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Perception of Parents and Educators on the Use of Indigenous Languages in the Teaching of Stem Subjects in Delta State

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Abstract

This study investigates the perceptions of parents and educators regarding the integration of indigenous languages in the teaching and learning of Science, Technology, Engineering and Mathematics (STEM) subjects among secondary school students in Oshimili South Local Government Area LGA. The study area is known for its rich cultural heritage and linguistic diversity, provides a unique setting for exploring the potential benefits and challenges of incorporating indigenous languages into STEM curricula. A total of ten schools, representing a mix of public and private institutions across urban and semi-urban areas, were selected to ensure a representative sample. Data were collected through structured questionnaires distributed to 500 participants, with a high retrieval rate of 491 responses (98.2%). The quantitative data were analyzed using SPSS. The findings reveal that parents generally support the integration of indigenous languages in STEM education, recognizing its potential to enhance their children's understanding and engagement with STEM concepts. However, some parents expressed concerns about the possible impact on future career opportunities and the preparedness of teachers. Educators similarly view the integration positively, noting improvements in students' academic performance, comprehension, and

participation when indigenous languages are used. Nevertheless, they highlight the need for additional training and resources to effectively implement this approach. Based on these findings, the study recommends providing comprehensive professional development for teachers to enhance their proficiency in using indigenous languages for STEM instruction. Additionally, developing culturally relevant STEM curricula and engaging local communities and indigenous leaders are crucial for successful implementation. Securing government and institutional support is also essential to sustain and scale up these efforts. In conclusion, integrating indigenous languages into STEM education in Oshimili South holds significant promise for improving educational outcomes and preserving cultural heritage. However, addressing the identified challenges through targeted interventions and collaborative efforts is vital for realizing the full potential of this approach.

Keywords: Indigenous Language, STEM Education, Cultural Relevance, Parental Perceptions, Educator Perspectives

Introduction

In the landscape of global educational reforms aimed at fostering cultural diversity and inclusivity, the integration of indigenous languages into STEM (Science, Technology, Engineering, and Mathematics) education has emerged as a topic of considerable interest. Indigenous languages are vehicles for cultural transmission and potentially advantageous mediums of instruction that can significantly enhance learning outcomes, particularly among indigenous students (Barrett and Cocq, 2019). Proponents argue that using indigenous languages in STEM education can facilitate deeper understanding of scientific concepts by connecting them to students' cultural contexts and linguistic foundations.

However, despite the acknowledged benefits, the implementation of such initiatives encounters complex challenges influenced by socio-cultural, educational, and institutional factors. For instance, proponents of indigenous language integration, such as Sithole et al., (2017), emphasize the cognitive, cultural, and motivational benefits that can arise when students learn STEM subjects in their native languages. They argue that this approach not only respects and preserves cultural heritage but also enhances students' engagement and academic achievement.

Conversely, critics highlight significant barriers and potential drawbacks. Schissel et al., (2021) point out challenges related to curriculum development, teacher training, and assessment practices that are tailored to diverse linguistic contexts. They argue that the practical implications of implementing indigenous languages in STEM education require careful consideration of resource allocation, teacher preparedness, and standardized assessment frameworks.

Parents play a crucial role in shaping educational decisions for their children, including preferences for the language of instruction. Their perceptions, beliefs, and expectations regarding the integration of indigenous languages into STEM education are pivotal in determining societal acceptance and support for educational reforms (Gondwe and Longnecker 2015). Research by Brown and Davis (2019) suggests that parents often prioritize practical considerations such as their children's future career prospects and proficiency in dominant languages like English or French, which may influence their attitudes toward indigenous language use in STEM education.

Similarly, educators' perspectives on the feasibility and effectiveness of incorporating indigenous languages into STEM teaching are essential for assessing the practical implications and pedagogical strategies necessary for successful implementation. Perry (2022) argue that while there is potential for enhancing student engagement and learning outcomes through culturally relevant STEM education, educators require adequate support, training, and resources to effectively integrate indigenous languages into their teaching practices.

