PARENTING EDUCATION FOR CAREER DEVELOPMENT AND ENTREPRENEURSHIP IN SCIENCE EDUCATION

Florence Abidemi ODELEYE
Mathematics Education Department
Faculty of Science Education,
Emmanuel Alayande University of Education, Oyo, Nigeria
odeleyeflorence@gmail.com; +2347061158010

Deborah Oyeronke OLUWOLE
Mathematics/Statistics Department,
College of Education (Technical), Akoka.
Deboronke1965@gmail.com; +2348150760539
Corresponding Author: odeleyeflorence@gmail.com; odeleyefa@eauedoyo.edu.ng

Abstract
The evolving global economy demands a shift in education that integrates career development and entrepreneurship into science learning, with parents playing a crucial role in shaping students' aspirations, motivation, and readiness for the workforce. This paper explores the significance of parenting education in fostering students' interest in science-related careers and business ventures, emphasising collaboration between parents, educators, and policymakers to equip students with innovation-driven skills. It examines how parental guidance, financial literacy, and an entrepreneurial mindset influence career choices while addressing barriers such as socio-economic constraints and traditional career perceptions. The study highlights mentorship programs, career counseling by teachers and parents, and industry partnerships by the governments as strategies to bridge the education-to-workforce gap. It proposes models for integrating parenting education into science curricula through experiential learning, STEM-focused entrepreneurship programs, and industry collaborations. Findings underscore the need for a supportive home environment that fosters inquiry, experimentation, and risk-taking which are key attributes for entrepreneurial success. The paper concludes with suggestions for comprehensive parenting education programmes to enhance employability, encourage innovation, and promote a culture of entrepreneurship in science education that aligns with global workforce demands.

Keywords: Parenting Education, Career Development, Entrepreneurship, Science Education.

Introduction

Science education in the 21st century has evolved beyond the mere dissemination of theoretical knowledge to encompass the cultivation of practical skills, critical thinking, and entrepreneurial acumen. This paradigm shift is particularly pertinent in Nigeria, where the integration of entrepreneurship education into science curricula aims to address challenges such as youth unemployment and economic stagnation, (Nnenna, 2024). Despite these curricula advancements, a critical but often overlooked factor in students' career development and entrepreneurial pursuits is parental influence and education.

Parents are fundamental socialisation agents, significantly influencing their children's educational attitudes, career aspirations, and entrepreneurial potential. Their values and support systems are crucial for academic success and career choices. Research indicates that parental involvement can notably affect students' decisions to pursue science-related fields, shaping their academic and professional paths, (Plasman, et al., 2021).

However, in Nigeria, a gap exists between educational institutions' entrepreneurship promotion and parental engagement to support these initiatives, (Walker, 2025). The absence of structured parenting education programs for career guidance and entrepreneurship within science education worsens this gap, leading to challenges in parents' ability to assist their children effectively. This results in reduced student motivation and a lower capacity to apply scientific knowledge innovatively.

Tackling the issue of enhancing career development and entrepreneurial skills among science education students requires a thorough examination of parenting education. By analysing parental influence and effective integration strategies, stakeholders can foster a supportive environment that connects home and school. This is vital for developing scientifically literate and entrepreneurially minded individuals. Despite the global emphasis on STEM education, students often struggle to convert their scientific knowledge into career opportunities due to inadequate guidance. The responsibility for career development is primarily on schools which overlooks the significant role parents play in shaping aspirations. Additionally, there is a lack of parenting education programs that incorporate career and entrepreneurship guidance in science. This gap affects parents' abilities to support their children's career explorations, ultimately hindering motivation and entrepreneurial skill development. Research is limited regarding parenting education as a means to foster career development within science education. Investigating this relationship is essential to empower parents as career advocates, thereby contributing to an innovative workforce with robust scientific literacy.

The main objective of this study is to discuss how parenting education contributes to the advancement of career development and entrepreneurial skills among students in science education in Nigeria. Specifically, the study discusses:

1. parenting education, career development and entrepreneurship in science-related disciplines
2. parents' levels of awareness, attitudes, and participation in encouraging their children's career development and entrepreneurial aspirations in science education
3. strategies to improve parenting education for career development and entrepreneurship in science education
4. challenges to effective parental education in science education
5. suggestions for policy and practice that enhance the partnership between families and schools in supporting career and entrepreneurial opportunities in science.

