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Review Article

Leveraging STEM Education Beyond the Classroom to Combat Banditry in Zamfara State, Nigeria

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Abstract: This paper explored the potential of STEM education in combating banditry and promoting development in Zamfara State, Nigeria. Zamfara State had long been plagued by the complex challenges of banditry, severely hampering its social fabric and economic progress. Through an analysis of the banditry and socioeconomic development in the state, and the limitations of traditional approaches to combating banditry, the paper argued that innovative approaches were needed. Leveraging STEM education can play a critical role in building resilience and empowering communities by equipping individuals with the skills and knowledge needed to address local challenges, such as banditry. Drawing on successful STEM programmes from around the world, the paper also outlined key strategies for implementing effective STEM education beyond classroom in banditry affected areas in the state. The paper suggested that implementing STEM education beyond the classroom will develop critical skills for innovation among teeming youths in Zamfara State, thereby making them well engaged and productive, hence discouraging them from getting involved in any form of banditry related activities.

Keywords: STEM education, beyond classroom, banditry, development, innovative approach.

INTRODUCTION

Zamfara State, located in northwestern Nigeria, has been a hotbed of banditry and violent conflict for over a decade, resulting in numerous human rights violations, displacement, and death. According to a report by Amnesty International (2021), armed groups in Zamfara State have killed hundreds of people, displaced thousands, and committed a range of human rights abuses such as kidnapping, extortion, and rape. Government's failure to protect civilians and hold perpetrators accountable has only worsened the situation Amnesty International (2021). The rise of banditry in Zamfara State is a complex issue that requires a multifaceted approach to address. Banditry refers to the act of engaging in illegal activities such as kidnapping, robbery, and extortion for financial gain. The banditry has caused widespread fear and insecurity among residents, with many forced to flee their homes (Lawal, Audu, & Isma'il, 2018). The rise of banditry in Zamfara State is largely attributed to the proliferation of small arms and light weapons, which has made it easier for bandits to carry out their activities. According the Small Arms Survey (2019), Nigeria has one of the largest stocks of small arms and light weapons in West Africa, with an estimated 6 million weapons in circulation. The Small Arms Survey (2019) also reported that the majority of these weapons are unregistered and illegal. Another contributing factor to the rise of banditry in Zamfara State is the region's geographical location. Additionally, Zamfara state shares a border with Niger, which is known to be a major transit route for arms smuggling and other illegal activities. Additionally, the state's large gold reserves have attracted illegal mining activities, leading to a rise in criminal activities. The rise of banditry has been further compounded by poverty and unemployment in the state, which has made it easier for bandits to recruit young people as foot soldiers. According to a report by the United Nations Development Programme (UNDP), youth unemployment in Zamfara State is estimated to be around 70 percent (UNDP, 2018). This has created a fertile ground for banditry and other criminal activities. The impact of banditry in Zamfara State has been devastating, with many lives lost and many more displaced. The situation has also had a negative impact on the economy of the state, with many businesses shutting down due to the insecurity.

Despite the conflict, there have been efforts by the state government has been working with the federal government and international organizations to address the situation, but progress has been slow. The situation

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in Zamfara State highlights the need for innovative approaches to address conflict and promote development. Science, Technology, Engineering and Mathematics (STEM) education is one such approach that can equip young people with the skills and knowledge they need to create a better future for themselves and their communities. One potential solution which is not well explore is the use of STEM education. According to an article in The Guardian, STEM education has the potential to promote peace and development in conflict-affected areas like Zamfara State. The article cites examples of successful STEM education programmes in other parts of Africa that have empowered young people and helped to build sustainable communities (Alade, 2021). The situation in Zamfara State exposes the need for innovative approaches to banditry and promote development. In this paper, it is asserted that, STEM education is one of such approaches that can combat banditry by equipping youths with the skills and knowledge they need to create a better future for themselves and their communities.

Banditry and Socio-Economic Development in Zamfara State

Zamfara State in northern Nigeria has been facing challenges of banditry and development for several years. The state is characterized by low levels of socio-economic development and a high level of insecurity. Banditry has become a major security challenge in Zamfara State. The state has been facing increasing attacks from bandits who have been involved in kidnapping, killing, and cattle rustling (Lawal, Isma'il & Audu, 2018). These attacks have led to the displacement of many people, posttraumatic stress disorder and have adversely affected the economy of the state (Lawal, Audu & Isma'il, 2018). According to a report by the United Nations, there has been an increase in violent clashes between farmers and herders in Nigeria, and Zamfara State is one of the states most affected by these conflicts (UN News, 2020). The state has also been grappling with the issue of illegal mining, which has contributed to the rise of banditry. The state has significant deposits of gold, and illegal mining activities have become rampant. Illegal mining has contributed to the proliferation of small arms and light weapons in the state, which has made it easier for bandits to carry out their activities. According to a report by the Nigeria Extractive Industries Transparency Initiative, illegal mining is widespread in Zamfara State, and this has led to the loss of revenue for the government (NEITI, 2020).

