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SUSTAINABILITY TRAINING IN PRE-SERVICE TEACHER EDUCATION: ADDRESSING POLITICAL ECONOMY AND HIGHER EDUCATION CONSTRAINTS IN PAKISTAN

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Abstract
This study examined the impact of integrating sustainability training into pre-service teacher education programs to address political-economic and educational challenges. A mixed-methods approach was employed, combining qualitative and quantitative data collection. The study population comprised 120 pre-service teachers in their 7th semester of the B.Ed. (Hons.) program at a public university in Punjab, Pakistan. Participants were stratified by demographic variables, and a stratified random sampling technique ensured equitable representation. Concept-based, homogeneous pre- and post-training achievement tests revealed significant improvements in the confidence levels of teachers who received sustainability-integrated training compared to those receiving traditional training. The Sustainability in Teaching Self-Efficacy Scale (STSES) measured the enhancement in awareness and confidence after observing the application of sustainability principles in teaching practices. Results indicated a notable increase in sustainability awareness (15%–60%) and confidence levels (15%–45%) following integrated training. The study demonstrated that such training equips pre-service teachers to address global educational challenges by fostering awareness, confidence, persistence, and sustainability skills. Findings underscore the need to incorporate sustainability-focused courses into teacher education curricula and highlight the importance of public-private partnerships to support sustainable development initiatives in education.

INTRODUCTION

The political, economic, and educational landscape has significantly influenced the preparedness of preservice teachers, leading to a remarkable shift across diverse domains. This influence has become even more profound through structured teacher education programmes, which now extend beyond addressing traditional educational and societal challenges. These programmes are designed to equip future educators to respond effectively to evolving global demands, ultimately preparing them to manage and mitigate conditions defined as educational emergencies.

The political economies of society face numerous challenges, including environmental degradation, loss of biodiversity, economic instability, social injustice, and widespread insecurity. In this context, strengthening teacher education programs is essential to equipping future educators with the skills and knowledge necessary to address these pressing issues. By integrating sustainability principles into teacher training, educational institutions can contribute to long-term social resilience, economic stability, and environmental preservation, ensuring a more sustainable and equitable future (Nguyen, 2019).

According to Buchanan (2023), the increasing demand for preservice teachers highlights the need for their alignment with essential skills, professional commitment, and comprehensive knowledge, all within the framework of situated learning in a sustainable society. To effectively contribute to sustainable development, preservice teachers must be equipped with critical thinking, problem-solving abilities, and adaptability to address evolving educational and environmental challenges.

By integrating sustainability-focused training into teacher education, future educators can foster a deeper understanding of ecological responsibility, social equity, and economic stability. This holistic approach ensures that preservice teachers are not only well-prepared for the classroom but also serve as proactive agents of change, promoting sustainability principles in education and beyond (Buchanan, 2023; Smith & Jones, 2024).

The concept of teaching sustenance is crucial in addressing global challenges by fostering sustainable services and ensuring the provision of sustainable goods that enhance the development of sustainable classrooms. These elements play a vital role in integrating sustainability into teacher education programs, making it an essential component of future-ready pedagogy (Nguyen, 2019).

This study addresses critical socio-economic and environmental issues by exploring the enhanced preparedness of future educators to navigate the challenges they may encounter in their professional lives. By equipping preservice teachers with the necessary skills, knowledge, and adaptability, the study highlights the importance of sustainability-focused teacher education in fostering resilience and problem-solving capabilities.

Through a comprehensive analysis, the research underscores how well-prepared educators can effectively respond to evolving educational demands, integrate sustainable practices into their teaching, and contribute to broader societal well-being. By doing so, teacher education programs play a pivotal role in shaping educators who are not only competent in their profession but also proactive in addressing global and local sustainability challenges

Background of the Study

To address political and economic challenges, teacher education programs played a pivotal role in preparing preservice teachers to effectively respond to educational emergencies. These programs equipped future educators with the necessary skills, critical thinking abilities, and adaptive strategies to navigate complex socio-political landscapes while fostering sustainable and resilient educational systems.