This study is anchored on the interconnectedness of parenting education, career development, entrepreneurship and science education, with an emphasis on how these domains collectively influence the entrepreneurial potential of learners. Each of these concepts plays a distinct but complementary role in shaping students'

educational outcomes and future trajectories, particularly in science-related fields.

Parenting Education

Parenting education is a structured approach aimed at equipping parents with essential knowledge, skills, and attitudes to support their children's development in various areas, including academic, emotional, and career growth, (Breiner,2016). Traditionally, these programmes have concentrated on child development and behavioural management. However, there is an increasing recognition of the need to broaden this focus to encompass educational support and career guidance, particularly in STEM fields. Research indicates that parental involvement, especially in discussions about education and future careers, significantly influences adolescents' academic motivation and performance, (Irshad et.al. 2025). This impact is especially pronounced in science education, where students benefit from both cognitive encouragement and emotional support to navigate challenging subjects. By integrating strategies for career mentoring and entrepreneurial encouragement, parenting education can effectively connect home and school, enhancing parental engagement in line with modern educational and occupational needs.

Career Development

Career development is a lifelong process that helps individuals understand their relationship with the world of work, make informed decisions, and manage transitions. For students, this process encompasses awareness, exploration, and preparation for suitable vocations. According to Patton and McMahon's Systems Theory Framework (STF), various interconnected systems, including the individual, family, school, and societal context significantly influence students' career decision-making. Parents play a crucial role as influencers within this ecosystem, (Mailula, 2021). Career development supported at home tends to be more sustainable, especially when parents actively engage with their children's interests in fields like science and entrepreneurship. Such proactive involvement can inspire students to envision careers in scientific innovation or to pursue entrepreneurial ventures that address science-based challenges.

Entrepreneurship

Entrepreneurship is characterised by a blend of talents, including innovativeness, risk-taking, and the ability to navigate unforeseen challenges, (Oluyemi et al. in Salim, 2020). It involves individuals leveraging their skills and resources to create ventures that capitalise on business opportunities and generate value. This process emphasises the importance of transforming knowledge and experience into self-employment or job creation, (Jwara & Hoque in Salim 2020). In the realm of science education, integrating entrepreneurship represents a transformative approach that combines scientific knowledge with entrepreneurial thinking, (Blankesteijn, 2024). This integration is essential for fostering innovation, economic development, and addressing complex societal issues. Recent studies indicate that embedding entrepreneurial concepts within science curricula enhances students' problem-solving skills and cultivates a mindset focused on innovation and adaptability, (Jan, 2024). This approach encourages learners to apply scientific knowledge as a foundation for developing real-world solutions.

In Nigeria, the integration of entrepreneurship into science education is particularly relevant due to the country's youth demography and the urgent need for job creation. Equipping students with entrepreneurial skills grounded in scientific knowledge can significantly contribute to economic growth and self-reliance. Research underscores the necessity of incorporating entrepreneurial training within science education to prepare students for the evolving demands of the workforce, (Jan, 2024). Furthermore, the fusion of entrepreneurship and science education aligns with global educational trends that emphasise interdisciplinary learning. By merging scientific inquiry with entrepreneurial action, students gain a comprehensive understanding of how to engage with and influence their environment. (Pradikto, 2024). This approach not only enhances academic engagement but also empowers students to become proactive contributors to society. Ultimately, embedding entrepreneurship into science education is a strategic initiative aimed at nurturing a generation of innovative thinkers who can leverage scientific knowledge for societal advancement, bridging the gap between education and practical application.

Science Education

Science education is crucial for fostering innovation, critical thinking, and societal progress; it encompasses the fields of Science, Technology, Engineering, and Mathematics (STEM). Recent trends emphasise inquiry-based learning, experiential activities, and interdisciplinary approaches that integrate science with entrepreneurship. This integration empowers students to recognise opportunities, take initiative, and derive value from scientific knowledge, (Pearce, et al. 2025)..The effectiveness of these educational strategies is significantly enhanced by parental involvement. When parents are educated on how to support their children's science learning and entrepreneurial mindset, they create a more cohesive support system. This aligns with Vygotsky's Social Development Theory, (Remorosa, et al.2024), which highlights the importance of social interactions, including parental engagement, in children's cognitive development.

