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Planting Roots for a Greener Tomorrow: Connecting School Students with Nature, Environment and Sustainable Development

Dr. Poonam[1]; Dr. Chhaya Shukla[2]

[1]Post Doctoral Fellow; [2]Associate Professor
[1;2]Department of Resource Management and Consumer Science, College of Community Science, G. B. Pant University of Agriculture & Technology, Pantnagar, U.S. Nagar, Uttarakhand, India

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Abstract: In today's rapidly evolving world, urgent environmental challenges such as climate change, deforestation, and pollution necessitate immediate action. A critical approach to addressing these issues is engaging future generations through environmental education, fostering a sense of responsibility toward sustainable development. This study explores the role of tree planting activities in connecting school students to nature, empowering them to understand their environmental impact and contribute to global sustainability efforts. Integrating hands-on learning with environmental education, the study provides students with opportunities to engage directly in tree planting, a crucial activity with significant ecological benefits. Trees, as vital components of ecosystems, mitigate climate change by absorbing carbon dioxide, enhancing air quality, supporting biodiversity, and regulating water cycles. By participating in tree planting, students gain a deeper understanding of the interdependence between human actions and the environment, while recognizing the importance of conserving natural resources and fostering biodiversity. This study was conducted as part of the ICSSR PDF project titled "Handing the Torch of Planet Earth to School and University Students of Uttarakhand," at G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand. The project involved students from two schools on the Pantnagar campus namely Sarswati Shishu Mandir and Balniliyam Junior High School, who participated in tree planting activities. The findings indicate that students, through direct involvement in planting and nurturing trees, gained practical knowledge of ecological processes such as carbon sequestration, soil stabilization, and biodiversity support. This hands-on experience enhanced their understanding of sustainability by linking tree planting with ecosystem health and global environmental objectives. Moreover, students developed key values such as teamwork, responsibility, and empathy as they worked collaboratively to plant and care for trees, strengthening their sense of community and collective action. A pre-test and post-test research design was employed to evaluate students' knowledge, perceptions, and attitudes toward tree plantation and environmental conservation. The plantation drive provided students with hands-on learning experiences through planting saplings, interacting with soil, and learning plant care practices. The findings revealed a substantial improvement in students' environmental awareness, with the mean percentage score increasing from 34.67 percent in the pre-test to 93.75 percent in the post-test. Students reported feeling closer to nature, gained practical knowledge about the importance of trees, and developed a stronger sense of responsibility toward environmental protection. The study highlights that plantation drives are effective experiential learning tools for enhancing environmental awareness and fostering positive environmental attitudes among school students. Regular plantation activities in schools can play a significant role in promoting sustainable behavior and developing environmentally responsible citizens.

Keywords: *Tree Plantation, Environmental Education, Environmental Awareness and Knowledge, Sustainable Development.*

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I. INTRODUCTION

Environmental education is a continuous and lifelong process through which individuals and societies acquire awareness, knowledge, values, skills, and experiences related to sustainable development. It enables people to understand environmental issues and develop the commitment and capacity to take appropriate actions for

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addressing present and future environmental challenges. Environmental education helps individuals comprehend the complex relationships among humans, culture, and the biophysical environment, while fostering attitudes and behaviors that support environmental conservation and sustainability. Environmental awareness encompasses an understanding of the interdependence between human beings and nature, along with a sense of responsibility toward protecting natural resources for present and future generations. In recent years, the concept of Environmental Education for Sustainable Development (EESD) has gained prominence, emphasizing the integration of environmental knowledge, values, and skills into educational systems. The objective of EESD is to equip students with the awareness and competencies required to address environmental problems and contribute to environmental quality, resource management, and sustainable development.

Schools play a pivotal role in promoting environmental awareness and conservation-oriented behaviors among young learners. Educational institutions provide an ideal platform for introducing environmental concepts and engaging students in practical activities that encourage sustainable practices. The need for environmental education has become increasingly important due to growing environmental concerns worldwide. Rapid industrialization, urbanization, population growth, and the excessive exploitation of natural resources have resulted in significant environmental degradation. Issues such as climate change, global warming, air pollution, deforestation, biodiversity loss, and soil degradation threaten ecological balance and human well-being. Addressing these challenges requires increased public awareness and active participation in environmental conservation efforts, particularly among children and youth who will shape the future of society.