Furthermore, Zamfara State has one of the highest poverty rates in Nigeria. Poverty and unemployment have made young people vulnerable to recruitment by bandits. According to the United Nations Development Programme, the unemployment rate in the state is 14.2%, and about 70% of the population live below the poverty line (UNDP, 2018). This has led to the proliferation of criminal activities in the state, including banditry. In terms of development, Zamfara State has been lagging behind other states in Nigeria. The state has a low levels of education, and inadequate infrastructure. The lack of development in the state has contributed to the rise of banditry. According to a report by the African Development Bank, the state's human development index (HDI) is one of the lowest in Nigeria (AfDB, 2018). The low HDI score indicates that the state's population has low levels of education and access to healthcare, which has negatively impacted the state's development. Therefore, the context of banditry and development in Zamfara State is complex and multifaceted. The state has been facing challenges of insecurity, illegal mining, poverty, increased number of out of school children and underdevelopment (Lawal, Isma'il, & Audu, 2018). Addressing these challenges will require a coordinated effort from various stakeholders, including the government, civil society, and international organizations. It is important to address the root causes of the problem, such as poverty and underdevelopment, to find lasting solutions to the problem of banditry in Zamfara State.

Traditional Approaches to Combating Banditry in Zamfara State and their Limitations

Several traditional approaches were being employed in Zamfara State to counteract the pervasive challenge of banditry. Foremost among these was the strategic deployment of military operations, a measure aimed at disrupting and dismantling bandit networks to reinstate law and order within the region (Oluwagbemi, 2019). Additionally, the state undertook diplomatic engagements through dialogue and peace agreements with leaders of bandit groups, seeking to secure ceasefires and comprehensive peace accords that could lead to lasting peace (Idris, 2020). Another approach involved the implementation of amnesty programmes, providing an avenue for the peaceful reintegration of former bandits who voluntarily renounced their criminal activities. These programmes incorporated incentives and vocational training to facilitate the reformation and societal reintegration of individuals (Vanguard, 2019). Furthermore, Zamfara State conducted disarmament campaigns, urging bandits to willingly surrender their weapons in exchange for incentives or amnesty. This tactic aimed to diminish the availability of illicit arms within bandit groups, thereby contributing to an overall improvement in security (Punch, 2020). Finally, the region emphasized the importance of strengthening local law enforcement agencies and fostering community vigilance. By enhancing the capabilities of local law enforcement and engaging communities in security efforts, this approach highlighted the vital role of local communities in banditry prevention and response, emphasizing their collaboration with law enforcement agencies (Daily Trust, 2020).

Traditional approaches to combating banditry in Zamfara State have been limited in their

effectiveness. One of the limitations is the over-reliance on military operations. While military operations have been effective in some cases, they have not been able to address the root causes of the problem. Military operations have been criticized for their heavy-handedness, which has led to human rights abuses and the displacement of communities. This has further worsened the situation and fueled resentment towards the government and security forces. Another limitation is the lack of coordination and integration among the various stakeholders involved in addressing the problem. There has been a lack of collaboration and coordination between the government, security forces, and civil society organizations. This has led to duplication of efforts and a lack of coherence in the approach to addressing the problem. The lack of coordination has also contributed to a lack of trust and legitimacy in the government's efforts to address the problem. More so, traditional approaches have also been limited by a lack of focus on addressing the root causes of the problem. There has been a tendency to focus on the symptoms of the problem, such as the activities of the bandits, rather than the underlying issues that have given rise to the problem. These underlying issues include poverty, unemployment, lack of access to education and healthcare, and weak governance. In addition, traditional approaches have been limited by a lack of community engagement. Communities have not been effectively involved in the decision-making process, and their views and opinions have not been adequately considered. This has created a gap between the people and the government, and has made it difficult to address the root causes of the problem effectively. To overcome these limitations, there is a need for a more holistic and integrated approach that focuses on addressing the underlying issues that have given rise to the problem of banditry.