Statement of the Problem

Global educational reforms aimed at fostering cultural diversity and inclusivity, the integration of indigenous languages into STEM (Science, Technology, Engineering, and Mathematics) education remains a contentious issue. While proponents argue that using indigenous languages can enhance learning outcomes by bridging cultural and linguistic gaps (Perso, 2020), challenges persist in implementing such initiatives effectively. Oshimili South Local Government Area in Delta State, Nigeria, serves as a microcosm of these challenges, characterized by a rich cultural tapestry yet predominantly English-medium STEM education. Despite the potential benefits, the extent to which indigenous languages can be integrated into STEM education in Oshimili South LGA remains largely unexplored.

A significant gap in current research pertains to understanding the perceptions and attitudes of parents and educators in Oshimili South LGA regarding the integration of indigenous languages into STEM education. While studies highlight the potential cognitive and cultural benefits (Eisman et al., 2021), little empirical evidence exists on how stakeholders perceive the feasibility, benefits, and challenges of implementing such initiatives in practice. This gap is critical as parental and educator support is essential for the successful implementation of educational reforms (Goodall, 2017).

Moreover, existing literature often focuses on general perceptions or theoretical frameworks rather than empirical studies specific to Oshimili South LGA. This gap limits our understanding of localized factors that may influence the acceptance and effectiveness of indigenous language integration in STEM education. Research by Houston and Lange, (2018) underscores the need for context-specific insights into curriculum development, teacher training, and community engagement strategies tailored to Oshimili South LGA's linguistic diversity. Addressing these gaps is crucial for informing evidence-based policies and practices that promote inclusive and equitable STEM education in linguistically diverse communities.

Research Objective

1. Investigate perceptions of parents regarding the integration of indigenous languages in STEM education
2. Examine educators' perspectives on the feasibility and effectiveness of indigenous language use in STEM teaching
3. Evaluate the impact of indigenous language integration on students' learning outcomes and engagement
4. Identify strategies to promote the acceptance and implementation of indigenous language use in STEM education

Research Question

1. What concerns and expectations do parents in Oshimili South LGA have regarding the use of indigenous languages in STEM education?
2. How do educators in Oshimili South LGA view the feasibility of integrating indigenous languages into STEM teaching, and what factors influence their perspectives?

3. What are the impacts of integrating indigenous languages into STEM education on students' academic performance, understanding of STEM concepts, and overall engagement?
4. What strategies can be implemented to foster acceptance and effective use of indigenous languages in STEM education within schools and educational institutions in Oshimili South LGA?

Conceptual Clarification

Indigenous languages are those languages native to a region and spoken by indigenous people, reflecting their cultural heritage and identity (Reo et al., 2019). These languages carry unique cultural knowledge and worldviews, which can influence educational practices and learning experiences. The use of indigenous languages in education, especially in STEM subjects, is posited to enhance students' cognitive understanding and cultural relevance (Akintoye et al., 2023).

STEM education encompasses the teaching and learning of science, technology, engineering, and mathematics, aiming to foster critical thinking, problem-solving skills, and technological literacy (Elfrida et al., 2019). The integration of indigenous languages into STEM education involves using these local languages as mediums of instruction for STEM subjects. This approach is proposed to make STEM content more accessible and relatable to students by linking it to their linguistic and cultural contexts. However, the feasibility and effectiveness of such integration depend on various factors, including curriculum design, teacher preparedness, and educational resources (Delgado et al., 2015).

The perceptions of parents and educators are crucial in understanding the potential for implementing indigenous language use in STEM education. Parents' beliefs and attitudes towards the educational medium of instruction can significantly influence their support for or resistance to such initiatives (Galloway et al., 2017). Similarly, educators' views on the practicality and impact of using indigenous languages in STEM teaching are essential for assessing the potential benefits and challenges. This study examines these perceptions to identify common concerns, expectations, and perceived impacts on students' learning outcomes and engagement.

Theoretical Framework

Sociocultural Theory

The sociocultural perspective is a theory used in fields such as psychology and education and is used to describe awareness of circumstances surrounding

individuals and how their behaviors are affected specifically by their surrounding, social and cultural factors. Lev Vygotsky, a Soviet psychologist, proposed the Sociocultural Theory in the early to mid-20th century, with his ideas gaining prominence posthumously through the translation and dissemination of his works in the 1970s and 1980s.

