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EFFECT OF SUSTAINABLE DEVELOPMENT LEARNING MODULES ON DEVELOPING SUSTAINABLE COMPETENCIES AMONG SECONDARY SCHOOL STUDENTS

Dr. Maninder Kaur
Associate Professor, Khalsa University, Amritsar

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Abstract

In the present global scenario, sustainable development has become an urgent necessity due to growing environmental degradation, climate change, depletion of natural resources, and increasing social and economic challenges. Achieving sustainable development requires individuals who possess the knowledge, skills, values, and attitudes necessary to make informed and responsible decisions for the well-being of society and the environment. Educational institutions play a pivotal role in nurturing these sustainable competencies among students, enabling them to adopt environmentally responsible behaviors and contribute effectively to a more sustainable future. Since learners come from diverse social and cultural backgrounds, it is important to examine whether gender influences the development of sustainable competencies, thereby ensuring that sustainability education remains equitable, inclusive, and effective for all learners. The present study aims to explore the effect of sustainable development modules on developing the sustainable competencies among secondary school students by equipping them with the requisite knowledge, attitudes, and skills necessary for sustainable living. A sample of 100 secondary school students studying in schools affiliated to CBSE &PSEB, Amritsar was involved in the present study. The Self-Developed Learning Module (SDLM) on gender equity was designed by the investigator. To analyse the data, mean and standard deviation were used. The findings suggest that:1. No significant difference exist between boys and girls in the experimental group.2. Boys in the experimental group (Mean=26.24) outperformed boys in the control group (Mean = 21.77. 3. Girls in the experi mental group (Mean = 27.76) performed significantly better than girls in the control group (Mean = 23.73).

Keywords: *Sustainable Development Learning Modules, Sustainable Competencies, Secondary School Students*

Introduction

Over the past few centuries, human activities have profoundly impacted the environment, leading to the rapid depletion of natural resources such as water, forests, and minerals. Industrialization, deforestation, pollution, and large-scale land use changes for agriculture and urbanization have significantly altered natural ecosystems, often exceeding their ability to regenerate. As a result, the Earth's capacity to sustain life is increasingly under threat,

manifesting in extreme weather events, biodiversity loss, and widespread pollution of air, water, and soil. These environmental challenges highlight the urgent need for a transition towards sustainable practices that ensure the long-term viability of both human societies and natural ecosystems.

Education serves as a cornerstone for the realization of the Sustainable Development Goals (SDGs), playing a pivotal role in fostering individual empowerment, social cohesion, and sustainable development. The role of education in advancing gender equality and women's empowerment is equally significant. By providing girls and women with access to quality education, societies can dismantle barriers to gender equality, enhance women's participation in the workforce, and foster social justice. Education not only enhances women's economic opportunities but also enables them to assume leadership roles, advocate for their rights, and challenge discriminatory practices.

Literature Review

Zsóka, Szerényi, Széchy, and Kocsis (2023) reported that female students generally demonstrated stronger pro-environmental attitudes, greater environmental concern, and higher participation in sustainable practices than male students. The study emphasized that gender socialization influences sustainability-related values and behaviours, suggesting the need for gender-sensitive approaches in sustainability education.

UNESCO (2024) in its report on *Education for Sustainable Development (ESD) for 2030*, emphasized that sustainability education should be inclusive and gender-responsive. The report noted that while girls often exhibit higher levels of environmental responsibility and empathy, both male and female learners benefit equally when sustainability competencies are developed through participatory, experiential, and interdisciplinary learning approaches.

OECD (2025) through its analysis of global learning and sustainability competencies, found that gender differences in sustainability outcomes are generally small when students receive equitable educational opportunities. The report concluded that well-designed educational interventions significantly enhance sustainable competencies among both male and female students, thereby reducing traditional gender disparities and promoting equal participation in sustainable development initiatives.

Objectives

1. To analyze gender-based differences in the sustainable competencies of students in the experimental group.
2. To compare the sustainable competencies of boys in the control and experimental groups.
3. To compare the sustainable competencies of girls in the control and experimental groups.

Hypotheses

1. No significant differences exist in the sustainable competencies of boys and girls in the experimental group.
2. No significant differences exist in the sustainable competencies of boys in the control and experimental groups.
3. No significant differences exist in the sustainable competencies of girls in the control and experimental groups.

Sample of the Study

A sample of 100 secondary school students studying in schools affiliated to CBSE & PSEB, Amritsar was involved in the present study.

