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CALL FOR PAPERS
INTERNATIONAL JOURNAL OF CONTEMPORARY ISSUES IN INTEGRATED SCIENCE EDUCATION (IJCIISE)

NOTE TO CONTRIBUTOR

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EDITORIAL

Dear Readers,

We are excited to announce the launch of International Journal of Contemporary Issues in Integrated Science Education (IJCIISE). This Association Integrated Science Educators' Association of Nigeria (ISEAN) play a vital role in promoting scientific advancement, supporting science education, informing science policy, recognizing science excellence and fostering community engagement. The desire to float this journal was borne out of the passion to organize a yearly conference of Integrated Science by the Integrated Science Educators' Association of Nigeria, of which selected scholarly articles will be published after a thorough review. The journal dedicated to advancing knowledge and fostering dialogue within. Our mission is to publish high-quality research, innovative ideas, and critical analyses that contribute to the understanding and development of Integrated Science. At IJCIISE, we believe in the power of interdisciplinary collaboration and inclusivity. We welcome contributions from scholars, practitioners, and thought leaders worldwide, providing a space for diverse perspectives and groundbreaking work. As we embark on this journey, we invite you to submit your research, engage with our content, and join us in creating a vibrant academic community. Together, we can push the boundaries of knowledge and inspire future generations. Thank you for your support as we launch this exciting new endeavour.

This edition moves around issues that border on **"Enhancing Quality Assurance in Integrated Science in Nigeria."** It is believed that diverse contributions from scholars and researchers expressed in this edition will provoke the understanding of issues that could foster education for societal transformations on a global scale
We look forward to your contributions!

For further information on future conference activities, visit **http://ijciise.org/index.php/ijciise**

Warm regards,
Professor O. S. Agboola
President, Integrated Science Educators' Association of Nigeria (ISEAN)

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IMPACT OF MOTHERS IN STEM LEARNING FOR EARLY YEARS IN NIGERIA

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Abstract
STEM learning refers to science, technology, engineering, and mathematics education. It emphasizes an interdisciplinary approach to learning and problem-solving, incorporating elements of the natural world, scientific inquiry, technological innovation, engineering design, and mathematical reasoning. STEM learning aims to develop students' critical thinking skills, creativity, and proficiency in these essential areas, preparing them for future careers and addressing real-world challenges. Globally, STEM is at the forefront of economic development. The federal government of Nigeria has established several universities of science and technology to improve the teaching of STEM areas. This paper delves into how mothers impact STEM learning during early childhood, focusing on role modelling, encouragement, creating supportive learning environments, engaging in hands-on activities, language development, and advocacy for educational resources.
Keyword: Mothers, STEM, Early Childhood, Critical thinking skills

Introduction

As the world increasingly relies on technological innovation and scientific understanding, early education in Science, Technology, and Mathematics (STEM) cannot be overstated. Early exposure to these disciplines enhances cognitive development and shapes children's future academic and career paths. Central to this developmental journey is the role of mothers, who often serve as primary educators and caregivers in their children's lives. Their influence extends beyond primary caregiving; they actively foster curiosity, build confidence, and create enriching learning environments that encourage exploration of STEM subjects.

Early Years Learning

Learning for the early years refers to the educational experiences and opportunities provided to children from birth through their early childhood years, typically up to the age of eight. Children engage in foundational learning experiences during this critical developmental stage that help shape their cognitive, social, emotional, and physical development. Early years learning fosters curiosity,

creativity, and a love for learning while laying the groundwork for future academic success. It encompasses a range of activities, interactions, and educational settings designed to support children's holistic development and prepare them for ongoing learning and growth.

Problem Statement

Mothers play a crucial role in shaping their children's attitudes and interests in education. Understanding the specific ways in which mothers influence their children's participation and success in STEM fields can help educators and policymakers design more effective interventions and support systems. Additionally, such research can provide insights into addressing gender disparities in STEM education and promoting greater inclusivity and diversity in these fields.

As important as family-child interaction in STEM education is, study in this area is quite scarce (Salvatierra and Cabello, 2022; Šimunović and Babarović, 2020).There are many important studies on parent involveme nt in other disciplines, but it is limited in STEM learning (Thomas., 2020). There is also a gap in parent-child interactive learning activities (Sheahan, 2016). There is a need for research describing and summarizing the trends on family involvement in STEM education; hence this study.