Over the decades, efforts had been made to mitigate the challenges faced by teacher education, which now gained substantial attention globally. These challenges had been intensified by the mushroom growth of an unstable economy, inconsistent governance, and a series of global crises. The role of a teacher educator had become more evaluative than merely constructive. There was an immediate need for preparedness in terms of academic competence, resilience, social awareness, and the ability to contribute to economic stability amidst ongoing instability and political pressures, all while navigating a rapidly transforming society (Brown & Green, 2017).

The global emergency faced by teacher education has drawn increased emphasis from UNESCO (2014), highlighting the urgent need to address this growing concern. This urgency reflected the dire need to sustain and strengthen teacher education programs by incorporating sustainability principles. Such integration aimed to better equip future educators to effectively respond to global crises and evolving challenges.

The integration of the rule of law provided redressal for challenges such as climate change, social disintegration, poor governance, and food insecurity, helping to address difficulties including wars, floods, disasters, and pandemics. The strength gained through sustainability fosters resilience, flexibility, adaptability, and innovative problem-solving. This empowered teachers to contribute meaningfully to long-term educational stability and societal development. Prospective teachers' who are future assets, must be equipped with modern educational features, tools, resources, and literature to effectively address ecological emergencies,

political and economic instability, educational deficiencies, literacy challenges, and societal moral decline. This modern century presented its complexities, shortcomings, technological fluctuations, immersive demands, and evolving cohort-wise needs, requiring the effective implementation and application of governmental policies in the best possible way (Carter, 2021).

The challenges of generating critical thinking, promoting sustainability, and focusing on effective pedagogies played a vital role in shaping the character of facilitators who proactively addressed difficulties. These innovative challenges contributed in building a more resilient and equitable society. For empowering preservice teachers, it was essential to overcome their fears of adopting new ideas and ensured acceptance from the administration factors that were crucial to bringing positive change (Redding & Green, 2020).

Both theoretical and instructional experiences developed a deeper understanding of sustainable practices in real-life situations. Most approaches aimed to strengthen skills and aptitudes, enhancing the ability of preservice teachers to effectively implement sustainability-driven pedagogies (Nguyen, 2019; United Nations, 2021).

Teacher training and professional development programs were not overstated, as they played a crucial role in shaping students' confidence, competencies, and employability. These programs equipped preservice teachers with essential resources for integrating sustainable teaching practices. Preservice teachers contributed to the broader goals of enhancing environmental awareness, evolutionary consciousness, and social responsibility within education systems (UNESCO, 2017; Redding & Green, 2020).

Objectives of the Study

1.To assess the effectiveness of sustainable training after application of sustainability principles for enhancing the preservice teachers' awareness and confidence.

2.To evaluate the extent to which sustainability training, following the application of sustainability principles, influences preservice teachers' readiness.

Purpose of the Study

In this modern era, the significance of sustainable training held immense value for improving academic outcomes in education programs for preservice teachers. This study evaluated the integration of sustainability principles such as awareness, confidence, and practical application into teacher training. In doing so, the study made a meaningful contribution toward global recognition of the Sustainable Development Goals (SDGs) 2030, particularly in the context of Quality Education, by mobilizing effective training programs for preservice teachers (Khan, 2025).

Research Hypotheses

H^0: There is no significant difference in the level of awareness between preservice teachers who receive traditional training and those who receive training integrated with sustainability principles in education.

H^0: There is no significant difference in the confidence levels of preservice teachers who receive traditional training and those who receive training integrated with sustainability principles in education.

Research Questions

1. To what extent does sustainability training, as measured by the Sustainability in Teaching Self-Efficacy Scale (STSES), enhance preservice teachers' awareness and confidence in applying sustainability principles in their teaching practices?

Research Instruments

In the light of the objectives of the study, the quantitative data was collected through pre-training achievement test and post-training achievement test. The first one, was concept-based homogenous pre-training achievement test, comprised of 100 MCQs / Items for assessing awareness and confidence, served as pretest to the selected sample of the study (i.e., control and treatment group).

