrieved the same day to ensure 100% return rate of the instrument. Data collected were analysed using mean and standard deviation to answer research questions. The criterion mean is 3.00 since 5-point rating scale of VE =5, E = 4, ME = 3, SNE = 2, NE = 1 was used. The criterion mean was obtained by averaging the five scales as follows: $\frac{5+4+3+2+1}{5} = 3.00$. In taking decisions, a mean value

of 3.0 and above is agreed and mean value below 3.0 is disagreed. When the respondents agreed with the idea in the item, it implies that SDGs retraining workshops has impact in respect of the item. Similarly, when the respondents disagreed with the idea in the item, it implies that SDGs retraining workshops has no impact in respect of the item.

Results

Research Question One: What is the Impact of SDGs Retraining Workshops on Teaching Methods?

Table 1

Mean and Standard Deviation of the Impact of SDGs Retraining Workshops on Teaching Methods

S/No.	Items	X	SD	Remarks
1	Guided inquiry method	3.49	1.17	Impact
2	Demonstration method	3.48	1.07	Impact
3	Lecture method	3.53	1.16	Impact
4	Discovery method	3.60	1.15	Impact
5	Process-based classroom interaction methods	3.62	1.01	Impact
6	Discussion method	3.51	1.03	Impact
7	Questioning method	3.60	1.09	Impact
8	Laboratory method	3.46	1.06	Impact
9	Project method	3.38	1.09	Impact
10	Concept mapping method	3.51	0.91	Impact
11	Problem based method	3.67	1.02	Impact
12	Cooperative learning strategies	3.67	0.96	Impact
13	Competitive learning strategies	3.54	1.08	Impact
14	Field trip method	3.68	0.99	Impact
15	Use of analogy	3.24	1.03	Impact
16	Group discussion method	3.64	1.03	Impact
17	Group project method	3.68	0.97	Impact
18	Advance organizer method	3.59	1.05	Impact
	Grand mean / standard deviation	3.55	1.04	Impact

Table 1 shows item by item of mean and standard deviation of individual's responses on the impact of SDGs retraining workshops on competencies of primary school teachers in using teaching methods to deliver BST lessons. All the items have mean scores of above 3.00 benchmark, indicating that SDGs retraining workshops have positive impact on competencies of primary school teachers in using teaching methods in delivering BST lessons.

Research Question Two: What is the Impact of SDGs Retraining Workshops on Constructing Basic Instructional Materials?

Table 2

Mean and Standard Deviation of the Impact of SDGs Retraining Workshops on Constructing Basic Instructional Materials

S/No.	Items	X	SD	Remarks
19	kites,	3.76	0.99	Impact
20	inclined planes,	3.72	0.95	Impact
21	pulleys,	3.51	0.97	Impact
22	wind vanes,	3.53	1.87	Impact
23	Pulley	3.55	1.07	Impact
24	Simple level machines	3.65	1.87	Impact
25	measuring Instruments:	3.66	0.87	Impact
26	Measuring cylinder,	3.26	1.08	Impact
27	weighing balances	3.10	0.98	Impact
28	Ruler/Tape	3.16	0.78	Impact
29	chemical balance,	3.33	1.10	Impact
30	spring balance	3.01	1.12	Impact
31	tit-pipette	3.16	0.98	Impact
32	Stop clock/watch	3.24	0.87	Impact
	Grand mean/ standard deviation	3.40	1.06	Impact

Table 2 shows that the Mean and Standard Deviation of the respondents on the Impact of SDGs retraining workshops on BST Teachers' competencies in constructing basic instructional materials. The mean value of all the 14 items as well as the grand mean are more than the criterion mean of 3.00. This implies that SDGs retraining workshops have impacted positively on BST teachers' competencies to construct the basic instructional materials for delivering BST lessons.

Research Question Three: What is the Impact of SDGs Retraining Workshops on Primary School Teachers' Competencies in the Use of Out-of-Class Science Activities?

