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Linking Basic Science Teaching to Daily Activities of Learners: An Impetus for Sustainable Global Development

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Abstract
In an interconnected world where the pursuit of sustainable development is paramount, the acquisition of scientific and technological knowledge and skills is imperative for those striving to obtain the best that the environment can give. Thus, the major goal of basic science education is to equip the learners with essential scientific literacy and process skills and apply them in a problem context. However, despite the recognition of the importance of basic science, the traditional methods employed in its teaching in Nigerian schools often fail to effectively engage learners or demonstrate the relevance of scientific concepts to their daily lives. Yet, within the students' immediate environments lie a plethora of phenomena that can be seamlessly integrated into basic science classrooms through purposeful and organized learning activities. This paper examines the roles of linking basic science teaching to learners' day-to-day activities as a catalyst for sustainable global development. It explores the essence of basic science and its curriculum, alongside the fundamental science process skills, emphasizing their criticality in fostering sustainable development. It further explores strategies for implementing everyday activities of learners linked to basic science in the classroom to promote innovation, problem-solving and global sustenance. In essence, to encourage meaningful learning experiences and empower individuals for national growth, this paper advocates for bridging the gap between classroom science teaching and everyday life. Thus, by establishing a robust connection between theoretical concepts and real-world applications, teachers can help students understand the importance and practical uses of basic science in their lives for sustainable global development.

Keywords: Basic Science, Science classroom, Day-to-day activities of learners, Traditional methods, Sustainable global development

Introduction

Education is a dynamic field that continually seeks innovative approaches to enhance the students' learning experience and academic achievements. Today's world depends on education to provide people with deep knowledge and comprehension that push the boundaries of knowledge in a variety of fields. According to Oginni et al. (2019), education is the primary factor influencing social and economic change, and a necessary prerequisite for sustainability, peace, and tolerance. The Sustainable Development Goals (SDGs) of the UN emphasise the importance of a well-rounded education that gives students the attitudes, abilities, and information they need to tackle today's most serious global issues (Visser, 2015). Nonetheless, the value of science education in promoting sustainable global development has gained attention in recent years. At the heart of this science educational endeavour is basic science which lays the foundation for scientific literacy and critical thinking.

Basic science according to Maduabum (2011) is a science subject which expresses the fundamental unity of scientific thoughts It is considered the bedrock of all science subjects at the senior secondary school (SSS) level and it is a very important to the development of any nation (Ogundele et al., 2020). Thus, it is important to note that as the world grapples with complex challenges such as climate change, resource depletion, and public health crises, there is an urgent need for scientifically literate citizens who can critically evaluate evidence, make informed decisions, and contribute to solutions. Nevertheless, the conventional approaches to science teaching in schools frequently fall short of successfully engaging students or demonstrating the relevance of scientific concepts to their everyday lives, in spite of the acknowledged necessity of fundamental basic science education in providing learners with essential information and skills (Hassan, 2023). This disconnects between theoretical learning and practical application provides a fundamental challenge to encouraging sustainable global growth.

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Additionally, despite the glaring interest of the government in bringing about sustainable development through basic science skills application, studies have shown that the students' level of application of basic science skills has been on a low index. For instance, in their own study, Angura and Fatoki (2020) found that students in both government and private schools apply their knowledge of basic science and technology at a low level. A number of factors contribute to the current state of poor science integration for students' day-to-day activities in Nigerian society, including a lack of qualified teachers (Oginni & Saibu, 2019), inadequate infrastructure (Omorogbe & Ewansiha, 2013) and language barriers (Okebukola et al., 2013). Furthermore, the integration of science teaching with day-to-day activities represents a paradigm shift in educational practice. By linking abstract scientific concepts to tangible experiences, educators can enhance the relevance and applicability of science education, fostering deeper engagement and understanding among learners (Isau, 2009). This integrative approach not only strengthens conceptual learning but also cultivates essential skills such as problem-solving, inquiry, and collaboration.