The second one, was concept-based homogenous post-training achievement test, comprised of 100 MCQs / Items for assessing awareness and confidence, which served as posttest to the treatment group only.

Secondly, qualitative data was collected through the Sustainability in Teaching Self-

Efficacy Scale (STSES) to measure the extent of improvement in preservice teachers' awareness and confidence after observing the application of training integrated with sustainability principles in their teaching practices.

The above-mentioned scale was adopted to measure the extent of improvement in preservice teachers' awareness and confidence after observing the application of training integrated with sustainability principles in their teaching practices.

A Likert scale was used to measure Sustainability in Teaching Self-Efficacy Scale (STSES), observation-based 30 valid statements / items which clearly assessed awareness and confidence of preservice teachers within their teaching practices such as development of lesson plans, maintaining active classroom, promoting teaching-learning ecosystem by operationalizing sustainable resources in the context of Quality Education, by mobilizing effective training programs for preservice teachers (Khan, 2025).

1. Not Confident at All
2. Slightly Confident
3. Moderately Confident
4. Very Confident
5. Extremely Confident

Methodology

Population and Sampling Technique

Accessible population comprised of 120 preservice teachers from 7th semester, final year of B.Ed. (Hons.) enrolled in teacher education program of a public sector university in Punjab, Pakistan. In line with the demographic variables, the accessible population was divided into two strata which are based on gender, geographical and socioeconomic family context. The sample was collected from stratified random sampling that ensured equal and fair representation of participants.

Subjects

The 120 preservice teachers from 7th semester, final year of B.Ed. (Hons.) enrolled in teacher education program of a public sector university in Punjab, Pakistan were the subjects. Since, they were near to complete their teacher education degree, which was an ideal stage to assess the practicality and productivity sustainability training program.

Course and Grade Level

'Sustainability in Education,' is course name which is taught to 7th semester, Final year students of the B.Ed. (Hons.) program. The purpose of inculcating knowledge with real-life skill to the Preservice teachers is the prime objective where sustainability principles are incorporated in a teaching learning ecosystem.

Data Collection Methods

Prior to treatment, concept-based homogenous pre-training and post-training achievement tests are served to both control and treatment group, used as instruments for data collection. Through the Sustainability in Teaching Self-Efficacy Scale (STSES), the extent of improvement in preservice teachers' awareness and confidence is measured after observing the application of training integrated with sustainability principles in their teaching practices.

Plan of Intervention

It was mixed-method approach and concept-based homogenous pre-training and post-training achievement tests were used for data collection to assess the impact of sustainability training. In addition, the extent of improvement in preservice teachers' awareness and confidence was measured through Sustainability in Teaching Self-Efficacy Scale (STSES).

1. Pre- Training and Post-Training Achievement Tests: Prior to treatment, concept-based homogenous pre-training and post-training achievement tests were served to both control and treatment group, used as instruments for data collection. These tests measured preservice teachers' awareness and confidence whether they were applying sustainability principles in teaching beforehand or not. The responses taken from the tests of both groups were compared after the application of integrated sustainability training, only given to the treatment group. Therefore, significant difference was calculated in preservice teachers' awareness and confidence level alongwith perceived

competence of preservice teachers, in their teaching learning educational practices.

2. Sustainability in Teaching Self-Efficacy Scale (STSES): The extent of improvement in preservice teachers' awareness and confidence was measured through Sustainability in Teaching Self-Efficacy Scale (STSES).

The scale was divided into three parts:

1. Developing Sustainable Lesson Plans
2. Managing Classroom Resources Sustainably
3. Promoting Sustainability Discussions and Awareness

Prior and after the treatment i.e., sustainability training to the treatment group only, the Sustainability in Teaching Self-Efficacy Scale (STSES) served to assess three aforementioned components, which measured changes in preservice teachers' awareness and confidence.