Table 3

Mean and Standard Deviation of the Impact of SDGs Retraining Workshops on Primary School Teachers' Competencies in the Use of Out-of-Class Science Activities

S/No.	Items	X	SD	Remarks
33	Organizing BST debates for learners.	2.98	1.43	No impact
34	Taking learners out on field trip to places of BST interest in the community.	3.11	1.13	Impact
35	Linking community concerns to BST teaching/ learning activities.	2.82	1.20	Not impact
36	Linking community economic activities to BST learning activities	2.75	1.09	Not impact
37	Linking environmental concerns to BST teaching/ learning activities.	2.69	1.11	Not impact
38	Bringing in community-based resource persons as role models to talk to children learning through BST curriculum.	2.86	0.97	Not impact
Grand mean and standard deviation		2.87	1.15	Not impact

Table 3 shows the mean and standard deviation of the impact of SDGs in training workshops on primary school teachers' competencies in the use of out-of-class science activities. All the individual mean scores, as well as grand mean scores except for item 34 are below the criterion mean of 3.00. This that implies the respondents agreed that SDGs retraining workshops have negative impact on primary school teachers' competencies in using out-of-class science activities in BST lessons. Thus, primary school teachers are incompetent in using out-of-class science activities in delivering their BST lessons after the SDGs retraining workshops.

Research Question Four: What is the Impact of SDGs Retraining Workshops on Primary School Teachers' Competencies in Assessing Learning Outcomes?

Table 4

Mean and Standard Deviation of the Impact of SDGs Retraining Workshops on Primary School Teachers' Competencies in Assessing Learning Outcomes

S/No.	Items	X	SD	Remarks
39	Constructing good achievement test instrument based on the objectives of the lesson.	3.23	1.12	Impact
40	Assessing the learners as teaching goes on in the classroom	3.56	1.16	Impact
41	Using innovative assessment practices	3.10	1.08	Impact
42	Creating positively challenging assignment for the learners.	3.06	1.30	Impact
43	Constructing observational rating scale for assessment of practical skills.	2.89	1.13	No impact
44	Developing good BST attitude scale for learners.	2.74	1.16	No impact
45	Developing BST interest scale for learners.	2.56	1.18	No impact
46	Constructing practical tests.	2.82	1.13	No impact
47	Developing adequate marking scheme for scoring learners' tests outputs.	3.60	0.99	Impact
48	Marking series of assignments and tests	3.32	0.89	Impact
	Grand mean and standard deviation	3.09	1.11	Impact

Table 4 shows impact of SDGs retraining workshops on primary school teachers' competencies in assessing learning outcomes. Items 39, 40, 42, 43, 47 and 48 have means of 3.00 and above while items 43, 44, 45 and 46 have means below 3.00 criterion mean, however the grand mean of 3.09 was obtained for the 10 items indicating, that overall SDGs retraining workshops have positive impact in primary school teachers' competencies in assessing learning outcomes in BST lessons.

Discussion

Results on Table 1 in respect of research question one revealed that the primary school teachers who participated in the SDGs retraining workshop were generally of the view that their participation enhanced their pedagogical competencies on using conventional and innovative teaching methods in delivery BST lessons. The teacher's effective use of innovative teaching methods after the retraining workshop is a welcome development and realization of learner-centred teaching. This will encourage activity-based learning which include learner's active participation, interactive discussion, creativity and doing which are the hallmarks of learning science. It is particularly interesting to note the SDGs retraining workshops have positively impacted the primary school BST teachers towards the utilization of modern teaching methods in their classroom interaction pattern. Hence primary school teachers have not participated in the retraining workshops should endeavour to upgrade themselves in the use of modern teaching methods through attendance to SDGs retraining workshops. The finding of this study is in line with the findings of Ekim and colleagues (2022), and Osei-Owusi (2022) who