The relationship between parenting education and academic success suggests that informed and engaged parents can help students navigate science education's complexities, appreciate its relevance, and envision entrepreneurial pathways. Additionally, incorporating parenting education into career and science education strategies supports the principles of education for sustainable development (ESD), promoting holistic, participatory, and future-oriented learning, (Almazroa, Alotaibi & Alrwaythi, 2022). This framework positions parents as co-educators and vital stakeholders in their children's career and entrepreneurial growth within the science education context. By leveraging evidence-based parenting programs, career theories, and science education models, the study aims to provide a comprehensive understanding of how parenting education can empower future science-driven entrepreneurs. The research is grounded in established theories, including Super's Life-Span, Life-Space Theory, Social Cognitive Career Theory (SCCT), Vygotsky's Sociocultural Theory, and the Theory of Planned Behavior, all of which underscore the lifelong nature of career development and the critical role of parental support and social interactions, (Barbara-Cardona, 2021).

Parenting Education and Entrepreneurial Aspirations in Science Education

Parents significantly influence their children's academic and career paths, especially in science education. Their awareness, attitudes, and active participation are crucial in shaping students' engagement with science subjects and aspirations for science-related careers and entrepreneurship. Parental awareness involves understanding the importance of science education and the career opportunities it presents. Research indicates that informed parents are more likely to encourage their children to pursue science disciplines, highlighting the necessity for parents to be knowledgeable about diverse career options, (Gamariel & Blaise, 2021). The attitudes parents hold toward science and entrepreneurship also play a critical role in shaping their children's interests, (Halim et al, 2018). Positive parental attitudes can create a nurturing environment that fosters curiosity and ambition in science, while negative attitudes may discourage exploration of science-related careers. Studies show that parents' educational aspirations correlate positively with their children's academic self-concept, suggesting that supportive attitudes can enhance students' confidence and interest in science, (Lu, 2021).

Active parental participation, such as attending school events and discussing scientific topics at home, is linked to improved academic performance and increased interest in science careers. Consistent engagement from parents positively influences students' academic trajectories, (Lu, 2021). Therefore, enhancing parental awareness, fostering positive attitudes, and encouraging active participation are essential for promoting students' career development in science education. Educational institutions can support this by providing parents with information about science curricula, career paths, and involvement opportunities. Workshops and informational materials can equip parents with the tools needed to effectively support their children's interests. Additionally, addressing gender biases in parental perceptions is vital, as research shows that parents often overestimate their sons' mathematical abilities compared to their daughters', contributing to the gender gap in STEM fields, (Yaseen, & Hashmi, 2024). By promoting equitable attitudes and providing equal encouragement, parents can help create a more inclusive environment for science education and entrepreneurship.

Strategies to Improve Parenting Education For Career Development and Entrepreneurship in Science Education

The rapid evolution of global economies driven by technological advancements highlights the critical need for enhanced science education as a catalyst for career development and innovation. However, the influence of parents in shaping children's aspirations and competencies in science is often overlooked in educational policies and practices. Targeted parenting education, aligned with career development and entrepreneurial preparation in science, can bridge the gap between home and school, transforming aspirations into achievements. By equipping parents with the necessary skills and knowledge to foster scientific curiosity and entrepreneurial thinking, such education can prepare the next generation of scientists and innovators, (Wang & Okonkwo, 2023). To effectively contribute to career development in science, parenting education must move beyond traditional models focused solely on discipline and emotional support. It should include STEM literacy,

awareness of emerging scientific careers, and strategies for supporting inquiry-based learning at home. Many parents underestimate their impact on their children's science identity and may lack confidence in facilitating science-related learning, (Sasson & Yehuda, 2022). Therefore, parenting education should demystify science and encourage parents to engage in discussions about scientific topics and create environments that promote experimentation. Evidence indicates that STEM-integrated parenting workshops significantly enhance children's engagement in science and interest in science-related careers, (Lopez & Ramirez, 2023).

