

**TEACHER'S PERCEPTIONS ON THE INFLUENCE OF COMPUTATIONAL
THINKING ON INDIGENOUS LANGUAGE LEARNING**

BY

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CERTIFICATION

We, the undersign certify that this project work is adequate in scope and was carried out by OMUBO-PEPPLE ALAGBARIA with Mat. No. EDU2009206 in the Department of Curriculum And Institutional Technology under the supervision of Mr Osemwengie-Ero. In partial fulfillment for the award of B.Sc. (Ed) Degree in Computer science.

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DEDICATION

This work is dedicated to Almighty God for his grace that ensured the success of this research project. I also dedicate this work to my parents Mr. and Mrs. Freddie Nathan Omubo-Pepple, along with my siblings who have encouraged me all the way and whose encouragement made sure that I give it my all to finish that which I started.

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TABLE OF CONTENT

	PAGES
TITLE PAGE	i
CERTIFICATION	ii
DEDICATION	iii
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	vii
ABSTRACT	vii
CHAPTER ONE: INTRODUCTION	
Background of the Study	1
Statement of the problem	5
Research questions	6
Research Hypothesis	6
Purpose of the study	7
Significance of the study	7
Scope and Delimitation of the Study	8
Definition of Terms	8
CHAPTER TWO: REVIEW OF RELATED LITERATURE	
Theoretical Framework	10
Computational Thinking Activities in Indigenous Language	
Learning Institution	12
Teachers ICT Preparedness ForImplementing Computational Thinking	19
The Support Needed For Effective Computational Thinking Integration	20
Summary of Literature review	25
CHAPTER THREE: RESEARCH METHODOLOGY	
Research Design	28
Population of the Study	28

	PAGES
Sample and Sampling Techniques	28
Research Instrument	29
Validity of the Instrument	30
Reliability of the Instrument	30
Administration of Instrument	30
Method of Data Analysis	31
 CHAPTER FOUR: PRESENTATION OF DATA, ANALYSIS AND INTERPRETATION OF RESULTS	
Data Presentation	32
Discussion of Findings	38
 CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION	
Summary	40
Conclusion	42
Recommendation	43
REFERENCE	45
APPENDICES	

LIST OF TABLES

	Pages
Table 1: Distribution of Teachers genders in Correspondence to sample size	29
Table 2: The perceived advantages of computational thinking in Indigenous language learning	32
Table 3: The perceived disadvantages of computational thinking	33
Table 4: The preparedness to implement computational thinking	34
Table 5: The support required for effective implementation of computational thinking	35
Table 6: The result of hypothesis testing using chi-square test	37

ABSTRACT

This study examines teachers' perceptions of the influence of computational thinking (CT) on Indigenous language learning in Nigeria. Computational thinking, recognized as a critical 21st-century skill, encompasses problem-solving processes such as abstraction, pattern recognition, decomposition, and algorithmic reasoning. Its integration into language education has been proposed as a means of enhancing learner engagement, comprehension, and creativity. However, the effectiveness of this integration depends largely on teachers' readiness, attitudes, and the level of institutional support available. Therefore, the study specifically explores the perceived benefits and challenges of applying computational thinking in Indigenous language teaching, evaluates teachers' level of ICT preparedness, and identifies the support systems required for its effective implementation. The purpose of this study is to examine the perceived advantages and challenges of applying computational thinking in Indigenous language teaching, assess teachers' level of ICT preparedness, and identify the forms of support required for effective implementation. The study was guided by research questions focusing on teachers' perceptions of the benefits of computational thinking, the challenges encountered during its application, the level of teachers' ICT competence, and the support systems needed to facilitate its integration.

The study adopted a descriptive survey research design. The population comprised Indigenous language teachers in secondary schools within Oredo Local Government Area of Edo State. Data were collected through a structured questionnaire designed to capture teachers' perceptions, experiences, and competencies related to computational thinking and ICT usage. The collected data were analyzed using mean scores and standard deviations to determine trends and patterns in responses across the research questions.