revealed that in-service training programme significantly impacted teachers' pedagogical skills. Thus, the primary school teachers should be given retraining workshops that will keep them continually updated on the latest teaching methods and pedagogic skills. According to Sunthonkanokpong and Murphy (2019), the concept of quality in teacher education is underpinned by the acquisition of information, skills, and teaching methods by trainees through classroom instruction and practical experience. According to Lalvani (2013), the medical perspective on education primarily centres on the impact of individual students' learning difficulties on their academic performance, rather than considering the influence of social and contextual factors on students' grades. The fourth objective of the Sustainable Development Goals is to achieve the eradication of severe poverty and hunger by the year 2030. This phenomenon presents a greater challenge in attaining the desired objective. In response to this, recent revisions to the teacher training curriculum have endeavoured to shift the conceptualization of difference away from the deficit perspective. Currently, there is an increased emphasis on developing a heightened awareness and understanding of the social and educational elements that influence children's capacity to acquire knowledge (Lalvani, 2013).

The findings on Table 2 with respect to research question two revealed that the respondents agreed that SDGs retraining workshop had positive impact on primary school teachers' construction of basic instructional materials for BST lessons. Availability and utilization of instructional materials is one of the most essential components of teaching and learning process. Before the utilization of these materials they have to be available. However, in most developing countries, most of these instructional materials are not available because of the high cost. Therefore, science teachers have been called upon to improvise or construct some basic instructional materials from the resource materials available in their rich environment. However, the primary school teachers need their capacity strengthened in order to achieve this objective. The SDGs retraining workshops has remarkably improved teachers' pedagogical competencies in constructing some basic instructional materials for BST lessons. The, finding concur with the finding of Omar (2017) which revealed that the past professional development programmes resulted in high improvement in teachers' skills among others. Significant modifications are being implemented in educational institutions to acknowledge and embrace diversity (Jetly & Singh, 2019; Sunthonkanokpong & Murphy, 2019). According to the conceptual framework proposed by Sunthonkanokpong and Murphy (2019) for Sustainable Development Goal 4 (SDG 4), the notion of equity in teacher education entails facilitating trainees' ability to embrace principles of social justice and prioritise equitable teaching practises. Such as the construction and use of instructional materials in teaching and learning processes. This educational intervention aims to support students who are marginalised or socially excluded, facilitating lifelong learning opportunities in order to promote social equity within society. What was discussed about the least in the SEN course, meanwhile, were the rights of children to education, social justice, and communicating and working with parents.

The findings on Table 3 in respect of research question three revealed that the SDGs retraining workshops have not positively impacted primary school teachers in the aspect of out-of-class science activities. The results indicated that primary school teachers lack the pedagogical competencies to carryout out-of-class science activities after the SDGs retraining workshops.

The teachers were particularly deficient in some pedagogical competencies such as organizing BST debates for learners linking community concerns to BST learning activities, linking community economic activities, linking environmental concern and bringing community-based resource persons as role models. The finding of this study corroborates the finding of Ngwu and colleagues (2019) which found out that the professional development programmes are not meeting the pedagogical need of basic science and technology teachers. Thus, this particular result thus contradicts the objectives of the SDGs retraining workshops which emphasis on the use of, hand-on, mind-on activities to foster learner's interest in science. Therefore, there is need to focus attention on this aspect in future retraining programmes. Therefore, we argue that it is imperative to dismantle the hierarchical structure inherent in traditional teaching and learning dynamics, and instead foster an environment that nurtures personal development. This is because educators who possess a comprehensive understanding of pertinent laws and policies are more inclined to exhibit effectiveness in their inclusive pedagogy. Furthermore, the utilisation of outdoor activities that are beneficial and designed to cater to a wide range of individuals is a crucial aspect of delivering inclusive training that facilitates adaptable approaches to learning.

