

Promoting Students about Sustainable Development in Primary School Science

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Abstract

It is imperative that notions of sustainable development be incorporated into the teaching that is provided in elementary schools in order to cultivate a generation that is capable of comprehending sustainable practices and actively participating in them. This article investigates how teaching science in elementary schools might contribute to the promotion of sustainable development. It studies the significance of implementing sustainable development ideas into scientific curricula and classroom activities, such as environmental awareness, resource conservation, and social responsibility. The purpose of this work is to show the benefits of incorporating teaching about sustainable development into primary school science. In addition, it highlights the significance of sustainable science in primary school, which enable students to become active contributors to the development of sustainable practices.

Keywords: *school science; science education; sustainable development.*

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INTRODUCTION

The advancement of the sustainable development framework in the current situation, worldwide announcement is calling the way to live with nature in balance (Strange & Bayley, 2008), (Shi et al., 2019). The future of learning environment seems to be different due to the rapidly changed by information technology. It has brought about significant paradigm shifts in both the way that we think about and approach the teaching and learning on modern science through holistic approach (Yap & Watene, 2019). The concept of sustainable development places an emphasis on the interconnectedness of economic, social, and environmental problems. It also brings to light the need for adopting an all-encompassing approach to the process of creative problem-solving in social and school interaction. That is, sustainable development emphasizes the interconnection of economic, social, and environmental concerns in all sectors.

The current paradigm in science teaching can be focused on how to incorporate nature of science by contemporary content and science process. Students can gain new information by a

various kind of methods, knowledge, skills, and higher-ordered thinking need to grasp and deal with challenging authentic problems in the real world. Sustainable development requires that students learn about the natural sciences in which surroundings (Songsee & Nuangchalerm, 2022). This is because learning about the natural sciences gives students the knowledge and skills they need to understand and deal with complex problems like climate change, the depletion of natural resources, and the loss of biological diversity. These issues are all interconnected and require a multifaceted approach to solve them (Liu et al., 2020)

Science plays its significant role in primary school, it should instead put a focus on increasing students' talents in areas such as critical thinking, problem-solving, and communication (Prachagool & Nuangchalerm, 2021). If science instruction is to be effective, it must go beyond simply informing students about fundamental scientific principles and sustainable development ideas. Now that sustainable development is becoming more important to all sectors, science education has to be interdisciplinary as well. This means that it needs to use the knowledge and methods of many different scientific fields, as well as those of the social sciences, the humanities, and other fields of study is needed for sustainable development (Nuangchalerm et al., 2024).

Sustainable development is becoming more important, there are many different strategies that may be used to advance the cause of education. Science in primary school plays an essential part in the process of fostering sustainable development and life long learning. In order to usher in the age of sustainable development, there has to be a new generation of students who are scientifically literate and have understandings of the intricate connections that exist between human activities and the natural world (Parmin et al., 2019). Students should be prepared to become smart citizens to deal with uncertainty and environmentally friendly. They should be able to recognize and resolve environmental concerns in their communities and beyond. The purpose of this article is to disseminate successful teaching methods for science in primary schools. Primary schools have the ability to cultivate students' scientific abilities and encourage a lifelong passion for discovering sustainable science and social movement.

The transformational impact of scientific education in primary schools in terms of the formation of citizens who are ecologically conscious and responsible. It highlights how important it is to cultivate a sense of stewardship and a lifetime commitment to the advancement of sustainable development in students by providing a supportive educational environment that encourages them to investigate and confront difficulties related to sustainability. In a nutshell, the purpose of this study is to shed light on the significant role that elementary school scientific education plays in the process of fostering sustainable development. It stresses the need for a holistic approach that integrates conceptual learning, practical application, and teacher assistance in order to enable young learners to become agents of good change in both their local communities and the world as a whole.

PRIMARY SCIENCE AND THE GROWTH OF LEARNING

The foundation of education aims to help citizens live and learn with environment through lifespan based on environment-life balance. Children can learn how deal with future by employing science, other disciplines, and involvement is created active community. Primary school education plays a critical role in the development of scientifically literate people by laying a strong foundation in concepts and processes (Queiruga-Dios et al., 2020),(Alam, 2022). . In order to accomplish this objective, science education must integrate creative ideas and effective practices relating to sustainability into all aspects of the educational experience. This encompasses

education at all levels, from primary to higher level of education. In addition, the teaching of science should help cultivate a culture of sustainability by emphasizing the importance of responsible and ethical conduct in relation to the natural world (Şemin, 2019). Students should be encouraged to embrace environmentally friendly behaviors like as recycling, energy saving, and sustainable transportation. These practices may have a positive impact on the environmental movement.