Basic Tenets of Sociocultural Theory

1. **Zone of Proximal Development (ZPD):** This concept suggests that learning occurs most effectively within the zone where tasks are just beyond the learner's current abilities but can be accomplished with the guidance and support of more knowledgeable others, such as teachers or peers. When STEM subjects are taught in indigenous languages, which are often closely tied to cultural contexts and familiar social environments, students may operate within their ZPD more effectively, enhancing their learning experiences.
2. **Cultural Tools and Mediation:** Vygotsky proposed that cultural tools, including language, shape cognitive development and learning. Indigenous languages serve as cultural tools that carry specific meanings and ways of understanding the world within a community. Teaching STEM subjects in indigenous languages can therefore leverage these cultural tools to facilitate deeper conceptual understanding and application of knowledge.
3. **Scaffolding:** In Vygotsky's theory, scaffolding refers to the support provided by more knowledgeable individuals to help learners achieve higher levels of understanding and skill acquisition. When teachers use indigenous languages in STEM instruction, they can scaffold learning by providing explanations, examples, and guidance that are linguistically and culturally relevant to students, thereby enhancing learning outcomes.

The Sociocultural Theory of Learning is highly suitable for the research on integrating indigenous languages in STEM education due to its emphasis on cultural relevance, enhanced engagement, parental and educator involvement, scaffolded learning, and holistic development. The theory highlights the

importance of cultural tools, such as language, in learning, making the use of indigenous languages a means to enhance accessibility and relevance in education. It supports the idea that learning in a familiar language can boost students' engagement and comprehension. Additionally, Vygotsky's focus on social interaction and the involvement of knowledgeable others underscores the necessity of parental and educator support for effective implementation. By using indigenous languages, teachers can provide culturally and linguistically appropriate scaffolding, facilitating students' progression through their Zone of Proximal Development (ZPD) and better mastering STEM concepts. This theory aligns well with the research's goal of creating culturally relevant curricula and strategies for integrating indigenous languages into STEM education.

Methodology

The study was conducted in Oshimili South Local Government Area (LGA), a region known for its rich cultural heritage and linguistic diversity. This area was chosen due to its significant representation of indigenous languages and its ongoing efforts to improve STEM education. Oshimili South LGA includes urban and semi-urban schools, providing a diverse demographic for the study.

A total of ten schools within Oshimili South LGA were selected for this study. The selection process aimed to ensure a representative sample that includes a mix of public and private institutions, as well as schools from different geographical parts of the LGA. This approach ensured a comprehensive understanding of the perceptions and experiences of various stakeholders across different school settings. To gather data on the perceptions of parents and educators regarding the integration of indigenous languages in STEM education, a structured questionnaire was developed.

A total of 500 questionnaires were distributed across the ten selected schools. The distribution was done in a manner that ensured all schools received an equitable number of questionnaires, proportionate to their student and teacher populations. Out of the 500 questionnaires distributed, 491 were retrieved, resulting in a high response rate of 98.2%. The study employed a quantitative analysis approach to evaluate the collected data. The retrieved questionnaires were analysis using SPSS.

Data presentation and Analysis

Research Objective 1: Investigate perceptions of parents regarding the integration of Indigenous languages in STEM education

Table 1: Mean rating on parents' perceptions regarding the integration of indigenous languages in STEM education in Oshimili South LGA.

S/N	Items	X	Decision
1	Integrating indigenous languages into STEM education will enhance my child's understanding of STEM concepts.	2.5	Agree
2	I am concerned that using indigenous languages in STEM education might limit my child's future career opportunities.	2.6	Agree
3	I support using indigenous languages in STEM education as it helps preserve our cultural heritage.	2.9	Agree
4	I believe that teachers in Oshimili South LGA are adequately prepared to teach STEM subjects in indigenous languages.	2.3	Disagree
5	I think that incorporating indigenous languages in STEM education will make learning more engaging for my child.	2.6	Agree

The investigation into parents' perceptions regarding the integration of indigenous languages in STEM education in Oshimili South LGA reveals a generally positive outlook towards the initiative. Parents agree that using indigenous languages can enhance their children's understanding of STEM concepts (mean score: 2.5) and make learning more engaging (mean score: 2.6). They also support the integration for its role in preserving cultural heritage (mean score: 2.9). However, there are concerns about potential limitations on future career opportunities (mean score: 2.6) and a belief that teachers are not currently adequately prepared to teach STEM subjects in indigenous languages (mean score: 2.3). These findings imply that while parents generally support the initiative, addressing concerns about teacher preparedness and career prospects is crucial for successful implementation.