The findings on Table 4 with respect to research question 4 revealed that overall, primary school teachers were effective in their assessment of learning outcomes after the SDGs retraining workshop but were lacking in area construction of observational scale, attitude scale, interest scale and practical tests. Assessment of students is very essential in teaching/learning process as it provides the necessary feedback to the students. The finding of this study is in line with the finding of Mak (2019) which revealed that teachers' assessment knowledge was enhanced by the professional development efforts. This mean that the retraining workshops of teachers have improved their assessment abilities and should be encouraged to be organized on regular basis. It is on this note that Jetly and Singh (2019), posit that the aforementioned concerns hold significant importance in the context of sustainable development and serve as the foundation for fostering a sustainable future. Regarding the establishment of a sustainable future, the subsequent issues pertaining to sustainable development are of utmost significance. The findings of this study provide empirical support for advocating significant support for teachers training in line with SDG goal 4, this intervention is expected to have a lasting impact on the enhancement of teacher education. The perspective on this matter has the potential to influence the attitudes of educators towards endorsing inclusive education in both established (Lalvani, 2013) and developing (Dart, 2006) nations. Purdue and colleagues (2009), argued that trainees developed an understanding that every kid is entitled to get a quality education. This realisation occurred as a result of engaging in discussions about disability from various perspectives, including the lens of rights rhetoric. Adding strength to the above, the scholarly works of Jetly and Singh (2019) and Sunthonkanokpong and Murphy (2019), there is a proposal to incorporate the concept of quality into teacher education programmes in order to ensure its sustainability.

Implications

The Sustainable Development Goals (SDGs) can have a major impact on the pedagogical competencies of primary school teachers who are undergoing retraining. The aforementioned consequences have some implications which are discussed below: Teachers' awareness of global issues and ambitions is increased by the SDG retraining workshops, which promote a greater grasp of topics relating to sustainability, poverty, inequality, and climate change. This higher degree of awareness can lead to a more thorough and informed approach to teaching. The Sustainable Development Goals (SDGs) can be effectively used by educators to demonstrate the relevance of many academic fields in real-world contexts.

The capacity of educators to show students how their newly learned knowledge relates to larger global issues helps to increase student's engagement and the importance of the learning process. Collaboration among educators from various academic fields is encouraged as a result of the adoption of an interdisciplinary approach commonly required for the attainment of the Sustainable Development Goals (SDGs). As a result of learning how to design and implement cross-curricular lessons that encourage the development of critical thinking and problem-solving skills, teachers' pedagogical skills may be strengthened.

Since SDGs retraining workshops has impacted positively on primary school BST teachers' pedagogical competencies especially in areas of teaching methods, construction instructional materials and assessment techniques, all primary school teachers should be given the opportunity to attend the workshops. This can be achieved if government at various levels organize SDGs retraining workshops quarterly (4 times in a year) as against once in a year that is presently in vogue. Stakeholders such as non-governmental organizations should support government financially to ensure that adequate fund is available for the quarterly retraining of all the teachers in the primary schools in order to ensure greater instructional delivery BST lessons.

Since the primary school BST teachers are deficient in the pedagogical skills of out-of-class science activities, the SDGs retraining workshops should be organized to target this specific aspect of the skill, which in turn will improve their performance on their jobs in this specific area. Thus, accurately focused capacity building workshop should be developed and organized on out-of-class science activities for the primary school teachers. The SDGs retraining workshops should enable primary school teachers to effectively utilize out-of-class science instructional strategy in order to make their teaching real and activity-based, thereby enhancing pupils' interest in science subjects as well as ensuring equity.

Resource persons/facilitators of NTI should refocus their retraining programmes on the deficient areas of assessment techniques such as development of rating scales and practical tests. This will ensure that the retraining programmes cover the assessment of all the three educational domains (cognitive, affective and psychomotor) rather than cognitive domain only. In this way, emphasis will be laid on character formation and adequate development of motor skills of the pupils.