Results

Table 1: Pre- and Post-Training Achievement Tests: Awareness of Sustainability Principles

Awareness Level	Pre-Training (%)	Post-Training (%)
Low	45	10
Moderate	40	30
High	15	60

Table 1 shows improvement in awareness level of sustainability principles, after it is exposed to the treatment i.e., sustainability training to the preservice teachers in the field of education. It is quantitatively and qualitatively analyzed. The quantitative data shows significant increase in awareness (ranging from 15% to 60%) that rejects null hypothesis that there is no significant difference in the level of awareness between preservice teachers who receive traditional training and those who receive training integrated with sustainability principles in education.

Table 2: Pre- and Post-Training Achievement Tests: Confidence in Applying Sustainability

Confidence Level	Pre-Training (%)	Post-Training (%)
Low	50	15
Moderate	35	40
High	15	45

Table 2 shows improvement in confidence level of sustainability principles, after it is exposed to the treatment i.e., sustainability training to the preservice teachers in the field of education. It is quantitatively and qualitatively analyzed. The quantitative data shows significant increase in confidence (from 15% to 45%), that rejects null hypothesis that there is no significant difference in the confidence levels of preservice teachers who receive traditional training and those who receive training integrated with sustainability principles in education.

Furthermore, qualitative findings confirm visible improvements in readiness and motivation after applying sustainability training in classroom teaching practices. This supports the research question that sustainability training which is measured by the Sustainability in Teaching Self-Efficacy Scale (STSES), enhance the preservice teachers' awareness and confidence levels among preservice teacher after they applying sustainability principles in their teaching practices.

Table 3. Comparison between Pre- Training and Post-Training Achievement Tests Results between the Awareness levels and Confidence level of both Groups of Preservice Teachers with the help of Sustainability Training and Sustainability Principles.

Hypotheses / Research Question	Research Instrument	Pre-Training Score	Post-Training Score	Change (%)	Interpretation
H^0: There is no significant difference in the level of awareness between preservice teachers who receive traditional training and those who receive training integrated with sustainability principles in education.	Sustainability Awareness	15%	60%	+45%	Significant increase in sustainability awareness with the help of intervention i.e., Sustainability Training and Sustainability Principles
$H^{0:}$ There is no significant difference in the confidence levels of preservice teachers who receive traditional training and those who receive training integrated with sustainability principles in education.	Sustainability Confidence	15%	45%	+30%	Notable improvement in confidence with the help of intervention i.e., Sustainability Training and Sustainability Principles
RQ. To what extent does sustainability training, as measured by the Sustainability in Teaching Self-Efficacy Scale (STSES), enhance preservice teachers' awareness and confidence in applying sustainability principles in their teaching practices?	Self-Efficacy (STSES)	45	68	+23 points	Significant improvement in self-efficacy after applying sustainability principles in teaching practices.

Table No. 3 presents the measurements of levels of Sustainability Awareness and levels of Sustainability Confidence among preservice teachers, alongwith Sustainability in Teaching Self-Efficacy Scale (STSES), providing strong evidence for the above-mentioned hypotheses and research question.

Levels of Sustainability Confidence among preservice teachers of treatment group show a significant improvement ranging from 15% to 60%, reflecting a +45% change. Similarly, Levels of confidence among preservice teachers of treatment group after the application of sustainability principles in teaching learning educational ecosystem. It is increased from 15% to 45%, that resulted +30% improvement.

STSES, demonstrates a +23-point increase, ranging from 45 to 68. These results indicate that sustainability training has significantly enhanced preservice teachers' awareness, confidence, and self-efficacy, after integrating sustainability training into education.