Entrepreneurship in science education encompasses a mindset of creativity, risk-taking, problem-solving, and innovation, with parents playing a vital role in nurturing these traits from an early age. A progressive parenting education framework should introduce concepts of entrepreneurial education, such as opportunity recognition and resilience, in alignment with science education goals. According to Maseko & Hall, 2023, programs like "STEMpreneurs at Home" have demonstrated that family-centered workshops, where parents and children collaborate on science-based projects, can yield dual benefits in scientific knowledge and entrepreneurial thinking. These initiatives are most effective when parents act as facilitators of exploration rather than traditional instructors. Career development in science often involves exposure to non-linear career paths, including entrepreneurial ventures. Parenting education can support this by providing parents with career guidance tools, insights into labour market trends, and access to role models in science-based entrepreneurship. Empowered parents can offer more informed and future-oriented guidance to their children. Digital tools and platforms can deliver scalable parenting education focused on science and entrepreneurship, utilising mobile apps and interactive webinars to provide ongoing support and information, (Chen & Agyeman, 2022).

Online communities, such as science-focused parent groups on social media, can serve as valuable peer support networks, allowing parents to share resources and celebrate achievements. These platforms can also facilitate partnerships between parents and educators, fostering a community culture that values scientific entrepreneurship. A practical approach to enhancing parenting education is to integrate relevant modules into existing programs, such as adding components on STEM career awareness and science entrepreneurship to established parenting curricula. Collaboration with career guidance professionals and science educators is essential to ensure that parents receive accurate and contextualised information about science careers, (Barnes, et al. 2020). Integrating career mapping exercises and mentorship pathways into parent training can provide practical tools for guiding children effectively. Cultural relevance is a significant consideration in designing effective parenting education for science entrepreneurship, (Okeke & Smith, 2022). Tailoring programs to reflect the values and experiences of diverse populations is crucial for inclusivity. Culturally grounded approaches that highlight local innovators and emphasise community-based solutions can foster interest in science and strengthen community ties, ultimately uplifting educational and economic aspirations.

Challenges to Effective Parenting Education in Science Education

Parental involvement has long been identified as a crucial determinant of student success in science

education. Parents play an essential role in shaping attitudes toward science, providing learning support at home, and fostering curiosity and confidence in science-related subjects. However, despite the well-documented benefits, the implementation of effective parental education in science education remains fraught with numerous challenges. These barriers are multifaceted, encompassing socioeconomic, cultural, technological, institutional, and pedagogical dimensions. Understanding these challenges is essential for designing responsive interventions that engage parents meaningfully in their children's scientific learning journeys, (Sivabalan, 2024). Such challenges include:

1. Limited Parental Science Literacy and Confidence

A primary barrier to effective parental engagement in science education is the lack of scientific literacy and confidence among parents themselves. Many parents, particularly those from non-STEM backgrounds, feel unprepared or ill-equipped to support their children in science-related tasks, projects, or conversations (Sasson & Yehuda, 2022). This lack of confidence often leads to avoidance behaviour, where parents depend entirely on schools for science instruction. Without a basic understanding of scientific principles or familiarity with current science curricula, parents may struggle to recognise learning opportunities in everyday life or to answer their children's questions accurately.

Research indicates that even highly motivated parents may withdraw from engagement in science education due to fear of providing incorrect information or appearing ignorant (Wang & Okonkwo, 2023). This self-perceived inadequacy can be exacerbated in under-resourced communities, where exposure to science professionals or hands-on learning experiences is limited.

2. Socioeconomic Constraints

Socioeconomic status significantly influences the degree to which families can engage in science-related parenting activities. Parents from low-income households may lack access to essential resources such as science kits, books, museum visits, or internet connectivity, all of which are crucial for supporting science learning outside the classroom (Lopez & Ramirez, 2023). Furthermore, financial insecurity, inflexible working hours, and limited transportation options make it difficult for parents to attend school-based workshops or extracurricular science events. Studies have shown that economic precarity directly correlates with lower parental engagement in science education, regardless of interest level (Chen & Agyeman, 2022). Even when free parenting programs are available, hidden costs, such as childcare for other siblings or time off from work, can present insurmountable barriers for low-income families.

3. Cultural and Language Barriers

Another challenge in science education stems from cultural mismatches between programs and family backgrounds. Many curricula reflect western perspectives, which may not resonate with diverse families, particularly immigrant ones (Okeke & Smith, 2022). Language barriers and unfamiliarity with the education system can impede engagement in science. Additionally, some cultural values emphasise rote learning over exploratory methods fundamental to science education, leading to skepticism towards inquiry-based learning. Without culturally responsive

design, education programs may further marginalise communities facing systemic educational disparities.

