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# Assessment of the Impacts of Space Science Education Outreach of the Centre for Basic Space Science and Astronomy (CBSSA), Nsukka on Nigeria Education and Some Challenges Faced by the Programme

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## ABSTRACT

Space science and technology education outreach plays vital roles in inspiring young learners and creating scientific awareness, as well as supporting national development. This study was aimed at examining the impacts and challenges of space science education outreach in Nigeria, with a specific focus on the Centre for Basic Space Science and Astronomy, Nsukka, Enugu State, Nigeria. The research made use of a descriptive method to examine how space education outreach activities influence students, teachers, schools, and communities, while also identifying some of the challenges faced during implementation. The research shows that some of the impacts of the space education outreach are supporting Nigeria's space goals, developing future space professionals, fostering space science, enhancing teaching methods, educating the public on space science and Nigeria's place in it, promoting community engagement, and increasing interest in STEM education. It was also observed that some of the challenges facing the outreach programme are difficulty in getting approval from schools, insufficient funding for outreach programmes, limited manpower from the office, poor coordination of students by some teachers, inadequate provision of resource materials, and limited access to technology and internet connectivity. The findings reveal that while space science outreach has contributed significantly to science education and awareness in Nigeria, it is still being faced with some challenges that need urgent attention. It was concluded that strengthened institutional support, improved funding, and enhanced collaboration with schools and communities will significantly enhance the success of space education outreach programme in Nigeria.

***KEYWORDS:*** *Funding, Internet connectivity, Outreach, Space education, Space professionals, STEM.*

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## 1. INTRODUCTION

Outreach deals with the one-way delivery of educational programs and activities to those outside the institution or organization. It mostly consists of groups of people that may be connected either by geography, proximity, special interests, similar situations, or values (https://www.depts.ttu.edu). "Community education and outreach" refers to the provision of resources and services of a specific expertise to people who may otherwise lack access to them. And this aims to raise awareness around a

particular issue and equip community members with the knowledge and skills to make well-informed decisions, make improvements, and build community resilience. This can be in several different forms, such as public talks and newsletters, training sessions, workshops, peer support groups, mentorship, school or community center presentations, etc. (Green Business Benchmark, 2024). Education outreach events are great platforms for increasing exposure of students to some special careers like STEM careers. These STEM outreach activities increase awareness about STEM and motivate students to pursue a career in STEM by connecting applied STEM with school science learning (Vennix et al., 2018; Kaggwa et al., 2023). STEM stands for Science, Technology, Engineering, and Mathematics, representing an interdisciplinary approach to education and workforce development. It integrates these four fields into a cohesive learning paradigm based on real-world applications, fostering critical thinking, innovation, and problem-solving skills to address complex global challenges (UNESCO). It is important to know that some outreach activities are done with pleasure, and they allow students to explore their interests without the anxiety associated with formal assessments (Suter, 2016; Aslam, 2018). Educational outreach is the process of extending educational resources, services, and knowledge beyond traditional institutional settings (like schools or universities) to community members, underserved populations, or specific groups. And it involves active, often face-to-face, engagement to foster learning, increase access, and solve community-identified needs, with the goals of increasing engineering enrollment, diversifying engineers, educating the students, teaching the teachers, and developing undergraduate students (Taryn and Tania, 2009). Outreach programs have many benefits, as sometimes the participants in outreach programmes provide career and technical support that contributes to students' success by providing general guidance, professional development opportunities, and access to resources. Also, the participants engaged in active listening and training and supported inclusive activities to promote students' psychosocial support, which makes it very important (Bae1 et al., 2024).