The advantages of connecting science teaching to real-life contexts have been the subject of numerous studies. Chin and Osborne's (2008) study, for instance, showed that placing science lessons in the context of students' daily lives increased their engagement and conceptual understanding. Ademola (2022) and Bergmann and Sams (2012) supported the use of flipped classrooms, in which students learn foundational concepts through online lectures at home and then apply their knowledge through hands-on activities in the classroom. Ogunjobi (2016) confirmed that kids should be introduced to the fundamentals of science and technology education in their local context. Moreover, research by Hmelo-Silver et al. (2007) suggested that integrating science learning with authentic, real-world problems can enhance students' motivation and problem-solving skills. By presenting learners with meaningful challenges that mirror those encountered in their daily lives, educators can foster a sense of agency and empower students to apply scientific principles to address real-world issues. Ayua (2011) stressed that trying to teach students science without giving them ample opportunities to explore the environment, interact with materials, and learn science by doing science may end in futility.

In light of this, this paper aims to explore the theoretical foundations, practical strategies and potential impact of linking basic science teaching to day-to-day activities as a catalyst for sustainable global development.

An Overview of the Structure of Basic Science Curriculum

Basic science as the subject is offered at the primary and junior secondary schools in order to develop students basic knowledge, skills and attitude in contemporary science and technology in any way that opens up new vistas for them to future careers and opportunities in science and technology (Hassan, 2023). The structure of Nigeria's basic science curriculum in schools plays a crucial role in shaping students' understanding of fundamental scientific concepts. The 9-year Basic Science Curriculum in Nigeria is the product of re-alignment and restructuring of the revised curricula for Primary Science and Junior Secondary School Integrated Science. The Basic Science properly evolved from Integrated Science which is a science presented to learners in such a way that they gain the concept of the fundamental unity of science, the commonality of approach to problems of scientific nature, and an understanding of the role and function of science in everyday life and the world in which they live (Federal Republic of Nigeria, 2013).

According to Chukwuneke and Chikwene (2012), the basic science curriculum was introduced in response to the reform in the education sector and it is an innovation in Nigeria's education system. In recent years, Nigeria's secondary school basic science curriculum has undergone significant evolution to meet educational standards and societal needs (Ajayi & Oni, 2021). These developments reflect efforts to enhance scientific literacy and prepare students for a globally competitive world (Adewale & Afolabi, 2022; Ibrahim & Oluwafemi, 2021). Thus, Adeniyi (2010) outlined the overall goals of the new Basic Science Curriculum, which are to allow students to:

i. cultivate interest in science and technology;
ii. acquire fundamental scientific and technological skills;
iii. apply their knowledge and skills to meet societal needs;
iv. take advantage of many career opportunities that science and technology offer; and
v. become prepared for further studies in science and technology. The theme approach to content organisation was chosen in order to provide students with a comprehensive presentation of science and technology information (NERDC, 2012).

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Furthermore, the curriculum is made to help students develop their critical thinking, scientific literacy, and problem-solving abilities.

The basic science curriculum contents are organised into a specific spiral and theme order. Ovute (2010) claimed that the purpose of the curriculum's spiral structure is to maintain students' interest in science while also fostering meaningful learning by having teachers proficient in teaching basic subjects before moving on to more difficult ones. The content, principles, facts and concepts are arranged thematically in major themes and sub-themes that take into consideration the requirements and interests of the learner as well as the general societal issues and demands of the modern, scientific and globalised world. Therefore, three key issues influencing the world of knowledge now and influencing the growth of nations worldwide were identified in the process of choosing the curriculum contents (Ogundele et al., 2020). Globalisation, entrepreneurship education, and information and communication technology (ICT) are these issues.

The curriculum is arranged around four major themes vis-à-vis:

1. You and the Environment.
2. Living and Non-living Thing.
3. You and Energy.
4. You and Technology.

However, theme 4 'You and Technology' was renamed 'Science and Development' at the upper basic level. This was in order to provide students with knowledge and abilities that will help them overcome obstacles, make wise decisions, devise survival plans, and adapt to life in a global society. More so, in order to maintain students' interest and encourage meaningful learning, the contents under each theme were arranged in a spiral, starting with the simple and working up to the complex over the nine years of basic education (Primary 1 to JSS 3). Thus, the junior secondary school curriculum (JSS 1-3) expands on the introductory science ideas taught in the primary school curriculum (Basic 1-6) by offering more advanced topics (Nwosu, 2023). Importantly, the activities listed under each topic suggest the use of the guided inquiry method of teaching and learning in order to support learning by doing and the development of skills (activities-based methods).