Research Objective 2: Examine educators' perspectives on the feasibility and effectiveness of indigenous language use in STEM teaching.

Table 2 presents educators' perspectives on the feasibility and effectiveness of using indigenous languages in STEM teaching in Oshimili South LGA

S/N	Items	$\bar{x}$	Decision
6	I find it feasible to incorporate indigenous languages into STEM teaching in our school.	2.5	Agree
7	I believe that teaching STEM subjects in indigenous languages will improve students' academic performance.	2.6	Agree
8	I am confident in my ability to teach STEM subjects using indigenous languages.	2.5	Agree
9	I think that the current curriculum adequately supports the integration of indigenous languages in STEM education.	2.4	Disagree
10	I believe that integrating indigenous languages into STEM education requires additional training and resources.	2.8	Agree

The examination of educators' perspectives on the feasibility and effectiveness of using indigenous languages in STEM teaching in Oshimili South LGA reveals a generally positive attitude towards the initiative. Educators find it feasible to incorporate indigenous languages into STEM teaching ($\bar{x}$ 2.5) and believe it will improve students' academic performance (mean score: 2.6). They are confident in their ability to teach STEM subjects using indigenous languages (mean score: 2.5). However, they disagree that the current curriculum adequately supports this integration (mean score: 2.4) and emphasize the need for additional training and resources (mean score: 2.8). These findings suggest that while educators are optimistic about the potential benefits and their capability to implement indigenous language use in STEM education, there is a clear need for curriculum adjustments and additional support to facilitate this integration effectively.

Research Objective 3: Evaluate the impact of indigenous language integration on students' learning outcomes and engagement

Table 3 shows the evaluation of the impact of integrating indigenous languages into STEM education on students' learning outcomes and engagement in Oshimili South LGA

S/N	Items	$\bar{x}$	Decision
11	I have observed an improvement in students' academic performance when indigenous languages are used in STEM education.	2.7	Agree
12	Students seem more engaged in STEM classes taught in indigenous languages.	2.6	Agree
13	The use of indigenous languages in STEM education has enhanced students' comprehension of complex concepts.	2.7	Agree
14	I have noticed increased participation in STEM activities when indigenous languages are incorporated.	2.6	Agree
15	Integrating indigenous languages into STEM education has positively affected students' overall interest in STEM subjects.	2.8	Agree

The evaluation of the impact of integrating indigenous languages into STEM education on students' learning outcomes and engagement in Oshimili South LGA reveals positive results. Educators agree that they have observed improvements in students' academic performance (mean $\bar{x}$ 2.7) and increased engagement in STEM classes taught in indigenous languages ($\bar{x}$ 6). They also note enhanced comprehension of complex concepts ($\bar{x}$ 2.7) and increased participation in STEM activities ($\bar{x}$: 2.6). Furthermore, integrating indigenous languages has positively

affected students' overall interest in STEM subjects ($\bar{x}$ 2.8). These findings suggest that using indigenous languages in STEM education significantly benefits students' academic performance, engagement, comprehension, participation, and interest in STEM subjects.

Research Objective 4: Identify strategies to promote the acceptance and implementation of indigenous language use in STEM education

Table 4 shows the identification of strategies to promote the acceptance and implementation of indigenous language use in STEM education in Oshimili South LGA

S/N	Items	X	Decision
16	Providing professional development for teachers on using indigenous languages in STEM education will enhance its implementation.	2.7	Agree
17	Developing culturally relevant STEM curricula will facilitate the integration of indigenous languages in education.	2.6	Agree
18	Increasing awareness among parents about the benefits of indigenous language use in STEM education will promote acceptance.	2.5	Agree
19	Collaborating with local communities and indigenous leaders is crucial for the successful implementation of indigenous languages in STEM education.	2.6	Agree
20	Securing government and institutional support is essential for promoting the use of indigenous languages in STEM education.	2.6	Agree