In the work by Vinay et al. (2019), which was aimed to evaluate the effectiveness of outreach programs on academic development, personal development, and civic responsibilities of dental students and also to assess the changes in the domain scores within and between genders postintervention, it was observed that the outreach programs developed and enhanced the subject's academic skills, leadership qualities, self-confidence, communication skills, managerial skills, and responsibilities toward the rural community. Outreach programs are a key element in endearing institutions of higher education to their surrounding communities and constituents. In the longer term, these positive perceptions can lead to increased donations to the university. Outreach activities can also encourage enrollment, especially from students interested in pursuing advanced degrees or continuing their education in specialized areas. In addition to fostering economic development and enrollment, outreach programs can promote faculty development (Hearn et al., 2019). Despite some works already being done on outreach or related topics, no one has looked at the outreach programme of the center for basic science and Astronomy Nsukka, or before, the gap this work wants to fill.

## 2. Research Methodology

This study adopted a descriptive research methodology to investigate the impacts of space science and technology education outreach carried out by the Centre for Basic Space Science and Astronomy (CBSSA), Nsukka, as well as its challenges. The approach was chosen to allow for a clear and practical understanding of outreach activities as they occur in real educational and community settings. The study relied mainly on qualitative data obtained from outreach reports and observations from outreach programmes. The research focused on identifying key areas where outreach programs have positively influenced students, teachers, and communities, as well as the challenges that limit effective implementation. This methodology made it possible to present realistic insights into the experiences of outreach facilitators and beneficiaries. The human-centered approach ensured that the study reflects practical realities rather than abstract theory, making the findings relevant to policymakers, educators, and stakeholders interested in improving space science education outreach in Nigeria.

## 3. Results and Discussion

**3.1.** Impacts of space science education outreach on Nigeria, with a focus on the Centre for Basic Space Science, Nsukka, and Astronomy, Nsukka, Enugu State. This section discusses some major impacts of space science education outreach in Nigeria.

1. The space education outreach Supports Nigeria's Space Goals
2. It develops future space professionals.
3. The space education outreach promotes astronomy awareness.
4. It enhances teaching methods.
5. The space education outreach inspires STEM interest.

6. It promotes space science clubs.
7. It brings about community engagement.
8. It brings about research. Collaborations

**Explanations**

1. **The space education outreach supports Nigeria's space goals:** The outreach programme of the Centre for Basic Space Science and Centre for Basic Space Science and Astronomy (CBSSA), Nsukka, helps in building public awareness and developing human capacity. This is done through teaching, training, demonstration, seminars, and others in schools, and it involves the students or pupils and their teachers. By doing this, CBSSA Nsukka contributes to the sustainability of Nigeria's space program. In other words, the CBSSA outreach programmes directly support Nigeria's national space policy and the objectives of NASRDA (National Space Research and Development Agency). The space education outreach ensures continuity by nurturing interest and competence among younger generations who will sustain Nigeria's space ambitions because an informed and skilled population is essential for advancing space technology activities, as well as applying space-based data for national development.
2. **It develops future space professionals:** Frankly speaking, one of the most important long-term impacts of space science education outreach is the development of future space professionals. This is because, through mentorship of the students, their early exposure to space science activities, and practical engagement, students are prepared for careers in space science, engineering, and related fields in the future. The knowledge gained by the students as well as the teachers from the space outreach programmes of CBSSA will help build a skilled workforce in the society who are capable of driving innovation and supporting Nigeria's growing space sector.
3. **The space education outreach promotes astronomy awareness:** Investigations have revealed that some Nigerians have limited knowledge of astronomy or even Nigeria's participation in space activities. CBSSA Nsukka organises public enlightenment programs, media engagements, and exhibitions that feature astronomy and other lectures. These initiatives by the center and, of course, the space education outreach group educate the public about celestial phenomena such as eclipses, space missions, and planetary motion. It also educates or sensitises the public about Nigeria's achievements in satellite development and space research. An increase in astronomy education or awareness will increase national pride as well as help citizens understand the importance of space science to everyday life, such as the use of mobile phones, weather forecasting, navigation, and disaster prevention and management.
4. **It enhances teaching methods:** Space science outreach is significantly enhancing science teaching and technology methods in Nigerian schools. CBSSA Nsukka organizes capacity-building workshops and training sessions for science teachers. These teachings or workshops sometimes involve charts, photos of satellites and rockets, space and space environments, maps, etc. These programmes or methods introduce modern pedagogical approaches, inquiry-based learning, and the use of practical demonstrations in teaching to the teachers. Improved teaching quality leads to better student understanding and performance in science subjects. Over time, this contributes to a stronger science education system and improved learning outcomes not only in Enugu State but nationwide.
5. **Space education outreach inspires STEM interest:** Space science education outreach has proven to be a powerful tool for inspiring interest in Science, Technology, Engineering, and Mathematics (STEM) among Nigerian students. Through hands-on activities, seminars, public lectures, and telescope viewing sessions, CBSSA Nsukka's school outreach programmes expose students to informative, exciting, and real-world applications of science. By interacting with various fields of space scientists, students develop curiosity and motivation to pursue STEM-related subjects. These outreach programmes help to reduce the misconceptions about space science careers, which can discourage students. by showing students practical career pathways in engineering, satellite communication, astronomy, remote sensing, and space research.
6. **It promotes space science clubs:** The establishment of space science and astronomy clubs in secondary schools and tertiary institutions is another notable impact of outreach programs. Through the space education outreach, CBSSA Nsukka encourages students to form science clubs where they can explore astronomy, robotics, satellite technology, and basic research activities beyond the classroom. These clubs in schools provide a collaborative environment where students develop teamwork, leadership, and problem-solving skills, including working with those in other schools or space organizations