Conclusion

Based on the finding of the study, it was concluded that the SDGs retraining workshops have impacted positively and thereby enhanced the pedagogical competencies of primary school BST teachers in the areas of the use of teaching methods, construction of some basic instructional materials and assessment of learning outcomes, but the teacher are still deficient in some areas of assessment procedures such as construction of observation, attitudes' and interest scales as well as the construction of practical tests.

It was also concluded that in spite of SDGs retraining workshops, primary school teachers were still lacking in pedagogical competency of out-of-class science activities. It is important to carry out this study in wider context to include the use of technologies. Therefore, further research should be conducted on the impact of SDGs retraining workshops on primary school BST teachers' use of computer assisted instruction (CAI).

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Appendix

Primary School Teachers' Pedagogical Competencies Questionnaire (PSTPCQ)

We are science teacher educators. We are conducting a research to find out the teaching skills which Basic Science and Technology teachers in our schools have and those they do not have. The need is to create a competency based programme of retraining the **Basic Science and Technology (BST)** teachers to improve their knowledge and skills. We therefore request you to most sincerely complete the questionnaire below to enable us find the important things you may not know so that we can select what we shall include in the retraining programme we want to develop to improve the capacity of BST teachers. **Please, Tick (√) in the appropriate column** of the scale below as it applies to you. Please try and be as honest as possible for the information you give will be used for only research purpose and your confidentiality is assured.

Section A: Demographic Information

Gender: Male Female

Location: Urban Rural

The Classes you teach.: (Tick as many as you teach)

PRY 1 PRY 2 PRY 3 PRY 4 PRY 5 PRY 6

Your Qualifications: SSCE TCII NCE OND ND

B.Ed. B.SC MASTERS PhD Any Other

Did you benefit from the training given by NTI during the MDG training programme?

Yes No

Section B: Rate yourself on 5-point scale in each of Competency statements below. The scale points range from 1 to 5 where 5 is the highest level of effectiveness. How effective are in you in the following areas:

Cluster A	Item statement using teaching methods to deliver BST lessons.	1	2	3	4	5
S/No.						
1	Guided inquiry method					
2	Demonstration method					
3	Lecture method					
4	Discovery method					
5	Process-based classroom interaction methods					
6	Discussion method					
7	Questioning method					
8	Laboratory method					
9	Project method					
10	Concept Mapping					
11	Problem based method					
12	Cooperative learning strategies					
13	Competitive learning strategies					
14	Field Trip method					
15	Use of analogy					
16	Group Discussion method					
17	Group project method					
18	Advanced Organizers Method					

Cluster B	Constructing basic instructional materials/equipment:						
19	kites,						
20	inclined planes,						
21	pulleys,						
22							
3	wind vanes,						
23	Pulley						
24	Simple level machines						
25	Using measuring Instruments:						
26	Measuring cylinder,						
27	weighing balances						
28	Ruler/Tape						
29	chemical balance,						
30	spring balance						
31	tit-pipette						
32	Stop clock/watch						

Cluster C	Out-of-class-science activities and programmes						
33	Organizing BST debates for learners.						
34	Taking learners out on field trip to places of BST interest in the community.						
35	Linking community concerns to BST teaching/learning activities.						
36	Linking community economic activities to BST learning activities						
37	Linking environmental concerns to BST teaching/learning activities.						
38	Bringing in community-based resource persons as role models to talk to children learning through BST curriculum.						

Cluster D	Effective Assessment of Learning Outcomes.						
39	Constructing good achievement test instrument based on the objectives of the lesson.						
40	Assessing the learners as teaching goes on in the classroom						
41	Using innovative assessment practices						
42	Creating positively challenging assignment for the learners.						
43	Constructing observational rating scale for assessment of practical skills.						
44	Developing good BST attitude scale for learners.						
45	Developing BST interest scale for learners.						
46	Constructing practical tests.						
47	Developing adequate marking scheme for scoring learners' tests outputs.						
48	Marking series of assignments and tests						