The findings revealed that computational thinking offers significant educational benefits, including improved learner engagement, enhanced vocabulary development, and strengthened problem-solving skills. Despite these advantages, several challenges were identified, such as limited training opportunities, inadequate ICT facilities, increased time required for lesson preparation, and concerns regarding the cultural relevance of digital learning activities. The study further showed that although teachers possess basic ICT skills, many lack the confidence to implement innovative digital teaching strategies. Based on these findings, the study concludes that computational thinking has strong potential to enhance Indigenous language learning when supported by adequate training, technological infrastructure, and enabling policies. It therefore recommends that educational authorities and policymakers provide targeted professional development, improve access to ICT resources, and promote collaboration among teachers, technology experts, and community stakeholders to ensure effective and culturally responsive integration of computational thinking in language education.

CHAPTER ONE

INTRODUCTION

Background Of Study

Computational thinking (CT) has emerged as a fundamental 21st-century skill. Scholars note that CT equips learners with problem-solving strategies including abstraction, decomposition, and algorithmic reasoning applicable across disciplines (Denning & Tedre, 2021; Lai, 2023). Wing in 2006 first reintroduced CT to K–12 education as a way to “conceptualize and approach problems” using core computer science concepts. Since then, researchers worldwide have integrated CT into diverse subjects for example: Lai (2023) reports that CT activities have been introduced in language and humanities courses to strengthen learners’ reading and writing abilities via programming exercises. In Nigeria, educational technology research is expanding, with recent studies advocating game-based and co-design pedagogies (e.g. using Scratch) to teach CT to K–12 and university students (Oyelere, A. S., Agbo, F. J., Suhonen, J., Jormanainen, I., & Tukiainen, M., 2025). These efforts reflect a broader policy push to develop digital literacy and problem solving skills in Nigerian education.

Nigeria is one of the world’s most linguistically diverse countries, with over 500 indigenous languages spoken across more than 250 ethnic groups. The Nigerian National Policy on Education acknowledges this diversity by mandating mother-tongue instruction in early grades (Primary 1–3), followed by English in higher grades. In practice, however, English has come to dominate classrooms at all levels (Isa, A., Abd Rahman, A., Halili, S. H., Abdul Razak, R., Nasreen, F., & Muzakkir, M., 2024). Globalization and historical colonial influence have led many Nigerian elites to favor English, creating a “gap” between the home language and the school language. This marginalization of local languages has serious cultural implications: Olagbaju (2023) observes that the influx of foreign languages and media is “crushing” Nigeria’s

indigenous educational content (folktales, rites, etc.), threatening the survival of local languages and cultural heritage. Indeed, recent studies emphasize that language is a repository of culture and cognition, and its erosion undermines community identity (Dimkpa & Eze, 2023; Ajala, A., Adewale, O., & Yusuf, M., 2025). At the same time, policy experts note persistent obstacles to revitalizing mother-tongue education in Nigeria, including a severe shortage of trained teachers, societal attitudes favoring English, the complexity of Nigeria’s multilingual landscape, and a lack of teaching resources. As Isa et al. (2024) recommend, addressing these challenges will require systematic reforms – for example, creating a multilingual curriculum framework, strengthening teacher preparation, and leveraging digital tools to support indigenous languages. Previous research underscores the pedagogical value of indigenous languages. Teachers in Nigeria often believe that using the mother tongue enhances comprehension and preserves culture. For example, Adedigba et al. (2023) found that Nigerian teachers view indigenous languages as “a powerful tool for culture preservation” and report that students achieve deeper understanding when instructed in their home language rather than a foreign language. Such findings align with longstanding theories of bilingual education: early cognitive development and literacy are most effective in a learner’s first language, which in turn anchors cultural identity.

The intersection of CT and indigenous language education is a promising but underexplored frontier. Several scholars argue that CT concepts and tools can be adapted to support language learning and preservation. Lai (2023), for instance, notes that CT has been introduced into language and arts classes, using programming tasks to enhance reading and writing skills. In Nigeria, one illustration is the development of programming languages based on indigenous lexicons: Olatunji et al. (2018) designed a prototype “Yoruba-based” programming language and

argue that coding in the mother tongue could improve Nigerian students' grasp of computational problem solving. Likewise, digital media initiatives (such as language-learning podcasts or educational apps) suggest new ways to marry technology with local languages. For example, Ajala et al. (2025) highlight how the adoption of colonial languages has endangered African languages, and they explore digital approaches (like podcasting in Yoruba) that generate both enthusiasm and challenges for language learners. In short, CT offers tools (algorithmic thinking, programming environments, language processing) that could be repurposed to develop resources (e.g. apps, curricula) in indigenous languages. At the same time, success depends critically on teacher involvement: educators must be willing and able to blend CT instruction with local linguistic content.