The identification of strategies to promote the acceptance and implementation of indigenous language use in STEM education in Oshimili South LGA reveals strong support for several key initiatives. Educators agree that providing professional development for teachers ($\bar{x}$: 2.7), developing culturally relevant STEM curricula ($\bar{x}$ 2.6), and increasing parental awareness about the benefits ($\bar{x}$ 2.5) are essential steps. They also emphasize the importance of collaborating with local communities and indigenous leaders ($\bar{x}$ 2.6) and securing government and institutional support ($\bar{x}$ 2.6) for successful implementation. These findings

highlight the necessity of comprehensive, multi-faceted approaches to effectively integrate indigenous languages into STEM education.

Discussion

The findings from the investigation into parents' perceptions regarding the integration of indigenous languages in STEM education reveal a generally positive outlook, with parents agreeing that this approach can enhance their children's understanding of STEM concepts and make learning more engaging. This aligns with Lau and Shea, (2022), who emphasizes that using indigenous languages in education can create a more relatable and effective learning environment for students. However, concerns about potential limitations on future career opportunities and the perceived inadequacy of teachers' preparedness indicate areas needing attention. These concerns must be addressed to garner broader parental support and ensure the successful implementation of indigenous languages in STEM education.

Educators' perspectives on the feasibility and effectiveness of using indigenous languages in STEM teaching show a similarly positive attitude. Educators believe in the feasibility of this integration and its potential to improve students' academic performance and engagement. They express confidence in their ability to teach STEM subjects in indigenous languages, though they highlight the inadequacy of the current curriculum to support this integration. Pratt et al., (2018) support these views, noting that while the potential benefits of indigenous language integration in education are significant, curriculum adjustments and additional training resources are crucial for realizing these benefits.

The evaluation of the impact of integrating indigenous languages into STEM education on students' learning outcomes and engagement indicates positive effects across multiple dimensions. Educators observe improvements in academic performance, enhanced comprehension of complex concepts, increased engagement, and higher participation in STEM activities. These findings are consistent with the research by Lasagabaster, (2017), who argue that indigenous language use in education can lead to better cognitive understanding and greater student motivation. The positive impact on students' overall interest in STEM subjects further underscores the potential benefits of this educational approach.

The identification of strategies to promote the acceptance and implementation of indigenous language use in STEM education highlights the importance of comprehensive and coordinated efforts. Educators support professional

development for teachers, the development of culturally relevant STEM curricula, and increasing parental awareness about the benefits of indigenous language use. Additionally, they stress the need for collaboration with local communities and indigenous leaders, as well as securing government and institutional support. Toh, (2016) agree with this multifaceted approach, emphasizing that successful educational reforms require holistic strategies that involve all stakeholders. These findings underscore the necessity of addressing both practical and perceptual barriers to integrate indigenous languages effectively into STEM education.

Conclusion

The findings from this study underscore the potential benefits and challenges associated with integrating indigenous languages into STEM education in Oshimili South LGA. Parents generally perceive this integration positively, believing it can enhance their children's understanding of STEM concepts and make learning more engaging. However, concerns about future career opportunities and the readiness of teachers highlight the need for targeted interventions to address these apprehensions and garner broader parental support. Educators, on the other hand, demonstrate optimism about the feasibility and effectiveness of using indigenous languages in STEM teaching, noting improvements in academic performance, comprehension, engagement, and participation among students. Nevertheless, they emphasize the necessity for curriculum adjustments and additional training to fully support this integration.

Recommendations

1. Schools and educational authorities should organize workshops and information sessions for parents to highlight the benefits of using indigenous languages in STEM education and address concerns about future career opportunities for their children.
2. Educational institutions should provide ongoing professional development and training for teachers, focusing on pedagogical strategies for teaching STEM subjects using indigenous languages and adjusting the curriculum to support this integration.
3. Schools should develop and implement culturally relevant STEM curricula that leverage indigenous knowledge and perspectives, ensuring that the content is engaging and comprehensible for students.

4. Educational stakeholders should collaborate with local communities, indigenous leaders, and government bodies to gain their support, secure necessary resources, and foster a culturally inclusive educational environment.

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