Conceptual Framework

STEM education remains a challenge to some developing countries in Africa. Meanwhile, Africa is a significant consumer of technology. The development of any society is adjudged by its science and technological advancement and the level of awareness of its citizens (Adegun, 2003). Nigeria is embracing STEM education to meet the needs of its population in 2018. As crucial as STEM education in Nigeria is for its future, the reality is that STEM is still in its infancy. In the past, the federal government established several federal science and technology universities to improve the teaching of STEM areas and build the workforce necessary for economic development. Nigeria has moved to develop STEM education (Abdulrahman, 2017). The government of Nigeria has already forged partnerships and is drawing upon the technological experience of other countries to build new STEM learning opportunities for Nigerian students. Global Partnership for Education (GPE) has allocated more than US$100 million in grants to Nigeria to improve the quality of education. Traditional education in Nigeria is failing, even the newly introduced STEM education. The challenges range from poverty, poor school funding, and waning student interest to poorly trained teachers, inadequate learning aids, and incessant strikes.

There is a growing understanding that parents and teachers can effectively collaborate to help children succeed in school. This has led worldwide policymakers and school leaders to deliberate actions to increase parents' participation in school life (e.g., Epstein, 2018; Raikes & Love, 2002). For example, the Chilean Education Minister recently encouraged contracts between parents, schools, and the state to

increase parental involvement (Borgonovi & Montt, 2012). The Australian government has formed a Research Alliance for Children and Youth (Australian Government Department of Education and Training, 2018) to develop and promote understanding of parent involvement.

Literature

STEM was once referred to as Science, Technology, and Society (STS) in the distant past (Badmus, 2018). STEM acronym was introduced in 2001 by Scientific Administrators at the U. S. National Science Foundation (NSF) (Sanders, 2009). The organization previously used the acronym SMET (Science et al.) when referring to the career fields in those disciplines or a curriculum that integrated knowledge and skills from those fields. This has been transformed into STEAM (science, technology, engineering, arts, and mathematics) education today by popular agitations by researchers and educators (Taylor, 2016). STEAM aims to provide students with the best-rounded education to prepare them for the challenges of the 21st century. STEAM takes STEM to the next level. STEM approach would provide students with critical thinking skills that promote creative problem solving and provide a qualitative workforce for self-reliance. The perception of researchers on STEM education is that its students would benefit after post-secondary education and more at the tertiary education level (Butz et al., 2004).

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Methodology

The study adopted content analysis research design. This was done by conducting literature search on the sub-topics as it relates to Nigeria. The references to the literature and the data used were given.

Parental Involvement in Stem Education

The impact of mothers in STEM learning for the early years is significant. Research has shown that mothers play a crucial role in fostering a positive attitude towards their children's STEM subjects (science, technology, engineering, and mathematics) during their early years. Mothers who actively engage their children in STEM activities contribute to developing critical thinking skills, problem-solving abilities, and a strong foundation in these subjects. Additionally, mothers can serve as role models and mentors, inspiring their children, especially girls, to pursue STEM education and careers. Therefore, recognizing and supporting the influence of mothers in STEM learning is essential for encouraging early interest and proficiency in these critical fields.

Young children's everyday scientific thinking often occurs in the context of parent-child interactions (Crowley *et al.,* 2001). The family factor in STEM education offers an untapped resource that has the potential to increase students' motivation and success (Šimunović &Babarović, 2020). Parents' involvement in their children's STEM learning is a crucial determinant of a child's academic success in this area, but this can be difficult for parents without a STEM background (Sheahan, 2016).

Fleer *et al.* (2020) state that STEM education starts from infancy and suggest the work parents can do with their babies. Salvatierra and Cabello (2022), who examined the studies on parental involvement in STEM education in early childhood, stated that STEM activities can encourage parent involvement and positively affect children's STEM learning. Children's scientific literacy development takes a long time, and the parents accompanying them increase the effect (Mei, 2017). The suggestions are for parent involvement in STEM (Ansberry and Morgan, 2019). STEM learning occurs in everyday situations (identifying geometric shapes of household items, swimming-sinking experiments, reading new inventions, designing creative solutions to everyday problems). In STEM education, children's interest, curiosity and imagination can be stimulated by building toys, legos, board games, experiment kits, and robotics toys (Mei, 2017). Homemade materials can be prepared using nature in STEM education (Mei, 2017). Home cooking, grocery shopping, and outdoor games can support children's science and math knowledge (Zucker & Yeomans-Maldonado, 2022).