like CBSSA. Participation in space science clubs supports creativity and sustained interest in scientific inquiry, which prepares the students for higher education and careers in science and technology.

7. **It brings about community engagement:** Through school visits, community seminars, science fairs, and public demonstrations, CBSSA Nsukka reaches underserved and rural communities. These programs promote scientific literacy and encourage community participation in science-related discussions. Space science outreach initiatives actively engage local communities by bringing science closer to the grassroots.
   This programme inspires parents and guardians to support their children's interest in science education, thereby strengthening the social foundation for STEM development in Nigeria, knowing fully well the various advantages and opportunities it contains.
8. **It brings about research collaborations:** Space science outreach can facilitate research collaborations between CBSSA and some schools or groups of students within and outside the country, including those in tertiary education. These partnerships support knowledge exchange, joint research projects, training opportunities, and access to global scientific resources. It can be in the form of a workshop where CBSSA staff are invited to train some staff of a school and/or where joint research works are agreed on based on the results or outcome of the CBSSA space education outreach. In addition, through such collaborations, Nigerian researchers and students gain exposure to global best practices in space science and astronomy. This will help to enhance research quality and increase Nigeria's position on the global space science contribution scale.

**Photos from various outreach programmes**

### 3.2. Challenges facing space science and technology education outreach programme of CBSSA Nsukka, Enugu State

Space science and technology education outreach of the Centre for Basic Space Science and Astronomy, Nsukka, is designed to build scientific understanding and prepare young people for future careers in space science and technology; however, the outreach group or the programme is facing some challenges. Some of these challenges are:

1. Getting approval from schools, especially government schools
2. Inability of students to understand the English language
3. Inability of teachers to coordinate students
4. Inadequacy in providing resource materials from the office
5. Few manpower from the office
6. Limited access to technology and internet connectivity in rural schools
7. Insufficient funding for outreach programs
8. Limited collaboration with local communities and industries

**Explanation**

1. **Difficulty in Getting Approval from Schools:** One of the most common challenges faced during outreach activities is gaining approval from schools, particularly government-owned schools. Many school administrators are cautious about allowing external programmes due to bureaucratic processes, tight academic schedules, examination pressures, and even security problems. In some cases, approval processes take so long that planned outreach visits have to be postponed or cancelled completely. This situation reduces the number of students that the CBSSA outreach group can reach and limits the overall impact of its outreach efforts.

2. **Difficulty in Understanding the English Language by Some Students:** Another major challenge is the difficulty some students have in understanding English, especially those in the rural and semi-urban areas or schools, which is usually the language used during outreach programmes. It becomes harder for students to understand space science concepts when they struggle to understand the language of instruction, given that some space science concepts are abstract by nature. As a result, some students lose interest or fail to fully benefit from the outreach activities. This challenge shows the importance of using simple language, visual demonstrations, and, where possible, local languages to improve understanding.