Students are given the opportunity to take an active role in the learning process when teacher-centered instructional strategies in scientific education are implemented. The level of involvement and comprehension of students may be improved by encouraging them to inquire, solve problems, and think critically. Students are given the opportunity to investigate scientific phenomena, formulate hypotheses, and test their predictions via the use of instructional methods such as hands-on experiments, project-based learning, and cooperative group work (Hadjichambis & Paraskeva-Hadjichambi, 2020). Teachers are able to make scientific concepts more accessible to young students and give them greater significance by using examples from the actual world and drawing connections between them and everyday occurrences (Davies, 2021), (Saenprai et al., 2023).

Students are encouraged to ask questions, conduct investigations, and uncover scientific concepts. Students are able to gain the necessary scientific abilities by following the steps of the scientific process, which include making observations, coming up with hypotheses, carrying out experiments, and drawing conclusions. The role of the teacher is that of a facilitator, helping the pupils through the process while encouraging both autonomous thought and curiosity. Students are given the opportunity to improve their problem-solving skills, critical thinking ability, and scientific idea comprehension.

Experiential learning should be emphasized in science classrooms, and students should be given opportunity to participate in environmental work (Seow et al., 2019), (Morris, 2020). That is, the learning relevant to the real world. Students may, for instance, perform experiments to study the impact of various pollutants on local ecosystems or devise ways to decrease waste and save resources. Another option would be for students to discuss and debate environmental issues (Figure 1).

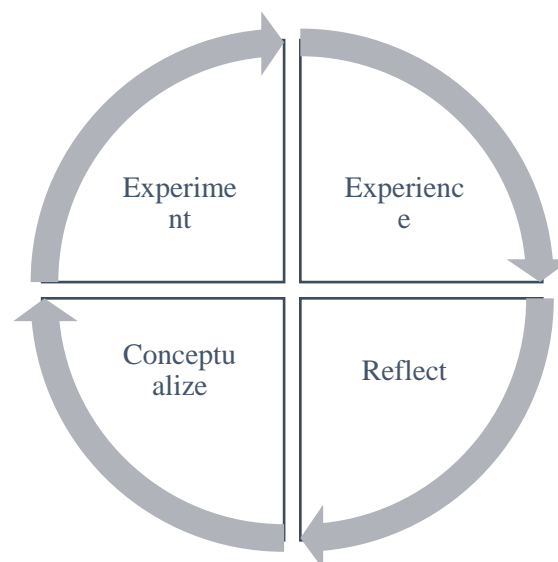


Figure 1. Experiential learning

Students are greatly benefit from sustainable development and science, it helps them develop their natural curiosity as well as their critical thinking and ability to solve problems. It lays the groundwork for future scientific literacy as well as the growth of a society that is necessary knowledgeable about developments (et al., 2019).

In addition, teaching students about the interconnectedness of environmental, economic, and social concerns via a scientific curriculum that emphasizes sustainable development may encourage interdisciplinary thinking. This is because students learn about the interdependence of these issues. Students will be able to discover creative solutions to difficult problems as a result of this, which may contribute to the creation of a more holistic approach to problem-solving. We can help create a more sustainable society and protect the environment for future generations by teaching the next generation how important it is to grow in a way that is good for the environment.

SUSTAINABLE DEVELOPMENT AT PRIMARY STUDENTS

Primary students should explore their holistic science with the suitable information and abilities to face creative communities. Students should be given the chance to investigate and create their own ideas for a sustainable future, as well as be exposed to a variety of viewpoints and methods to sustainable development. This will help students better prepare for a sustainable future by effective instruction. Collaborating with industry professionals, politicians, and other stakeholders in the area of sustainable development may be necessary to accomplish it (Holmberg, J., & Sandbrook, 2019), (Penuel, 2019), (Turner-Skoff & Cavender, 2019).