STEM Education beyond Classroom

STEM education, an acronym encompassing Science, Technology, Engineering, and Mathematics, transcends the boundaries of conventional classrooms, casting its influence far and wide across diverse domains. This paradigm shift from classroom centric learning to real world application forms the cornerstone of STEM's significance. One of its pivotal roles lies in honing critical thinking and problem-solving skills, a transformation succinctly noted by Venville and Dawson (2010), who advocate for the transformative power of authentic, hands-on STEM projects. These endeavours equip learners to grapple with intricate, real-world challenges, ranging from climate change mitigation to public health improvement.

Furthermore, STEM education's outreach extends into local communities, underlining its potential as a catalyst for community engagement and outreach. Activities such as science fairs, robotics clubs, and science camps serve as bridges between educational institutions and society, a point eloquently expressed by Bybee (2013). These initiatives are veritable sources of inspiration, fostering enthusiasm for STEM subjects and sowing the seeds for the next generation of scientists, engineers, and innovators. But the impact of STEM impact is not confined to the realm of education alone; it reverberates through the corridors of entrepreneurship and innovation.

Bhattacharyya (2017) emphasized this facet, highlighting how STEM education ignites the flames of creativity, nurturing the innovative spirit of students and individuals. The result? The birth of groundbreaking solutions to a multitude of real world problems, offering fresh perspectives on issues like sustainable energy and technological advancement. Beyond its role in personal and professional development, STEM education assumes the mantle of a global enabler. The World Economic Forum (2017) underscores the indispensability of STEM professionals in addressing pressing global issues such as climate change, disease outbreaks, and rapid technological advancements. These professionals serve as torchbearers, guiding society through the complex maze of contemporary challenges. Crucially, STEM education in non-traditional settings nurtures a lifelong learning ethos. Bybee (2013) emphasizes the enduring curiosity and a zeal for exploration instilled in individuals, ensuring that they remain avid seekers of knowledge long after their formal education ends. This commitment to lifelong learning not only fosters personal growth but also equips individuals to adapt to the ever-evolving landscape of science and technology. In essence, STEM education transcends the boundaries of the classroom, offering a plethora of opportunities for real-world application, community engagement, and societal progress. Its comprehensive impact touches upon diverse facets, including problem-solving acumen, community outreach, innovation, and the cultivation of a lifelong learning ethos. In a world increasingly reliant on STEM disciplines, embracing STEM education beyond the classroom emerges as an imperative for individuals and communities alike, unraveling their full potential to address complex local and global challenges.

Empowering Communities through STEM Education beyond Classroom

STEM education, encompassing science, technology, engineering, and mathematics, emerges as a pivotal catalyst for fostering resilience and empowering communities beyond traditional classroom settings, particularly in confronting multifaceted challenges such as those rooted in conflict and development dynamics (Dunford, 2018). Centered on cultivating critical thinking, problem-solving acumen, and technical proficiency, STEM education's applicability spans diverse contexts and industries. In the context of conflict and development intricacies, STEM education emerges as a strategic conduit to address the fundamental drivers of conflict, foster economic

growth, and cultivate communities with robust adaptability. One of the key ways in which STEM education can build resilience and empower communities beyond the classroom is by providing access to technical skills and knowledge that can improve economic opportunities. STEM skills are in high demand in today's global economy, and individuals with these skills are well-positioned to access a range of well-paying jobs (National Academies of Sciences, Engineering, and Medicine, 2018).

By providing STEM education to young people in conflict-affected areas, they can acquire the skills necessary to participate in the global economy, which can improve their livelihoods and help build more stable and prosperous communities. STEM education can also be leveraged to address the root causes of conflict by promoting critical thinking and problem-solving skills. Through STEM education, individuals can learn to approach problems in a logical and evidence-based way, which can help to reduce tensions and prevent conflict (Dunford, 2018). Additionally, STEM education can be used to promote intercultural understanding and bridge divides between different ethnic and religious groups. By promoting STEM education as a tool for conflict prevention, communities can work towards a more peaceful and stable future. Building resilience in communities by providing them with the technical skills and knowledge necessary to respond to emergencies and disasters can be achieved through the utilization of STEM education. For example, in the aftermath of natural disasters, individuals with STEM skills can help to restore infrastructure and provide essential services, such as healthcare and clean water (UNESCO, 2020). By building the capacity of communities to respond to emergencies, STEM education can help to mitigate the impacts of disasters and build resilience.