4. Lack of Awareness of Science Career Pathways

Many parents lack awareness of the extensive career opportunities in STEM fields beyond traditional roles like doctors and engineers. This ignorance restricts their ability to guide, encourage, or connect their children with meaningful opportunities in science (Maseko & Hall, 2023). Specifically, those who haven't encountered entrepreneurial or interdisciplinary science may deter exploration in these areas, particularly if they view them as risky or unattainable. This issue is particularly urgent in fast-changing sectors like biotechnology, environmental sciences, and artificial intelligence, where early exposure and support can significantly influence career aspirations.

5. Inadequate School-Parent Communication and Collaboration

Effective parental education in science relies on strong school-family partnerships, which are often weak due to poor communication about science goals and limited parental involvement. Schools tend to emphasise academic performance over engagement opportunities, leading to assumptions about parents' interests and capabilities. Many parents feel excluded by complex jargon and inaccessible events (Gauthier & Smith, 2022). Additionally, there may be insufficient training for staff on collaborating with diverse or marginalised families. Without proactive inclusion strategies, relationships between schools and parents can remain transactional rather than transformative.

6. Technological Gaps and Digital Divide

In the digital age, access to science learning resources like simulations and videos hinges on reliable internet and digital literacy, which is hindered by the digital divide, particularly in rural and disadvantaged urban areas. Parents lacking internet access or digital skills face challenges in supporting their children's science education. Current initiatives using mobile apps or WhatsApp may further marginalise families with limited tech resources, exacerbating existing inequalities.

7. Time Constraints and Competing Responsibilities

Modern family life, especially in dual-income or single-parent households, faces time poverty, making it challenging to engage in science learning activities. Unlike structured subjects like reading or math, science is often viewed as optional and more susceptible to being neglected (Sasson & Yehuda, 2022). Practical barriers, including the need for preparation and materials, necessitate simplified accessible strategies to integrate science into daily life, such as through cooking, gardening, or nature observation.

Suggestions

The following suggestions were made based on the study:

1. Integration of parenting education programmes with STEM and entrepreneurship content into curriculum
2. Teachers are to leverage digital tools and community-based platforms for delivery
3. Implement monitoring and evaluation frameworks by policy maker
4. Advocate for policy support and resource allocation

Conclusion

The 21st-century workforce demands support systems for young learners in science and innovation, with parenting education being vital yet often overlooked. This paper discussed how empowering parents with knowledge and resources could yield long-term benefits for children and society. Despite challenges such as low parental science literacy and socioeconomic disparities, tailored interventions can bridge connections between home, school, and society. Incorporating entrepreneurship education into parenting programs and leveraging technology can enable parents to boost their children's science-related curiosity and future readiness. Positioning enhanced parenting education as a strategic investment in national development equity calls for a redefinition of the parent's role through policies and partnerships that recognise the family as a vital contributor to the development of future scientists and innovators.

References

Almazroa, H., Alotaibi, W., & Alrwaythi, E. (2022). Sustainable development goals and future-oriented teacher education programs. IEEE Transactions on Engineering Management, 1-2.

Barbara-Cardona, J. (2021). The building blocks of human capital: Socioculturalism and career development of Maltese youths (Doctoral dissertation, University of Leicester).

Barnes, S. A., Bimrose, J., Brown, A., Gough, J., & Wright, S. (2020). The role of parents and careers in providing careers guidance and how they can be better supported. Evidence report produced by Warwick Institute for Employment Research, pg.6-16.

Blankesteijn, M. L. M. (2024). Towards transformative experiential learning in science-and technology-based entrepreneurship education for sustainable technological innovation. *Journal of Innovation & Knowledge*, 9(3), 100544.

Breiner, H., Ford, M., Gadsden, V. L., & National Academies of Sciences, Engineering, and Medicine. (2016). Parenting knowledge, attitudes, and practices. In Parenting matters: Supporting parents of children ages 0-8. National Academies Press (US).