Computational thinking equips learners with the ability to analyze complex information, identify patterns, and develop effective solutions. These skills are invaluable for navigating the complexities of language learning, particularly within the context of diverse linguistic and cultural perspectives (Grover & Pea, 2013).

While research on the benefits of computational thinking in general education is growing, its specific application to indigenous language learning remains relatively unexplored. This study aims to address this gap by investigating the perspectives and experiences of teachers regarding the integration of computational thinking into the teaching and learning of indigenous language (Grover & Pea, 2013).

Drawing upon research by Mishra and Koehler (2016) on the Technological Pedagogical Content Knowledge (TPACK) framework, this study will examine how teachers' beliefs about technology, pedagogy, and content knowledge influence their willingness and ability to integrate computational thinking into their institution. Recognizing the importance of professional

development in supporting teachers' integration of new technologies and pedagogical approaches (Ertmer & Newby, 2013), this research will also explore teachers' perceived needs and preferences for professional development related to computational thinking in indigenous language education.

Furthermore, this study will consider the findings of research by Dede (2012) on the challenges and opportunities of technology integration in education to identify and address potential barriers to the successful implementation of computational thinking in indigenous language classrooms. By understanding teachers' perspectives and addressing their concerns, this research aims to inform the development of effective and sustainable strategies for integrating computational thinking into indigenous language education and ultimately contribute to the revitalization and preservation of these valuable linguistic and cultural resources (Ertmer & Newby, 2013).

In understanding teachers' perceptions of the influence of Computational Thinking on indigenous language learning, it is also important to consider demographic factors that may shape how teachers engage with CT-related practices. The variables of sex and institution level offer meaningful insight into how teachers experience training, access resources, and adopt new pedagogical approaches. Sex as a demographic characteristic, is often examined in educational technology research because male and female teachers may differ in their levels of confidence, ICT exposure, and willingness to experiment with innovative instructional strategies (Homles, 2021; Ngadengon, 2024).

Although such differences are not universal, they remain relevant to understanding whether gender plays a role in shaping teachers' readiness and ability to integrate CT into Indigenous language lessons. Likewise, institution level whether teachers operate in junior secondary, senior secondary or the university can influence the extent to which Computational Thinking is

emphasized within the curriculum, the availability of ICT resources, and the type of pedagogical demands placed on teachers (UNESCO, 2019). Teachers in higher levels may receive more ICT-related training, while those in lower levels may face resource limitations that affect CT integration. Considering these demographic variables provides a clearer picture of the contextual and structural factors that influence teachers' CT use. Their inclusion strengthens the study by helping identify whether differences in CT adoption arise from gendered patterns or institutional disparities, thereby guiding more targeted professional development, equitable support structures, and context-sensitive implementation strategies for integrating Computational Thinking into Indigenous language learning.

Statement Of Problem

In Nigeria, numerous indigenous languages, including Igbo, Yoruba, Hausa, and countless smaller languages, are facing the threat of extinction. Factors such as cultural assimilation, urbanization, and the dominance of English as a medium of instruction significantly contribute to this alarming trend.

Despite government efforts to promote indigenous language education, challenges such as a lack of qualified teachers, inadequate resources, and ineffective teaching methodologies persist. Traditional language learning methods often fail to engage learners and foster a deep understanding of language and culture, leading to low motivation and limited proficiency among students (Gay G. 2018).

The loss of Nigerian indigenous languages has profound cultural, social, and cognitive implications. It erodes cultural heritage, diminishes linguistic diversity, and limits cognitive development. Furthermore, the disappearance of these languages can lead to the loss of valuable knowledge systems, traditional practices, and unique worldviews.

While there is growing interest in language revitalization in Nigeria, there is a critical need for innovative approaches that leverage technology and computational thinking to address the specific challenges faced by indigenous languages (Mishra & Koehler, 2016). Existing research has primarily focused on traditional language education methods, with limited exploration of the potential of computational tools and techniques to enhance language learning and cultural transmission.