Instructional Intervention

The Self-Developed Learning Module (SDLM) on gender equity was designed by the investigator based on experiential and participatory learning principles. The intervention was implemented over a period of 15 working days, with one instructional session conducted each day. During the intervention period, the experimental group received instruction through the SDLM, whereas the control group was taught using the conventional textbook-based method of instruction.

Results and Discussions

To analyse the data, mean and standard deviation were used. Following are the results.

Table 1: Mean Score Value of Boys and Girls in the Experimental Group

Group	Gender	N	Mean	S.D.	$S.E_d$	Mean difference	df	t-value	R
Experimental	Boys	25	26.24	3.03150	.90104	1.52	48	1.687	Not Significant at 0.05 level
	Girls	**25**	**27.76**	**3.33267**					

Table 1 reveals that the mean scores of boys and girls in the experimental group are 26.24 and 27.7, respectively. This indicates that both boys and girls taught using sustainable development learning modules exhibited almost the same performance. The t-value of 1.687 is found to be statistically non-significant at 0.05 level of significance. This indicates that there is no significant difference in the sustainable competencies of boys and girls in the experimental group. Thus, the results suggest that the sustainable development learning modules had a similar effect on both boys and girls. Therefore, the Hypothesis, "No significant differences exist in the sustainable competencies of boys and girls in the experimental group" stands accepted.

The similar sustainable competencies observed between girls and boys may be attributed to the modules' interactive and student-centered design, which ensures that all participants engage actively in discussions, activities, and problem-solving tasks. By emphasizing real-world problem-solving and collaborative learning, the modules provide equal opportunities for both genders to practice and internalize sustainability concepts, thereby minimizing traditional gender-based differences.

Table 2: Mean Score Value of Boys in the Control and Experimental Group

Gender	Group	N	Mean	S.D.	$S.E_d$	Mean difference	df	t-value	R
Boys	Control	27	21.7778	3.61975	.92990	4.46222	50	4.799	Significant at 0.05 level
	Experimental	25	26.2400	3.03150					

A close scrutiny of the result inserted in Table 2 reveals that the mean score for boys in the control group is 21.77, whereas the mean score for boys in the experimental group is 26.24.

The t-value of 4.799 is found to be statistically significant at 0.05 level of significance. This indicates a significant difference in the sustainable competencies of boys in the control and experimental groups. Thus, the results suggest that the sustainable development learning modules had a substantial effect on the performance of boys in the experimental group. This indicates that boys taught using sustainable development learning modules exhibited a significant improvement in their sustainable competencies compared to those taught using conventional teaching methods. Therefore, the Hypothesis, "No significant differences exist in the sustainable competencies of boys in the control and experimental groups", is rejected.

The better performance of boys in the experimental group may be attributed to the interactive, experiential, and action-oriented nature of the sustainable development learning modules, which likely fostered greater engagement and motivation.

Table 3: Mean Score Value of Girls in the Control and Experimental Group

Gender	Group	N	Mean	S.D.	$S.E_d$	Mean difference	df	t-value	R
Girls	Control	23	23.7391	2.86384	.90066	4.02087	46	4.464	Significant at 0.05 level
	Experimental	25	27.7600	3.33267					

A close scrutiny of the result inserted in Table 3 reveals that the mean scores of girls in the control and experimental groups are 23.7391 and 27.7600, respectively. The calculated t-value (4.464) is significant at the 0.05 level. This indicates a significant difference in the sustainable competencies of girls in the control and experimental groups. Thus, the results suggest that the sustainable development learning modules had a substantial impact on the girls in the experimental group.

This indicates that girls taught using sustainable development learning modules exhibited a significant improvement in their sustainable competencies compared to those taught using conventional teaching methods. Therefore, the Hypothesis, "No significant differences exist in the sustainable competencies of girls in the control and experimental groups" is rejected.

The superior performance of girls in the experimental group can be attributed to the interactive, inquiry-based, and problem-oriented structure of the sustainable development learning modules, which likely fostered deeper engagement, motivation, and understanding.

Educational Implications

1. The study affirms the value of integrating sustainability education into mainstream curriculum using well-designed, interactive learning modules.
2. The significant improvement in students' understanding and application domains highlights the importance of moving beyond rote learning to include experiential and problem-based learning strategies.
3. Educators should be encouraged and trained to use interdisciplinary approaches when teaching sustainability, connecting environmental, social, and economic aspects.
4. The observed gender neutrality in learning outcomes suggests that inclusive and equitable pedagogy in sustainability education can foster balanced learning across student groups.

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