Furthermore, additional relevant contents from four non-school curriculum innovations: Environmental Education (EE), Drug Abuse Education (DAE), Population and Family Life Education (POP/FLE), and Sexually Transmitted Infection (STI) - including HIV/AIDS - were incorporated into every class from basic 1 to 9 in order for Nigeria to be recognised as a global leader in modern development (Igwe, 2022). In the field of environmental education, students are expected to learn about and comprehend the environment in which they live; in other words, social development and the physical environment of humans are intertwined. Research has demonstrated how crucial it is to incorporate cross-cutting issues into the curriculum, such as gender sensitivity and environmental education (Ezeh, 2022). Consequently, Okeke (2022) suggested a more flexible and adaptive curriculum structure, incorporating indigenous knowledge and contextualizing the curriculum to Nigerian realities. However, despite its strengths, the basic science curriculum in Nigeria faces challenges such as outdated textbooks, inadequate infrastructure, and teacher training deficiencies (Oginni & Saibu, 2019). Addressing these challenges is essential for improving educational outcomes and fostering students' engagement (Adeyemi & Olusola, 2024).

Basic Science Process Skills

The goals of teaching fundamental science have increased due to technological advancements, which now include teaching students how to apply their knowledge to solve issues in the real world in addition to helping them grasp basic science principles. According to Baram and Tsabari (2022), basic science education equips students for civic engagement in a quantified, digitised, and scientifically infused world. Students must therefore gather pertinent data to be evaluated and interpreted in order to apply sound scientific procedures to arrive at the desired answers. It is anticipated that both teachers and learners should acquire a variety of skills and use them to positively impact society worldwide (Kaniawati et al., 2024). There are several skills applied in basic science learning, one of which is science process skills. Science process skills are techniques that teachers use as guides for creating and implementing science learning procedures. In a similar vein, one of the traits scientists use when conducting scientific research studying and seeking solutions to problems are process skills. Students can use them to accurately construct scientific concepts and conduct investigations into and understand their surroundings (Sri, 2021). They are fundamental skills that students develop to effectively engage in scientific inquiry and problem-solving. The acquisition of basic science process skills involves the development of abilities such as observation, measurement, classification, inference, prediction, and communication.

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Learning using science process skills highlights the need for intervention in instructional activities that highlight applying critical thinking and creative thinking skills in an efficient and effective manner to meet learning objectives (Kareem et al., 2020). Thus, the fundamental prerequisite for research that is required to understand specific concepts in basic science is the development of science process skills. Studies highlight the importance of hands-on activities and inquiry-based learning approaches in fostering these skills (Smith & Johnson, 2021; Brown & Lee, 2023).

The Science Process Approach (SPA) categorised science process skills into two groups: integrated skills (formulating hypotheses, interpreting data, formulating models, experimenting, operationally defining, and identifying and controlling variables) and basic skills (observation, classification, measuring, communicating, predicting, and inferring), (Agustina & Saputra, 2016). These process skills are essential to the overall development of a socially relevant, critical-thinking, problem-solving individual because they comprise the set of experiences that an individual will carry with them long after the cognitive knowledge learnt in the classroom has faded. Acquiring the science process skills helps the learner develop abilities for solving life challenges, learning with experience, seamless communication with classmates, taking responsibility and actively participating in their learning (Bayar & Taş, 2022). According to Olowu (2023), fundamental scientific procedures are essential for science education and foster students' emotional responses to the development of scientific concepts in elementary and junior secondary education. Scholarly research has also emphasized the importance of integration of process skills into curriculum design to improve students' comprehension and involvement (Chen & Wang, 2022; Garcia & Martinez, 2020). As a result, illustrating the relevance and usefulness of fundamental science process skills requires giving concrete examples and real-world applications. By fusing abstract ideas with tangible experiences, well-drawn pictures improve learning outcomes (Nguyen et al., 2024; Jones & Smith, 2021). Mauricio et al. (2023) suggested that strong scientific process skills are thought to assist students in comprehending and accurately applying scientific principles. In addition, the integration of technology, such as simulations, virtual labs, and data analysis tools, supports the teaching and application of basic science process skills. This approach enhances educational opportunities and gets pupils ready for modern scientific methods (Robinson & Brown, 2023; Kim & Park, 2020).