Table 4. Self-Efficacy Scores of Preservice Teachers of Both Groups before and After the Application of Sustainability Principles in Teaching Learning Educational Ecosystem, only to the Treatment Group

Part (s)	Item(s)	Statement (s)	Pre-Training Score	Post-Training Score	Mean Score	Range (1-5)
Part 1: Developing Sustainable Lesson Plans	1	I feel confident integrating sustainability principles into my	2.5	4.0	3.25	1–5

Part (s)	Item(s)	Statement (s)	Pre-Training Score	Post-Training Score	Mean Score	Range (1-5)
		teaching.				
	2	I feel confident in developing lesson plan activities on environmental sustainability.	2.0	4.5	3.25	1–5
	3	I feel confident in creating lesson plans that promote social sustainability, such as equity and justice.	2.5	4.0	3.25	1–5
	4	I feel confident in designing multidisciplinary lessons that connect sustainability with subjects like science, social studies, language, and liberal arts.	3.0	4.2	3.60	1–5
	5	I feel confident incorporating sustainability concepts into classroom activities to enhance critical thinking and student engagement.	2.8	4.3	3.55	1–5
Part 2: Managing Classroom Resources Sustainably	6	I can manage classroom waste while using sustainable materials.	2.2	4.0	3.10	1–5
	7	I can manage classroom resources while minimizing paper, electricity, and noise.	2.4	4.2	3.30	1–5
	8	I can create a sustainable classroom that promotes recycling and reusing materials.	2.6	4.4	3.50	1–5
	9	I can teach others about sustainable practices while managing resources	2.7	4.3	3.50	1–5
	10	I can create a classroom	3.0	4.5	3.75	1–5

Part (s)	Item(s)	Statement (s)	Pre-Training Score	Post-Training Score	Mean Score	Range (1-5)
		environment that encourages saving water and smart electricity use.				
Part 3: Promoting Sustainability Discussions and Awareness	11	I feel confident initiating discussions on sustainability with my students.	2.3	4.1	3.20	1–5
	12	I feel confident engaging students in debates and discussions on climate change and resource depletion.	2.5	4.3	3.40	1–5
	13	I feel confident encouraging students to think critically about sustainability in their daily lives.	2.6	4.2	3.40	1–5
	14	I feel confident in creating a classroom environment that encourages active participation.	2.4	4.0	3.20	1–5
	15	I feel confident modelling sustainable practices as a teacher, so students can adopt them in their daily activities.	2.7	4.4	3.55	1–5
Total Score		**Total Self-Efficacy Score of Treatment Group Only**	**45**	**68**	**56.5**	15–75

The above-mentioned table No. 4 shows that Pre-Training Score refers to the score before the sustainability training, and Post-Training Score refers to the score after the training i.e., intervention to the treatment group. Mean Score is the average score of all 15 items for both pre- and post-training. Range (1–5) refers to the scale used for responses, where 1 = Not Confident at All and 5 = Extremely Confident. The Total Score range from 15 to 75, where a higher score indicates higher self-efficacy in sustainability teaching practices.

Discussion

The results acquired both quantitatively and qualitatively, were analyzed to identify areas of growth in self-efficacy, where teachers were uncertain or less confident in their daily life educational practices and pedagogy. These findings were used to refine and tailor future sustainability training programs, ensuring they addressed specific areas. However, preservice teachers needed additional support or resources to effectively integrate sustainability into their teaching practices.

This study highlighted the significant positive impact of integrating sustainability training into preservice teacher education. The teachers' improved awareness, confidence after being exposed with the sustainability training, and so, self-efficacy, was the ultimate success. Sustainability training showed significant increase in awareness and confidence level of preservice teachers, alongwith improved self-efficacy after they incorporated integrating sustainability into educational practices. Sustainability awareness calculated 5% to 60% raise and confidence 15% to 45%, which showed successful dissemination of the sustainability training. The Self-Efficacy (STSES) scale also showed significant results which calculated 45 to 68 score raised in terms of feel cater by preservice teachers who were more aware, capable and confident after incorporating sustainability principles into their teaching pedagogy.

Quantitative data was collected from pre-training and post-training achievement tests, and Teaching Self-Efficacy Scale (STSES), was administered after the application of sustainability training. Classroom observations, also supported the study findings proved that preservice teachers were more curious and eager to use apply sustainable pedagogies in their educational ecosystem.