The duties of Mothers as Role Models

Mothers influence their children's attachment style, emotional regulation and empathy, social skills, cognitive development, sense of self, and other traits. The bond between a mother and her child profoundly and significantly influences the child's growth and development.

Mothers serve as critical role models for their children, particularly in the context of STEM learning. When mothers engage in STEM activities, whether building a simple circuit, exploring the scientific method through kitchen experiments, or discussing technological advances, they exemplify the application

of knowledge in everyday life. A notable example is a mother who regularly incorporates science experiments into family activities. Research shows that children who witness their parents' engagement in STEM-related discussions are significantly more likely to express interest in those fields (Wang *et al.* 2019). This modelling is particularly crucial for girls, who may face societal pressures that discourage their participation in STEM. Mothers help dismantle stereotypes and empower their daughters to pursue their interests by actively participating in these areas.

Encouragement and Growth mindset

Maternal encouragement is instrumental in fostering a growth mindset in children, an essential aspect of success in STEM education. Mothers who provide positive reinforcement, celebrate efforts and encourage persistence help their children develop resilience. For instance, a mother who emphasizes the value of hard work and dedication over inherent talent reinforces the idea that skills can be developed. Dweck (2006) highlights how a growth mindset correlates with higher academic achievement. A practical scenario could involve a mother helping her child navigate a challenging math problem, emphasizing the learning process rather than the result. Such interactions promote a positive relationship with challenges, motivating children to confidently embrace STEM learning.

Creating Stimulating Learning Environments

Mothers have a unique ability to crate home environments that stimulate STEM learning. They create spaces that encourage exploration and inquiry by providing access to educational materials such as science kits, books, puzzles, and technology tools. For example, a mother might set up a designated area for science experiments equipped with safe materials for hands-on learning. Hossain *et al.* (2021) emphasize that children exposed to enriching home learning environments demonstrate improved problem-solving skills and a more extraordinary passion for learning. Integrating everyday experiences into STEM learning, such as measuring ingredients while cooking or discussing weather patterns during a walk, can make learning engaging and relevant.

Engagement in Hands-on Activities

Hands-on activities are crucial for effective STEM education, and mothers can significantly influence their children's engagement in these experiences. When mothers participate in activities that require critical thinking and creativity, they facilitate experiential learning. For instance, a mother and child working on a gardening project can discuss plant biology, environmental science, and even basic engineering principles related to garden design. This practical approach enhances understanding and retention of concepts, as evidenced by Benenson *et al.* (2020), who found that children learn best through active participation. Furthermore, collaborative projects allow for the development of teamwork and communication

skills, which are essential for future success in STEM fields.

Language Development and Communication

Effective communication surrounding STEM topics is crucial for early learning, and mothers play a key role in enhancing their children's language development. Engaging in discussions about scientific concepts, asking open-ended questions, and encouraging children to articulate their thought processes fosters critical thinking and verbal skills. For instance, a mother might ask her child to explain their reasoning during a science experiment, reinforcing their understanding of the scientific method and communication skills. Hart and Risley (1995) found that children exposed to rich language experiences achieve higher academic performance later in life. Mothers contribute significantly to their children's overall educational success by promoting discussions about STEM topics.

Advocacy and Community Engagement

Mothers also influence STEM education at a broader level by advocating for quality resources and programs within schools and communities. By engaging in parent-teacher associations or local organizations, mothers can raise awareness about the importance of STEM curricula and push for necessary changes. For example, a mother who organizes STEM workshops or science fairs in her community creates opportunities for children to engage with STEM concepts in a supportive environment. McGinnis et al. (2018) highlight parental advocacy's positive impact on educational policies prioritizing STEM learning. This community involvement benefits individual children and promotes a culture that values STEM education.