STEM Education Programme initiatives in combating conflict and Lessons for Zamfara State

The application of STEM education to address societal challenges such as banditry and promote sustainable development has been gaining traction globally. Many initiatives and programmes have been established worldwide, which have been successful in achieving their goals. Some of these programmes are beyond the classroom initiatives. These programmes go beyond traditional classroom based education and focus on practical, real-world applications of STEM education to address various challenges, including conflict and development issues. They often involve hands-on learning experiences, mentorship, entrepreneurship, and community engagement to empower individuals and communities to make a positive impact. Some examples of successful STEM education initiatives of addressing conflicts that have been implemented across the globe are as follows; STEM for Peace in South Sudan: The STEM for Peace programme was established in 2017 to promote STEM education and skills training among South Sudanese youth. The programme has been successful in providing opportunities for conflict-affected youth to develop STEM skills, access higher education, and promote peacebuilding in their communities. The programme has also contributed to the development of innovative solutions to local challenges, such as renewable energy and agriculture (STEM for Peace, n.d.). By implementing STEM for Peace's model, Zamfara can empower its youth with STEM skills and knowledge. This approach equips young individuals to innovate and develop solutions, enabling them to contribute positively to conflict resolution and create avenues for economic advancement.

The NUBAA STEM Initiative in Nigeria: The NUBAA STEM Initiative is a programme that promotes STEM education and mentorship for underrepresented groups in Nigeria. The programme has been successful in increasing access to quality STEM education, promoting diversity in STEM fields, and improving academic performance. The programme has also contributed to the development of innovative solutions to local challenges, such as healthcare and renewable energy (NUBAA STEM Initiative, n.d.). Zamfara State can replicate NUBAA's success in fostering diversity and inclusivity within STEM education. Ensuring that STEM opportunities reach marginalized groups can unlock untapped potential among its youth and create a more inclusive approach to conflict mitigation. The TechGirls Programme in the Middle East and North Africa Region: The TechGirls programme is a U.S. Department of State initiative that provides opportunities for girls from the Middle East and North Africa **(**MENA) region to participate in STEM education and mentorship programmes in the United States. The programme has been successful in promoting gender equity in STEM fields, improving academic performance, and promoting cross-cultural understanding (TechGirls, n.d.). Zamfara can initiate cross-cultural STEM education exchanges similar to the TechGirls programme. This approach broadens youth perspectives, fostering a global understanding of conflict dynamics and innovative solutions. The Girls4STEM: This a programme in Afghanistan serves as an exemplary model showcasing the potential of STEM education in conflict-affected regions.

By providing girls with STEM education opportunities, the programme tackles gender disparities and challenges societal norms, thus fostering empowerment and progress. Through targeted outreach, mentoring, and inclusive learning environments, "Girls4STEM" actively promotes gender equity and social inclusion, enabling girls to contribute positively to their communities (UNESCO, 2019). Zamfara State can draw essential insights from this initiative. By replicating its gender-focused strategies and tailoring STEM education to local context, Zamfara can empower its marginalized youth, particularly girls,

while fostering community development and peacebuilding. The Girls Access to Education (GATE) programme in Sierra Leone: The Girls Access to Education (GATE) was established in Sierra Leone to promote STEM education and skills training among marginalized girls in Sierra Leone. The programme has been successful in improving girls' access to quality education, promoting gender equity in STEM fields, and empowering girls to become agents of change in their communities (GATE, n.d.). Learning from GATE, Zamfara can focus on promoting gender equity in STEM education (GATE, n.d.). Empowering girls with STEM skills would not only drive development but also create a gender-balanced workforce capable of contributing to conflict resolution efforts. The Gaza Sky Geeks Programme in Gaza: The Gaza Sky Geeks programme is an initiative that promotes tech entrepreneurship and innovation in Gaza. The programme has been successful in providing opportunities for youth and women in Gaza to develop their skills in STEM fields, access employment and entrepreneurship opportunities, and contribute to the development of innovative solutions to local challenges (Gaza Sky Geeks, n.d.).

Zamfara can replicate the entrepreneurship and innovation-focused model of Gaza Sky Geeks (Gaza Sky Geeks, n.d.). This approach encourages young individuals to think creatively and develop solutions to local challenges, simultaneously fostering economic growth and conflict resolution. The Science for Peace programme in Colombia: The Science for Peace programme is a joint initiative between the Colombian government and the Organization of American States (OAS) that promotes STEM education and skills training among youth affected by conflict in Colombia. The programme has been successful in providing opportunities for youth to develop STEM skills, access higher education, and contribute to the development of innovative solutions to local challenges, such as environmental conservation and agriculture (Science for Peace, n.d.). Zamfara can adopt Science for Peace's model, which provides education and skills training to conflict-affected youth (Science for Peace, n.d.). This strategy equips young individuals with the capacity to engage in innovative problem-solving and contribute to sustainable conflict resolution.