Among various environmental education strategies, plantation drives are recognized as one of the most effective experiential learning activities. Trees are often referred to as the “lungs of the Earth” because they absorb carbon dioxide and release oxygen, thereby improving air quality and helping mitigate climate change. In addition, trees contribute to biodiversity conservation, prevent soil erosion, regulate the water cycle, moderate local temperatures, and provide habitat and food for numerous living organisms. Therefore, tree plantation activities not only contribute directly to environmental sustainability but also serve as valuable educational tools for developing environmental awareness and responsibility among students. Participation in plantation drives provides students with practical, hands-on learning experiences that strengthen their connection with nature. Through activities such as planting saplings, handling plants, and interacting with the soil, students gain first-hand knowledge of ecological processes and environmental conservation practices. These experiences help enhance their understanding of ecological balance, biodiversity conservation, and the role of afforestation in maintaining environmental health. Furthermore, plantation activities foster positive attitudes toward environmental stewardship by encouraging students to appreciate nature and recognize their responsibility in protecting natural resources.

The direct involvement of students in plantation activities offers valuable insights into their environmental knowledge, perceptions, and awareness. Such experiential learning approaches have been shown to be effective in promoting sustainable environmental behaviors and nurturing a sense of environmental responsibility among young learners. By actively participating in conservation activities, students are more likely to develop long-term commitments toward environmental protection and sustainable living. In view of the growing importance of environmental education and the educational value of plantation activities, the present study was undertaken to assess the impact of a plantation drive on the environmental awareness of school students. The study aimed to examine how participation in tree plantation activities influences students’ environmental knowledge, attitudes, and perceptions, and to explore the potential of such programmes in fostering long-term commitment toward environmental conservation and sustainable development.

➢ *Objectives of the Study*

- To create environmental awareness among school students through plantation activities.
- To assess students’ knowledge regarding environmental protection before and after the plantation drive.

II. MATERIALS AND METHODS

The present study was conducted in Pantnagar, Uttarakhand. The plantation drive programme was implemented in two schools, namely Saraswati Shishu Mandir, Pantnagar and Bal Nilayam Junior High School, Pantnagar. These schools were selected to engage middle-school students in experiential environmental learning through direct participation in plantation activities. A total sample size of 120 students from Classes VI–VIII participated in the programme. Data were collected using pre designed questionnaire before (pre-test) and after (post-test) the plantation drive activity. These methods provided valuable insights into the effectiveness of the plantation drive as an experiential learning approach for promoting environmental awareness and sustainable behavior among school students.

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III. RESULTS AND DISCUSSION

Table 1 Knowledge of Students on Plantation Drive (Pre-Test Analysis) (N=120)

S. No.	Questions	Yes	No
1	Do you know the importance of trees and plants?	46 (38.33)	74 (61.67)
2	Do you know the difference between plants and saplings?	39 (32.50)	81 (67.50)
3	Have you ever planted a tree or sapling before?	35 (29.17)	85 (70.83)
4	Do you think trees help in reducing pollution?	48 (40.00)	72 (60.00)
5	Have you participated in any plantation drive earlier?	31 (25.83)	89 (74.17)
6	Do you know about environmental protection?	44 (36.67)	76 (63.33)
7	Do you know about World Environment Day?	33 (27.50)	87 (72.50)
8	Do you think every student should plant at least one tree?	54 (45.00)	66 (55.00)
9	Do you know how to take care of a sapling after planting?	30 (25.00)	90 (75.00)
10	Do you think every student should plant at least one tree?	56 (46.67)	64 (53.33)

The pre-test analysis was conducted to assess the baseline knowledge and awareness of school students regarding plantation activities, environmental protection, and the importance of trees before organizing the plantation drive. The findings revealed that the majority of students had limited knowledge and awareness related to environmental conservation and plantation practices.

The data showed that only 38.33 percent of students were aware of the importance of trees and plants, while the majority (61.67%) lacked awareness regarding their significance. Similarly, only 32.50 percent of respondents knew the difference between plants and saplings, whereas 67.50 percent did not possess this basic knowledge. Regarding previous experience in plantation activities, only 29.17 percent students had planted a tree or sapling before, while a large majority (70.83%) had never participated in such activities earlier. The findings further indicated that 40.00 percent of students were aware that trees help in reducing pollution, while 60.00 percent lacked this understanding. Only 25.83 percent students had previously participated in plantation drives, whereas 74.17 percent had never been involved in such environmental activities. Knowledge regarding environmental protection was also found to be low, as only 36.67 percent students were aware of environmental protection concepts, while 63.33 percent were not aware. Awareness regarding important environmental events was also limited. Only 27.50 percent students knew about World Environment Day, while 72.50 percent had no knowledge about it. Similarly, less than half of the students (45.00%) believed that every student should plant at least one tree, whereas 55.00 percent did not support or understand the importance of this responsibility. Knowledge regarding plant care was particularly low, as only 25.00 per cent students knew how to take care of a sapling after planting, while a majority of 75.00 percent lacked this knowledge.