The Role of Technology in Maternal Influence

Technology plays a significant role in shaping STEM learning experiences in the digital age. Mothers who utilize educational apps, online resources, and interactive platforms can enhance their children's engagement with STEM subjects. For instance, a mother who introduces her child to coding games or interactive science videos can foster a love for technology and innovation. Research by Gunter et al. (2020) indicates that children exposed to educational technology show improved learning outcomes and motivation. Furthermore, mothers can guide their children in navigating the digital landscape responsibly, teaching them critical skills for the future workforce.

Advantages of Parental Involvement in Stem

Parent involvement increased students' internal and external motivation and established a strong relationship with their science learning and self-efficacy (Asoka De Silva et al. (2018)). Parental involvement is crucial to the success of our students. When parents take an active interest in their child's education, it can significantly impact their learning outcomes.

Here are some of the benefits of parental involvement:
Increased Motivation: Children who feel supported by their parents are more likely to be motivated to learn. Parents showing interest in their child's progress conveys that their education is essential.

Improved Academic Performance: Studies have shown that children with involved parents perform better academically. Parents can help their children by providing a supportive learning environment at home, assisting with homework, and attending school events.

Enhanced Social-Emotional Development: Parental involvement can also positively impact a child's social-emotional development. Parents who are involved in their child's school life can help them build relationships with other students and teachers.

How Parents Can Get Involved

There are many ways for parents to get involved in their child's STEM education:

Encourage Learning at Home: You can create a supportive learning environment at home by providing your child with books, educational toys, and opportunities for exploration.

Attend STEM Events: STEM often hosts events and workshops for parents and children. Attending these events can help you learn more about STEM education and connect with other parents.
By getting involved in your child's STEM education, you can help them reach their full potential.

Academic Advantages of Parent Involvement

Parent involvement in education is widely believed to influence student outcomes. A plethora of research shows that children demonstrate various achievement-related outcomes when parents are actively involved with their child's education. In the case of general socialization benefits, research has shown that parent involvement impacts children's:

1. social, emotional, and character development;
2. increased attendance, reduced suspensions, and reduced high school dropouts;

With regard to general school achievement, research has shown that parent involvement positively influences children's:

3. attitude toward school;
4. academic motivation;

5. pursuit of complex tasks;
6. self-efficacy; and
7. academic performance

Also, as parents become involved in their children's education, research has shown that parent involvement positively influences teachers and the school at large:

8. teachersgain confidence in teaching children;
9. student-teacher relationships are enhanced;
10. administrators strengthen community relations;
11. curriculum transformed as teachers build on community funds of knowledge and
12. Schools become more collaborative and caring when they work with the community.

Benefits of Stem Education in Nigeria

The potential educational benefits that STEM education in Nigeria offers its students are quite obvious.

1. Provide solutions to local and global problems.
2. STEM education provides the link that can help drive Nigeria's technological and scientific advances, as the world is tech-driven.
3. STEM jobs usually pay above market salary rates and are also considered and more fulfilling than desk jobs.

Addressing Barriers and Challenges Mothers Face

While mothers' impact on STEM learning is profound, it is essential to acknowledge the barriers some mothers face.

Socioeconomic factors, lack of resources, and educational background can limit their ability to engage fully in their children's STEM education. For instance, a mother with limited access to educational materials may struggle to create stimulating environments. Addressing these challenges through community support programs, access to resources, and educational workshops can empower mothers to become more involved in their children's STEM learning.

Many parents believe they are not qualified to do STEM activities with their children and that STEM can only be taught in formal school settings (Ansberry & Morgan, 2019). Barriers to home implementation of STEM education by families are that parents do not know how to lead their children to scientific inquiry, the thought that science education is only the school's duty, and the scarcity of resources supporting inquiry-based STEM education (Mei, 2017). There is a lack of resources for adult amateurs who will learn at home with their children (Sheahan, 2016). In some cases, the use of technology can help parents.

Conclusion

The influence of mothers in STEM learning during early childhood is multifaceted and crucial for fostering a solid foundation in these essential fields. Mothers play an integral role in shaping their children's interests and competencies in STEM through role modelling, encouragement, the creation of stimulating environments, engagement in hands-on activities, language development, advocacy, and the effective use of technology. As we strive for a future that values diversity and innovation in STEM fields, recognizing and supporting the influence of mothers is vital. By investing in programs and resources that empower mothers, we can ensure that all children have the opportunity to explore and thrive in STEM areas, ultimately contributing to a more skilled and inclusive workforce.

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