- Students should become familiar with a variety of renewable energy sources, including solar power, wind power, and hydroelectric power, as part of the unit on exploring renewable energy sources. Students should participate in hands-on activities, such as the construction of modest models powered by wind turbines or solar panels, to show the operation of alternative energy sources and their positive effects on the environment
- Students should be encouraged to examine local ecosystems, such as woods, wetlands, or urban green spaces, which may include any of these types of environments. Students have the opportunity to witness and document the plants, animals, and interactions that occur within these ecosystems when they go on field trips or engage in virtual exploration.
- Students should be learned how to manage waste and recycling. The significance of minimizing waste and recycling materials wherever possible. They should explore strategies to minimize, reuse, and recycle waste items and have a conversation about the negative effects that excessive waste has on the ecosystem. Also, raising their awareness about sustainable consumerism may be accomplished by running recycling campaigns within the school, organizing garbage sorting activities, and having conversations about the product life cycles of common items.
- Students should conserve water in daily lives, incubate consciousness of the significance of water conservation and using water in a responsible manner. They have to know about water cycle, the dangers of water pollution, and the importance of clean water to the health of ecosystems as well as human beings. Engage students in activities such as estimating water consumption, devising methods to save water, and investigating ways to conserve water at home and in the school environment.
- Students should have experiences about the notion of sustainable agriculture and the role that it plays in supplying food while limiting the damage that it has on the environment. Organic farming, crop rotation, and composting are three examples of sustainable agricultural

techniques that should be discussed. They can participate in activities that require them to use their hands, such as planting their own veggies or herbs using organic techniques or putting up composting bins.

- Students should explore the issue of climate change and having a conversation about its origins or cause and effect, and potential solutions is an excellent way to engage them in learning. Students also need to understand the function of greenhouse gases, the significance of cutting down on carbon emissions, and the influence that climate change has on ecosystems and communities. They have opportunities to think about and submit ideas for activities that they may do in their everyday lives to help alleviate the effects of climate change.
- Students can involve in community-based initiatives that are connected to sustainable development. The planting of trees, the creation of community gardens, the planning of clean-up campaigns, and working together with local groups whose primary goal is the preservation of the environment are examples of possible activities. These kinds of initiatives provide them to put knowledge into practice and make a positive contribution to the communities.
- Students can explore eco-friendly construction materials, energy-efficient technology, and environmentally aware architecture as a way to introduce the idea of sustainable design and engineering or STEM education.
- Students can involve the planning and execution of environmental awareness campaigns, either inside the school itself or within the surrounding community. They should have a chance to participate in the planning and execution of activities like Earth Day celebrations and sustainability fairs.
- Students can learn to deal with environment by visiting nature reserves, environmental centers, or renewable energy installations to offer students real-life experiences and interactions with professionals in the field of sustainable development. Students would greatly benefit from hearing from outside experts, such as environmental scientists, conservationists, or engineers, who would be willing to share their insights and experiences.

The teaching of science and some practices of sustainable development lesson and learning activities are closely connected in many different kinds of ways. Students may find it easier to understand how important it is to protect natural resources, take care of the environment, and help the economy and society grow in a way that doesn't hurt the natural environment. The inclusion of lessons on environmental participation in a school's science curriculum may serve them in sense of environmental responsibility as well as a desire to contribute to the preservation of the natural world. This could be helpful to build a new generation of people who are devoted to sustainable development and who are able to use their knowledge and abilities to discover solutions to the complex environmental issues.

Primary school science can shape students to deal with environmental in friendly, they have to promote sustainable development ideas and also stimulate them to participate social movement. Both the instillation of environmentally responsible attitudes and the propagation of sustainable practices are essential components of the elementary school science curriculum. Instructors can encourage students to engage in energy conservation, waste reduction, recycling, and appropriate water consumption both in the classroom and at home. Teachers can better assist students in comprehending the significance of individual actions in the context of achieving sustainable development objectives if they demonstrate and investigate the effects of ecologically responsible behaviors.

When teachers and community members collaborate with local organizations, community members, and specialists in sustainable development, the learning experiences of students are enhanced, and the significance of community participation is emphasized. Through activities such as field trips to environmental centers, collaboration on environmental projects, and the invitation of guest lecturers, students are provided with real-world knowledge and the opportunity to interact with specialists working in disciplines related to sustainable development.