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Plate 1: Plantation Drive

Overall, the pre-test analysis clearly indicates that the majority of students had insufficient awareness, knowledge, and practical experience regarding plantation activities, environmental conservation, and sustainable practices before the intervention. These findings highlight the urgent need for environmental education programs and practical plantation activities in schools to enhance students' environmental awareness, ecological responsibility, and participation in sustainable development initiatives.

Table 2 Students Experience and Learning Outcomes from Plantation Drive (Post-Test Analysis) (N=120)

S. No.	Questions	Yes	No
1	Did you feel happy while planting the tree?	114 (95.00)	6 (5.00)
2	Did you enjoy touching the soil during plantation activity?	110 (91.67)	10 (8.33)
3	Did the plantation activity make you feel closer to nature?	112 (93.33)	8 (6.67)
4	Did you learn the importance of planting trees?	116 (96.67)	4 (3.33)
5	Did the activity increase your interest in environmental protection?	109 (90.83)	11 (9.17)
6	Did you encourage your friends to plant trees?	105 (87.50)	15 (12.50)
7	Did you learn how to take care of plants after planting?	111 (92.50)	9 (7.50)
8	Do you feel responsible for protecting the environment after this activity?	113 (94.17)	7 (5.83)
9	Would you like to participate in future plantation drives?	117 (97.50)	3 (2.50)
10	Do you think plantation activities should be organized regularly in schools?	118 (98.33)	2 (1.67)

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The post-test analysis was conducted to evaluate the impact of the plantation activity on students' environmental awareness, emotional connection with nature, and attitudes toward environmental protection after participating in the plantation drive. The findings clearly indicate a significant positive change in students' knowledge, interest, and environmental responsibility following the activity.

The results revealed that an overwhelming majority of students (95.00%) felt happy while planting trees, indicating that the plantation activity provided a joyful and engaging learning experience for students. Similarly, 91.67 percent students enjoyed touching the soil during the plantation activity, reflecting their positive interaction with nature and hands-on environmental learning. A large majority of respondents (93.33%) reported that the activity made them feel closer to nature, suggesting that direct involvement in plantation activities helped strengthen students' emotional connection with the natural environment. The findings further showed that 96.67 percent students learned about the importance of planting trees through the activity, demonstrating the effectiveness of experiential learning in improving environmental awareness. In addition, 90.83 percent students stated that the activity increased their interest in environmental protection, highlighting the motivational role of plantation programs in encouraging sustainable behavior among school children. The study also found that 87.50 percent students encouraged their friends to plant trees, indicating the development of positive environmental attitudes and peer influence toward eco-friendly practices. Similarly, 92.50 percent respondents learned how to take care of plants after planting, which reflects the practical knowledge gained through active participation in the plantation drive. Furthermore, 94.17 percent students reported feeling responsible for protecting the environment after participating in the activity, demonstrating the development of environmental ethics and social responsibility among students. A very high percentage of respondents (97.50%) expressed willingness to participate in future plantation drives, showing their continued interest and enthusiasm toward environmental conservation activities. Additionally, 98.33 percent students believed that plantation activities should be organized regularly in schools, indicating strong support for integrating practical environmental education into school programs.

Overall, the post-test findings clearly demonstrate that the plantation activity had a highly positive impact on students' environmental awareness, practical knowledge, emotional attachment to nature, and sense of responsibility toward environmental conservation. The activity successfully transformed students' attitudes and motivated them to actively participate in sustainable environmental practices. These findings highlight the importance of organizing regular plantation drives and experiential environmental education programs in schools to develop environmentally responsible citizens and promote sustainable development.

Table 3 Comparison between Pre-Test and Post-Test Analysis (N = 120)

S. No.	Test Type	Total Score	Maximum Score	Mean Score	Mean Percentage Score
1.	Pre – Test	416	1200	3.47	34.67
2.	Post –Test	1125	1200	9.38	93.75

The comparative analysis of pre-test and post-test scores clearly indicates a substantial improvement in students' environmental awareness, knowledge, and attitudes after participation in the plantation drive activity. The pre-test results revealed that students had limited baseline knowledge regarding trees, plantation activities, environmental protection, and sapling care. The total score obtained in the pre-test was 416 out of a maximum possible score of 1200, with a mean score of 3.47 and a mean percentage score of 34.67 percent. This reflects comparatively low awareness levels among students before the intervention. After participation in the plantation drive and practical environmental learning activities, the post-test results showed remarkable improvement. The total post-test score increased to 1125 out of 1200, with a mean score of 9.38 and a mean percentage score of 93.75 percent. The findings demonstrate that students developed greater understanding regarding the importance of trees, environmental conservation, pollution reduction, and sustainable environmental practices.