Yang and Liu (2016) stated that Basic Science process skills comprised the following:

i. Observation: This method entails learning about an object or event through your senses;
ii. Inferring: Using previously acquired data or knowledge to make a well-informed assumption about an object or event;
iii. Measuring: Determining the dimensions of an object or event using both conventional and non-standard measures or estimations;
iv. Communication: Depicting an action, item, or event with words or pictorial symbols;
v. Classifying: Putting things or occurrences in groups or classifications according to a pattern of evidence;
vi. Predicting: estimating a future event's result from a pattern of available data;
vii. Identifying and controlling variables that may have an impact on an experiment's result, with the majority of the variables remaining constant and only the independent variable being changed;
viii. Formulating a hypothesis: Specifying the anticipated result of an investigation;
ix. Interpreting Data: Arranging information and making inferences from it;
x. Posing Questions: Posing a pertinent query; and
xi. Formulating Theories: Putting an event or process into a mental or physical model.
xii.

However, research has also shown that many science students still lack these skills, and as a result, they have developed extremely negative attitudes towards science. In a nutshell, the application of science process skills in the daily activities of students has remained less obvious, which has limited the scope of basic science education (Deehan et al., 2024). Consequently, the lack of competent teachers with adequate training in basic science process skills and the inefficiency of teachers in applying these skills in the classrooms have been cited as two of the key culprits (Martinez & Garcia, 2021). An additional explanation for this low standard of science process skills has been traced to the sparse frequency of science experiments or practical activities in classroom teaching (Raharjo & Puspita, 2024).

Sustainable Development in the Realm of Science Education

Sustainable development refers to the development that addresses both present and future challenges without causing damage or depletion to existing human and natural resources. It is said to be the development that

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satisfies current demands without jeopardising the capacity of future generations to satisfy their own wants (Nwosu & Micha, 2017). These developments focus on areas ranging from human resources development, economic development, and natural and environmental development to technology development. According to Sheehy and Farneti (2021), sustainable development started out as an attempt to raise awareness of issues on a worldwide scale before evolving into an agenda for global policy.

Sustainable development in the context of science education refers to the integration of sustainable development concepts and practices into science teaching. This approach aims to equip students with the skills, information, and attitudes needed to address global sustainability concerns. As a result, it is acknowledged that integrating science for sustainable development is a key focus of science education in practically every nation on the planet. As stated by the National Education Research and Development Council, or NERDC (2018), one of the aims and objectives of the three-year Upper Basic Science and Technology curriculum is to help students apply their scientific and technological knowledge and skills for sustainable community development. In the view of Yacoubi et al. (2015), sustainable development in science education involves the promotion of critical thinking, problem-solving, and decision-making skills to address complex sustainability issues. In a similar vein, Salmi et al. (2017) stress how crucial it is to incorporate sustainable development into scientific curricula and highlight how it can improve student enthusiasm and engagement.

Furthermore, in order to improve learner outcomes and promote sustainable development, Ali et al. (2024) emphasized the significance of multidisciplinary approaches to sustainable development in scientific education. In the meantime, a study by Khan et al. (2022) looked at how science and technology may support sustainable development and found that it could improve social well-being and economic progress. According to Mwamwenda et al. (2018), teacher preparation programs are required to address this issue as they investigated the impact of science teacher education in fostering sustainable development. Furthermore, Sharma et al. (2020) emphasised the role of science education in tackling climate change and the necessity for students to comprehend the scientific ideas behind this worldwide issue. Furthermore, it was highlighted by Fakai et al. (2023) and Obianuju et al. (2013) that basic science education is an essential instrument for reducing threats to national security and promoting growth. Science education equips people to effectively contribute to their country's security and development goals by promoting critical thinking, technological innovation, environmental stewardship, global health expertise, international collaboration, and sustainable development.

Strategies for Linking Basic Science to Day-to-Day Learners Activities Towards Sustainable Development

Teaching science can be daunting as it requires extra effort on the part of the teacher to attract attention and arouse interest in the learners. In order to achieve this, there is a need for teachers to always relate scientific ideas and principles to real-world occurrences, thereby making science as appealing and more tangible as possible. Integrating science into daily life involves making scientific knowledge and principles accessible and applicable in various aspects of everyday routines and decision-making. This is crucial for fostering a scientifically literate society and leveraging the benefits of scientific understanding for personal and societal development.