3. **Poor Coordination of Students by Some Teachers:** Successful school outreach activities depend majorly on the support of the school's teachers in coordinating the students. In some outreach activities or sessions, there will be little or no achievement due to poor student coordination because of a lack of teacher involvement or due to large class sizes. When students are not well organised, practical demonstrations or hands-on trainings become

difficult to manage, and learning becomes less effective or less impactful. This challenge is very critical as it reduces the quality of interaction between outreach facilitators and students, which will affect the overall success of the planned programme.

4. **Inadequate Provision of Resource Materials**: The availability of teaching and learning materials is essential for successful outreach programmes. Though CBSSA has many education materials or resources, the outreach activities are sometimes limited by inadequate resource materials such as charts, models, practical tools, and printed handouts. Truly speaking, without sufficient materials, facilitators, or space, outreach instructors are forced to rely mainly on verbal explanations without visual presentation of materials, which may not fully capture students' attention. This challenge is reducing the hands-on experience that makes space science exciting and memorable for learners.

5. **Limited Manpower from the Office:** Based on the number of schools to cover as well as their size, it can be said that CBSSA Nsukka operates with a limited number of staff responsible for planning and delivering outreach programmes. It is mostly difficult to cover many schools or communities within a short period given that the personnel in the CBSS outreach unit are few. More so, this shortage places significant pressure on existing staff, thereby limiting the frequency of outreach activities. This will in a way affect the programme as many schools that are interested in hosting outreach programmes may not be reached on time.

6. **Limited Access to Technology and Internet Connectivity**: Some rural schools do not have access to basic technological facilities such as computers, projectors, and reliable internet connectivity, thus posing a serious challenge to the activities because space science education sometimes relies on videos, simulations, and digital illustrations for its explanation and/or demonstration. Without tools such as computers or the internet, outreach sessions become less interactive and less engaging. This absence of technology or internet facilities widens the gap between students in rural areas and those in urban communities.

7. **Insufficient Funding for Outreach Programs:** Insufficient funding is the process in which the amount of money available is not enough to meet the requirements of a project or an activity. In other words, it does not mean no money at all. Funding remains one of the most critical challenges facing space science education outreach. Limited funds affect transportation, procurement of materials, staff welfare, and the ability to organize regular programs. When funding is inadequate, outreach activities become irregular and restricted in scope. This makes it difficult for the outreach programme group to sustain long-term impact and to expand outreach to more schools and communities.

8. **Limited Collaboration with Local Communities and Industries: Collaboration** is the process of working with others to achieve a common goal or complete a work, mostly by sharing ideas, expertise, and resources. A limited level of collaboration between CBSSA outreach programmes and local communities or industries is a challenge. Strong partnerships could provide additional resources, mentorship opportunities, and real-life applications of space science. Strengthening partnerships would help improve sustainability and broaden the impact of space science education outreach.

## 4. Conclusion

The research work on the study of the impacts of space science education outreach of CBSSA Nsukka on Nigerian education and some challenges faced by the programme has been conducted using the descriptive research method. The results show that through the outreach activities of the Centre for Basic Space Science and Astronomy (CBSSA), Nsukka, there have been improved teaching methods and greater community engagement. Students are exposed to space science concepts that inspire interest in STEM fields, improving learning experiences as well as encouraging the development of future space professionals. The study also revealed several challenges that limit the full impact of these outreach efforts, such as difficulty in getting approval from schools, insufficient funding for outreach programs, limited manpower from the office, poor coordination of students by some teachers, inadequate provision of resource materials, and limited access to technology and internet connectivity, particularly in rural areas. It can be concluded that while CBSSA outreach programmes have made commendable progress and have made great impact in space education in Nigeria, there is a need for improved funding mechanisms, better collaboration with schools and communities, stronger institutional support, and innovative strategies to sustain student interest.

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