The significant increase in mean percentage score from 34.67 percent in the pre-test to 93.75 percent in the post-test confirms the effectiveness of experiential learning through plantation activities. The program successfully enhanced students' environmental sensitivity, practical knowledge, emotional connection with nature, and motivation to participate in future environmental conservation activities. Overall, the plantation drive proved to be an effective educational intervention for promoting sustainable development and environmentally responsible behavior among school students.

Table 4 Level of Awareness

S. No.	Test Type	Mean Score	Awareness Level
1.	Pre -Test	3.47	Medium
2.	Post -Test	9.38	High

The pre-test mean score of 3.47 indicates that the respondents possessed a medium level of awareness before the implementation of the educational programme/ intervention. This suggests that although the participants had some knowledge regarding the subject, their understanding was not comprehensive. In contrast, the post-test mean score

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increased to 9.38, which falls under the high awareness level category. This substantial increase demonstrates that the respondents gained considerable knowledge and understanding after participating in the intervention. The shift from a medium level of awareness in the pre-test to a high level of awareness in the post-test clearly indicates the effectiveness of the programme in improving awareness among the respondents. The findings suggest that the educational intervention successfully enhanced participants' knowledge and understanding of the subject matter.

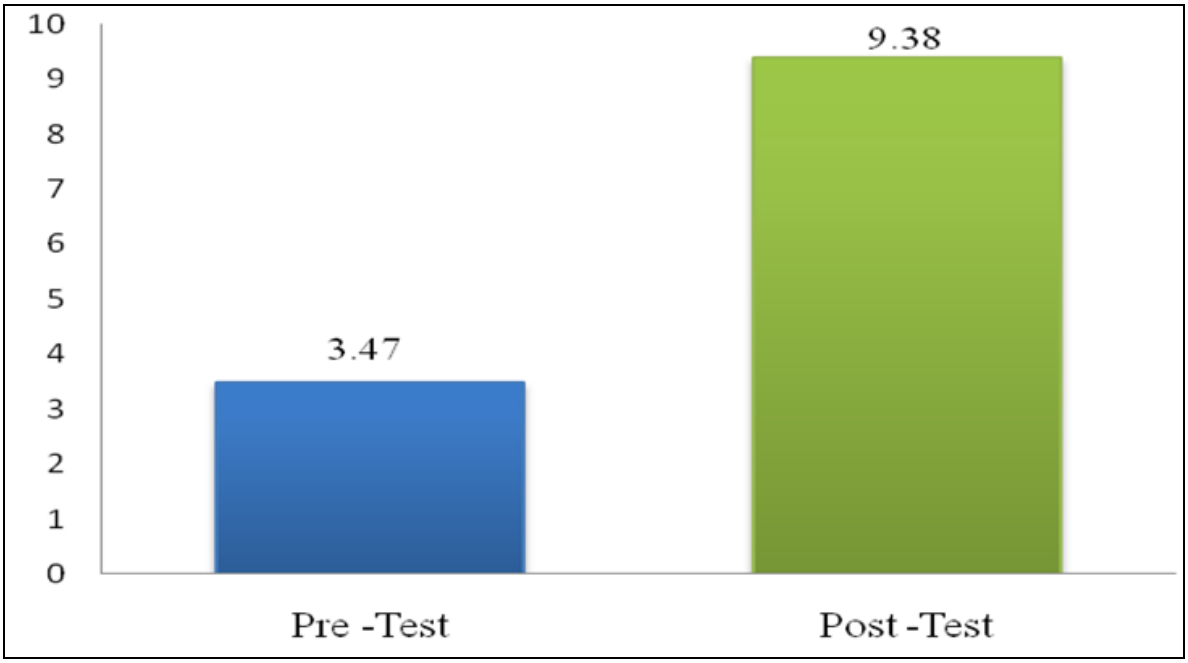

Fig 1 Level of Awareness

IV. CONCLUSION

The study demonstrated that plantation drives are effective in enhancing environmental awareness, knowledge, and positive attitudes among school students. The significant increase in awareness levels from the pre-test to the post-test indicates that hands-on participation in tree plantation activities helped students better understand the importance of environmental conservation and sustainable practices. Through direct experiences such as planting saplings, touching the soil, and caring for plants, students developed a stronger connection with nature and a greater sense of environmental responsibility. The findings suggest that experiential learning through plantation activities can successfully promote environmental stewardship and encourage students to actively participate in conservation efforts. Therefore, regular plantation drives and practical environmental education programmes should be incorporated into school activities to foster environmental awareness and support sustainable development among future generations.

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