MOVING FORWARD SCIENCE LEARNING TO GOALS OF DEVELOPMENT

In light of the increasing number of global problems related to the long-term viability of the environment, it is of the uttermost significance to incorporate concepts of sustainable development into the science curriculum of elementary schools. This article explores the concept of sustainable development and analyzes how it could be incorporated into elementary school science classes. It investigates methods for incorporating sustainability into scientific curricula by engaging students in real-world problem-solving activities, cultivating environmental consciousness, and teaching responsible attitudes toward the natural world. It is possible for elementary schools to significantly contribute to the formation of environmentally conscientious and responsible individuals if they incorporate sustainable development principles into science instruction.

Sustainable development is based on the principle of meeting the requirements of the present without compromising the ability of future generations to meet their own needs. Students are equipped with the knowledge, skills, and attitudes required for responsible decision-making and environmental stewardship when sustainable development principles are introduced in primary school science education (Ferguson et al., 2021). This article discusses the significance of incorporating sustainable practices into primary school science education as well as the potential effects of doing so.

The world is now rapidly changed by many factors, the utilizing available technology including technological components in scientific instruction may make learning more engaging for students and open up a multitude of new research opportunities. Students are able to investigate scientific topics in a virtual environment through the use of instructional software, interactive simulations, and virtual laboratories. Opportunities for visual and aural learning are made available through the use of online research platforms, multimedia presentations, and movies. However, it is of the utmost importance to guarantee that everyone has equal access to technology and to cultivate digital literacy skills among both students and teachers.

The effective learning should support for the professional development of teachers. A competent and self-assured teaching staff is essential to the success of any science curriculum (Ferreira et al., 2020). Primary school science teachers should be given ongoing professional development programs that provide them with essential topic knowledge, pedagogical skills, and instructional techniques. These programs should focus on content knowledge. The improvement of teachers' practices in the classroom of science can be aided by participation in collaborative professional learning communities, workshops, conferences, and mentoring programs (Chatmaneerungcharoen, 2019), (Nithitakkharanon et al., 2023). Primary schools may guarantee that students receive a high-quality scientific education and generate a positive influence on the learning outcomes of their students by encouraging the professional development of their teaching staff.

Resolving problems required engaging students in activities involving the solution of real-world problems not only promotes critical thinking but also empowers them to become active participants in the process of sustainable development. Teachers can design projects that allow students to investigate environmental issues in their communities, generate potential solutions, and take action. Participation in hands-on experiments, fieldwork, and community service activities increases students' understanding of the impact of human activities on the environment and the necessity of sustainable practices (Holmberg, J., & Sandbrook, 2019).

In addition, students required increasing awareness of environmental problems. It is essential for the promotion of sustainable development that students cultivate environmental consciousness. Teachers can achieve the aim of exposing students to a variety of ecosystems, environmental issues, and conservation initiatives by incorporating nature excursions, environmental films, and guest speakers into science classes. It is more likely that students will be motivated to protect and conserve their environment if they are taught to develop reverence and respect for the natural world.

Primary school science instructors must have access to opportunities for ongoing professional development if they are to effectively incorporate lessons on sustainable development into the curriculum. Participating in professional development opportunities, such as conferences, seminars, and courses, can equip educators with the knowledge and skills necessary to integrate sustainable practices into their lesson plans. Utilizing teacher collaboration platforms and teacher networks enables the sharing of best practices and instructional materials.

CONCLUSION

Integrating sustainability concepts and perspective into the science curriculum is important. The concept of sustainability must be integrated into elementary school science curricula as an overarching theme that permeates numerous scientific subfields. The problem is to convey abstract concepts such as biodiversity, conservation, renewable energy, and climate change, participants' age-appropriate activities and conversations can be utilized. When students investigate the interrelationships that exist between the economy, society, and the natural world, they gain a more comprehensive understanding of sustainability and its consequences. In order for the planet to survive, young students must develop environmental awareness, responsible attitudes, and sustainable actions; therefore, it is imperative that the science curriculum in primary schools incorporate concepts of sustainable development. By incorporating sustainability into the curriculum, engaging students in the process of finding solutions to problems that are relevant to the real world, cultivating environmental awareness, and promoting responsible attitudes, primary schools can significantly contribute to the development of environmentally conscious citizens who are capable of addressing the global challenges of the future.

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