This study aims to address this gap by investigating the perspectives and experiences of teachers regarding the integration of computational thinking into the teaching and learning of Indigenous language. Specifically, the research will explore teacher perceptions of the potential benefits and challenges of integrating computational thinking into indigenous language learning, their beliefs about the role of technology and innovative pedagogical approaches in revitalizing indigenous languages, their perceived needs and preferences for professional development related to computational thinking integration in indigenous language education, and the extent to which they believe computational thinking can enhance student engagement, motivation, and language proficiency. By understanding teachers' perspectives and addressing their concerns, this research seeks to inform the development of effective and culturally appropriate computational thinking-based interventions for revitalizing indigenous languages in Nigeria.

Research questions

1. What advantages do Indigenous language identify in the use of Computational thinking in their lesson?
2. What disadvantages do Indigenous language identify in the use of Computational thinking skills in their lessons?
3. To what extent are Indigenous language teachers' ICT prepared to use Computational thinking in teaching?

4. What form of support do Indigenous language teachers need to effectively implement computational thinking in their teaching?

Research hypothesis.

1. There is no significant difference between Indigenous language teachers' extent of Computational thinking use based on Sex
2. There is no significant difference between Indigenous language teachers' extent of Computational thinking use based on Institution Level

Purpose of study

The primary purpose of this study is to explore and understand the perceptions of teachers regarding the potential influence and integration of computational thinking skills into the teaching and learning of the Igbo indigenous language in Nigeria. Specifically, this research aims to:

1. Examine the perceived advantages of using Computational thinking in indigenous language teaching
2. Identify perceived disadvantages of integrating computational thinking into Indigenous language lessons
3. Determine the extent of Indigenous language teachers' ICT preparedness for using Computational thinking in their teaching
4. Explore the types of support that Indigenous language teachers require to effectively implement computational thinking in their instructional practices
5. To determine whether there is any significant difference in the extent of Computational Thinking (CT) use among Indigenous language teachers based on institution level.
6. To examine whether institution level influences the adoption and application of Computational Thinking in the teaching of Indigenous languages.

Significance of study

Demonstrating a tangible link between computational thinking and enhanced language acquisition can provide empirical evidence to support the integration of these skills into indigenous language curricula. This, in turn, can inform the development of culturally relevant and engaging teaching methodologies that resonate with indigenous learners.

Furthermore, it offers a unique perspective on how computational thinking, often associated with STEM fields, can be a powerful tool for humanities-based disciplines, specifically language education. This interdisciplinary approach can spark new conversations and inspire further research into the transformative potential of computational thinking across diverse subject areas.

Beyond the academic realm, by providing evidence-based strategies for enhancing language learning, the study can equip communities with valuable tools and resources to actively support the preservation and transmission of their ancestral languages to future generations. Integrating computational thinking skills can empower indigenous individuals to create their own digital resources, language learning applications, and interactive tools, fostering greater community ownership and engagement in language revitalization. Ultimately, this research aims to contribute to a more equitable and culturally rich educational landscape where indigenous languages not only survive but thrive in the 21st century.

Scope/Delimitation of study

This study focuses specifically on the perceptions of Language teachers involved in teaching the Indigenous language in Nigeria. It investigates their views, beliefs, attitudes, and perceived needs concerning the integration of computational thinking skills into their language instruction. The scope includes exploring perceived benefits (like enhanced engagement, critical thinking, cultural transmission) and challenges (like resource availability, teacher training, pedagogical shifts), as well as requirements for successful implementation, particularly regarding professional development.

This study focuses on Indigenous language teachers working within the secondary education levels in Nigeria, with particular emphasis on institutions located in Edo State, specifically within the Oredo Local Government Area, where Indigenous language instruction is formally included in the school curriculum.