This scale scored for each item, from 1 to 5 based on the response provided

(1 = Not Confident at All, 5 = Extremely Confident). Later, Part 1, Part 2, Part 3, scored together for each section. Higher scores across sections indicated greater confidence in the ability to incorporate sustainability principles into teaching practices. These results were interpreted for entire scale as higher total score indicates a higher self-efficacy regarding sustainability in teaching and a score range of 45-75 indicated high confidence, while a range of 15-30 suggested low confidence.

The following were the part-wise discussion: -

Part 1: Developing Sustainable Lesson Plans

1.I am confident in my ability to integrate sustainability principles into lesson plans.

2.I feel capable of developing activities that teach students about environmental sustainability.

3.I can create sustainable lesson plans on topics like good governance, equity, social responsibility, and justice.

4.I feel confident in designing multidisciplinary lessons that connect sustainability with subjects like science, social studies, language, and liberal arts.

5.I feel confident incorporating sustainability concepts into classroom activities to enhance critical thinking and student engagement.

Part 2: Managing Classroom Resources Sustainably

6.I can manage classroom waste while using sustainable materials.

7.I can manage classroom resources while minimizing paper, electricity, and noise.

8.I can create a sustainable classroom that promotes recycling and reusing materials.

9.I can teach others about sustainable practices while managing resources

10. I can create a classroom environment that encourages saving water and smart electricity use.

Part 3: Promoting Sustainability Discussions and Awareness

11. I feel confident initiating discussions on sustainability with my students.

12. I feel confident engaging students in debates and discussions on climate change and resource depletion.

13. I feel confident encouraging students to think critically about sustainability in their daily lives.

14. I feel confident in creating a classroom environment that encourages active participation.

15. I feel confident demonstrating sustainable practices as a teacher, so students can adopt them in their daily activities.

Recommendations

The present study recommends that:

1.Essential Sustainable Courses: Based on the discussion above, it is evident that sustainable education must be an integral part of all teacher education programs. Sustainability is another way to grow professionally and

continuously. Through this kind of continuous professional development, knowledge, skill and problem-solving help preservice teachers. Global issues are addressed through knowledge and competition effectively. The way sustainability is embedded into teachers' training, it is assumed that educational emergencies are managed gradually but surely.

2.Continuous Professional Development of Preservice teachers: All those initiatives which are taken for the professional development of preservice teachers help them to integrate and update their teaching practices in line with the sustainability principles. These initiatives are enhancing courage to adopt new sustainable method and ways to deal the teacher education. In this way, educators are prepared to face the evolving challenges around the globe. By incorporating sustainability training within schools, madrassas, universities through their preservice teachers, long lasting results are certain for the betterment of people and the society where we live in.

3.Partnership between university and community: Communal ties are the definite ways to get better results, among the preservice teachers and the society where they live in. Most importantly, real-life experiences are not limited therefore, the developmental process and career progression, both are flipped to play crucial role in promoting sustainability. This very collaboration and partnership are providing massive opportunities to our preservice teachers who knows the practical importance of concept-based knowledge.

4.Civic Education and Sustainability Trainings: Situated learning help preservice teacher to take immediate actions as and when they find an opportunity. Civic education conforms that practical ties are important to get results after the application of sustainability training. Activities like community-based meetings, communication and works projects, sanitation problems, water filtration plant issues, child abuse subjects, health campaigns, prenatal and postnatal care awareness camps, mobile NADRA facilities, parks and open places nature talks and other social event where preservice teachers are partaking and bringing immediate and effective results on the basis of sustainability principals and its training.

Conclusion

At present, the focus of the study was to address formal, non-formal issues of education alongwith the weak economic challenges. Still, aimed at awareness and confidence among preservice teachers, can bring a huge change. The paradigm needed to be upgraded within the ambit of sustainability through training-based programmes. The pressing need of 21st century was to resolve the issues based on situations instead of trends because the extent of problem determines generalizability and effectiveness of the sustainability training (Khan, 2025).

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