Gamariel, M., & Blaise, B. (2021). Parental Influence on Students' Career Choice and its Effect on Their Academic Performance. A Case of Schools in Rulindo District. *Journal Educational Verkenning*, 2(1), 13-19.

Halim, L., Abd Rahman, N., Zamri, R., & Mohtar, L. (2018). The roles of parents in cultivating children's interest towards science learning and careers. Kasetsart *Journal of Social Sciences*, 39(2), 190-196.

Irshad, A., Rasool, A., & Shehzad, M. (2025). Parental Involvement, Decision Making and Academic Performance among Students. *Dialogue Social Science Review (DSSR)*, *3*(2), 466-487.

Jan, I. (2024). Entrepreneurial teaching in Graduate Programs: Fostering an Entrepreneurial Mindset Through Technopreneurship Education.4-6

Lopez, M., & Ramirez, A. (2023). Family engagement in science education across income levels. *Science Education Quarterly*, 44(1), 67–85.

Lu, C., So, W. W. M., Chen, Y., Wiyarsi, A., Chiu, W. K. S., Ko, Y., ... & Tho, S. W. (2024). School students' aspirations for STEM careers: the influence of self-concept, parental expectations, career outcome expectations, and perceptions of STEM professionals. *Asia Pacific Journal of Education*, 1-18.

Mailula, K. (2021). An exploration of high school learners' perceived utility of career

guidance in a public township high school (Doctoral dissertation, Master's dissertation, University of the Witwatersrand).

Maseko, T., & Hall, D. (2023). Parental perceptions of STEM entrepreneurship: Barriers and breakthroughs. *International Journal of Educational Development*, 94, 102721.

Nnenna, O. F.(2024). The Historical evolution of education policies and their impact on youth empowerment in entrepreneurship. *International Journal of Youth Empowerment and Entrepreneurship Development,* 6(1)

Okeke, M., & Smith, J. (2022). Reimagining inclusive STEM education: The role of culturally responsive parenting strategies. *Equity in Education Journal*, 18(3), 215–230.

Olayemi, et al. (2018). Entrepreneurship education and national development in Nigeria. *International Journal of Innovative Education Research*, 6(3), 34-39.

Pearce, R., Zitha, I., Mokganya, G., Molaudzi, V., Nekhubvi, V., & Matsilele, O. (2025). Project-based learning for promotion of entrepreneurial education among first level science students. *International Journal of Research in Business and Social Science*, 14(1), 151-159.

Plasman, J., Gottfried, M., Williams, D., Ippolito, M., & Owens, A. (2021). Parents' occupations and students' success in STEM fields: A systematic review and narrative synthesis. Adolescent Research Review, 6, 33-44.

Pradikto, S. (2024). Exploring the entrepreneurial spirit: Student perspectives on innovation, education and career aspirations. *International Journal of Humanities Education and Social Sciences*, *3*(5).

Remorosa, M. M. R. et al. (2024).Vygotsky's Social Development Theory: The role of social interaction and language in cognitive development, *International Journal of All Research,* https://www.researchgate.net/publication/386875249, pg.10-12,

Salim B.S.(2020). Mathematics and Entrepreneurship Education: A remedy for unemployment and national development. *Journal of the Mathematics Association of Nigeria*, 45(1), 244-245.

Sasson, I., & Yehuda, I. (2022). Bridging home and school in science education: Empowering parents through informal science learning. *Journal of Research in Science Teaching*, 59(7), 1054–1072.

Sivabalan, Y., Pek, L. S., Nadarajan, N. T. M., Kusnek, H., Ismail, M. R., & Mee, R. W. M. (2024). A conceptual model of parental engagement in children's learning losses. *Quantum Journal of Social Sciences and Humanities*, *5*(3), 73-82.

Walker, T. D. (2025). Guiding intentional family leadership: New directions for educational purpose and parent involvement. In Critical Analysis of Parental Involvement in School (pp. 315-342). Routledge.

Wang, L., & Okonkwo, C. (2023). Scientific parenting and career exposure: Exploring parental roles in STEM pathways. *Career and Technical Education Research*, 48(2), 145–161.

Yaseen, M., & Hashmi, S. S. (2024). Addressing Gender Bias in Choosing Professional Fields: A Holistic Approach to Student Success. *Journal of Childhood Literacy and Societal Issues*, *3*(2), 1-16.