The STEM power programme in Lebanon: The STEM power programme is a joint initiative between the Lebanese government and the United Nations Development Programme (UNDP) that promotes STEM education and skills training among Syrian refugees and host communities in Lebanon. The programme has been successful in providing opportunities for youth and women to develop STEM skills, access employment opportunities, and contribute to the development of innovative solutions to local challenges, such as renewable energy and water conservation (STEMpower, n.d.). Following the STEMpower example, Zamfara can offer STEM education opportunities to displaced populations (STEMpower, n.d.). This approach not only empowers displaced individuals but also integrates them into the region's development and peacebuilding efforts.

Implementing Effective STEM Education for Combating Banditry

Implementing impactful STEM education programmes beyond conventional classroom settings is of paramount importance in the fight against banditry in Zamfara State. Such initiatives serve as instrumental tools in fostering peacebuilding, reconciliation, and sustainable development. To navigate the intricate challenges posed, a strategic and innovative approach is required:

Addressing infrastructure and resource constraints: Conflict-stricken areas often grapple with a lack of essential infrastructure and resources necessary for effective STEM education. This deficiency encompasses reliable internet access, consistent electricity supply, and the required equipment. Surmounting these hurdles mandates a local-centric adaptation strategy along with inventive solutions. This can involve leveraging offline learning resources, harnessing mobile technology, and embracing renewable energy sources like solar power to facilitate effective learning (Oyekanmi & Adu, 2020; Smith, 2020).

Tackling gender and social disparities: In areas of Zamfara state characterized by deep-rooted sociocultural norms, access to STEM education and associated opportunities can be severely hindered, particularly for girls and women. Overcoming this challenge entails an active commitment to promoting gender equity and fostering social inclusivity. Concrete actions, such as targeted outreach, robust mentoring programmes, and the creation of secure and welcoming learning environments, are essential (UNESCO, 2019).

Integrating stem education with local context: An effective STEM education programme for conflict-affected areas must be attuned to local knowledge and context. This entails an integration of indigenous wisdom, traditional practices, and a deep understanding of the specific environmental and social challenges of the community. By aligning STEM education with these factors, the programme ensures its relevance, sustainability, and resonation within the local community (Dunford, 2018).

Building strategic partnerships and collaborations: To ensure long-term impact and scalability, forging strategic collaborations with local stakeholders is crucial. These stakeholders encompass local communities, educational institutions, non-governmental organizations, and governmental bodies. Collaborative efforts leverage local expertise and

resources, enabling the programme to cater precisely to community needs while establishing enduring relationships (Smith, 2020).

Monitoring and evaluation: A robust system for monitoring and evaluation is indispensable for the success of STEM education programmes in conflict-affected zones. This system entails continuous assessment of programme outcomes, identification of challenges, and upholding accountability through rigorous data collection. This data includes metrics related to student performance, programme participation, and community engagement (Dunford, 2018). The strategic implementation of STEM education beyond traditional classrooms serves as a potent mechanism in the fight against banditry in Zamfara State. Through adeptly addressing challenges, leveraging local resources, and nurturing skills, these initiatives empower both youth and communities to proactively contribute to solutions and envision a promising future.

CONCLUSION

The persistent challenges of banditry in Zamfara State necessitate innovative solutions beyond traditional approaches. The success stories of STEM education programmes worldwide indicates the potential of inclusive and creative educational approaches in enhancing resilience and empowering communities in overcoming banditry. Implementing effective STEM education programmes beyond classroom in Zamfara State can equip youths with critical thinking, problem-solving, and technical skills essential for innovation across various sectors, including agriculture, healthcare, energy, and infrastructure. However, challenges in banditry affected areas, such as limited resources, inadequate infrastructure, a shortage of trained educators, and cultural barriers, must be acknowledged and addressed.

Suggestions

In proposing a more effective approach to tackle the challenges of banditry in Zamfara State, this paper contends that relying solely on traditional approaches like the military operations or deployment of vigilante members may not be sufficient and so cases can worsen the insecurity. Hence, the paper suggested that, all stakeholders both within and outside Zamfara State, to recognize STEM education as a powerful catalyst for countering banditry, fostering community resilience, and propelling socio-economic development. Drawing lessons from successful global STEM education initiatives can provide strategies adaptable to Zamfara State's unique context. Zamfara State government should be committed to the prioritization of STEM education, in order to lay the foundation for a more promising and peaceful future for its banditry affected communities.

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