Regular human activities have many ways in which they connect with science. Consciously or unconsciously, humans have continued to apply scientific principles in their commercial, agricultural, educational, health, communication, and even social activities. According to Jack (2018), most daily activities of humans which have always centred on critical thinking, experimenting, analyzing and interpreting observed facts, are processes through which students acquire scientific knowledge. Thus, linking basic science to the day-to-day activities of learners is essential for promoting sustainable development. Various strategies that can be adopted include contextualizing basic science, integrating sustainable development into curricula, using everyday materials, promoting critical thinking and problem-solving skills, encouraging innovation and entrepreneurship, and adopting interdisciplinary approaches and teaching climatic change.

i. **Contextualising Basic Science:** This method makes fundamental science ideas more accessible and engaging for students by connecting them to actual circumstances. It makes science more relatable and interesting for students by demonstrating how science is used in real-world situations. Contextualising basic science can boost students' interest and motivation by making it relevant to their lives and surroundings. This can result in a greater comprehension of scientific ideas and how to apply them to actual sustainability concerns.
ii. **Integrating Sustainable Development into Basic Science Curricula:** This entails introducing sustainable development ideas and methods into the teaching of elementary science. It assists students

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in comprehending how human activity affects the environment and cultivating the skills necessary to deal with sustainability issues. This method can help learners develop a comprehensive understanding of sustainable development principles and practices, enabling them to address complex sustainability issues and make informed decisions. This makes learners become more engaged and motivated, leading to better learning outcomes and a stronger connection to real-world issues.

iii. **Promoting Critical Thinking and Problem-Solving Skills:** This strategy focuses on helping students acquire critical thinking and problem-solving abilities. Solving complicated problems and applying critical thinking are necessary for tackling challenges related to sustainable development. It aids students in scenario analysis, problem identification, and the creation of workable solutions. Essentially, learners may build these skills through an emphasis on basic science education, which will lead to more sustainable development and more effective solutions.

iv. **Using Everyday Materials to Teach Basic Science:** This method teaches fundamental science topics using resources that are easily accessible. It makes science more approachable and interesting by encouraging practical learning, creativity, and resourcefulness. With the help of this method, students can apply fundamental scientific ideas to local issues, encouraging creative thinking and community growth.

v. **Encouraging Innovation and Entrepreneurship:** This approach entails promoting creativity, innovation, and entrepreneurial spirit in learners. It helps learners develop novel solutions to real-world problems and turn ideas into sustainable ventures. This can lead to the development of innovative solutions to sustainability challenges, creating new opportunities for sustainable development and economic growth.

vi. **Interdisciplinary Approaches to Basic Science Education:** In order to teach basic science principles, this approach integrates several disciplines, such as science, technology, engineering, and mathematics. It offers a thorough comprehension of intricate phenomena and cultivates an all-encompassing viewpoint. When different disciplines are integrated, students have a deeper comprehension of intricate problems related to sustainable development, which improves learning outcomes and produces more useful solutions.

vii. **Science and Climate Change:** This involves teaching students about the scientific theories that underpin global warming. It supports students' comprehension of climate change's origins, effects, and possible solutions, empowering them to act and make wise decisions. Understanding the scientific underpinnings of climate change enables students to create practical solutions that promote sustainable development and lessen its effects.

Conclusion

The integration of the teaching of basic science with the day-to-day activities of learners has emerged as a transformational strategy with significant implications for long-term sustainable global growth. This integrative method allows basic science education to go beyond the classroom and become a dynamic instrument for encouraging creativity, resiliency and civic responsibility. It also helps students develop critical thinking skills, problem-solving ability and a broader understanding of the relevance of science in resolving global concerns by placing scientific concepts within the context of everyday life. This study has further shown how integrating basic science instruction into daily activities helps develop a generation of scientifically literate people who can make significant contributions to a more just and sustainable world. Thus, teachers can encourage students to use their scientific knowledge to address urgent challenges like social inequality, environmental degradation, and climate change by bridging the gap between theory and practice.

Recommendations

In order to fully utilize the benefits of integrating basic science with the day-to-day activities of learners for sustainable development, the study recommends the following:

1. Alignment of basic science curriculum with everyday experiences and applications by integrating real-life examples and case studies into the curriculum.
2. Incorporation of problem-solving and critical thinking skills in basic science lessons.
3. Use experiential learning approaches, such as hands-on experiments and field trips in basic science teaching.
4. Utilization of technology, multimedia and digital resources to illustrate scientific concepts.
5. Engagement of learners in environmental and sustainability projects.
6. Encouragement of parents to support learners' basic science projects and investigations.

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