The investigation is limited to teachers who actively teach Indigenous languages such as Edo, Esan, and related languages offered within the region. The study examines their perceptions of the advantages and disadvantages of integrating Computational Thinking into Indigenous language lessons, their level of ICT preparedness for such integration, and the forms of support they require for effective implementation. The scope does not extend to students, administrators, policymakers, or teachers of non-indigenous language subjects, nor does it evaluate actual classroom performance or language proficiency outcomes. Instead, it concentrates solely on teachers' self-reported experiences, preparedness levels, and perceived needs within the defined geographical and institutional boundaries

Operational definitions of terms

Computational Thinking (computational thinking): Defined as a problem-solving approach involving decomposition, pattern recognition, abstraction, and algorithm design, as outlined by Wing (2016).

Indigenous Language: The language spoken by the people primarily in a particular ethnic group in Nigeria.

Teacher Perceptions: Gathered through interviews, focus groups, and surveys exploring teachers' beliefs, attitudes, and experiences regarding computational thinking integration in indigenous language instruction.

Indigenous Language Teacher: A qualified educator who teaches one or more Nigerian indigenous languages—such as Yoruba, Igbo, Hausa, or other recognized local languages—within a formal educational setting (secondary or tertiary institution) and is directly involved in classroom instruction, assessment, and curriculum delivery related to that language.

CHAPTER TWO

LITERATURE REVIEW

INTRODUCTION

This chapter presents a review of literature relating to Teacher's Perceptions On The Influence Of Computational Thinking On Indigenous Language Learning. This review was conducted under the following sub-headings;

- **Theoretical Framework**
- **Computational Thinking and Indigenous Language Learning**
- **Teachers' ICT Preparedness for Implementing Computational Thinking**
- **The Support Needed for Effective Computational Thinking Integration**
- Demographic Variables in the Study
- **Summary of Literature Review**

THEORETICAL FRAMEWORK

This study is grounded in Constructivist Learning Theory and Culturally Responsive Teaching and Learning (CRT), two frameworks that offer complementary perspectives on effective education, particularly within the context of indigenous language learning. Constructivism posits that learners actively construct knowledge through experiences and reflections, rather than passively receiving information. This active process, where learners build upon existing knowledge to understand and apply new concepts, emphasizes the learner's role in creating meaning through interaction with the world. In this framework, learning is personalized, subjective, and socially constructed through collaboration and interaction.

Constructivist principles necessitate a shift from the teacher as a direct instructor to a facilitator of learning experiences, designing activities that encourage exploration, problem-solving, and critical thinking (Brooks & Brooks, 2015). Key features include active engagement, where knowledge is actively constructed by the learner, the use of hands-on activities and real-world contexts, and scaffolding to support learning (Doolittle & Camp, 2019). Prior knowledge, active learning, and social interaction are crucial elements in this process. Learning is enhanced when new information is connected to prior knowledge, when students actively participate in the learning process, and when collaboration and dialogue are encouraged (Doolittle & Camp, 2019).

Complementing constructivism, Culturally Responsive Teaching (CRT) is a pedagogical approach that values students' diverse cultures, languages, and experiences, integrating them into the learning process (Gay, 2018). CRT emphasizes cultural competence for educators, the validation of students' cultural backgrounds, and the promotion of social justice (Gay, 2018). It also involves understanding diverse learning needs, utilizing culturally significant instruction styles, and adopting asset-based views that recognize students' strengths (Nieto, 2016). CRT challenges traditional "one-size-fits-all" approaches by acknowledging the unique cultural assets students bring to the classroom.

Key features of CRT include maintaining high expectations, implementing a culturally relevant curriculum, building strong relationships with students and families, and developing teachers' cultural competence (Villegas & Lucas, 2014; Paris & Alim, 2017). It also involves student-centered instruction, integrating linguistic diversity, developing critical consciousness, and fostering family and community engagement (Paris & Alim, 2017). By emphasizing high expectations and culturally relevant materials, CRT ensures that students' cultures are valued and that education empowers them.

Constructivist Learning Theory and CRT share significant intersections. Both emphasize building upon students' prior knowledge and advocate for active and relevant learning experiences. The social construction of knowledge in constructivism aligns with CRT's focus on the cultural context of learning, highlighting the importance of collaboration and culturally inclusive environments (Gay, 2018). Both theories also value student choice and agency, collaborative learning, and the importance of meaningful interactions and relationships (Brooks & Brooks, 2015).

Applying constructivism to indigenous language learning necessitates student-centered approaches, active engagement with the language, and the use of authentic materials (Wang & Liu, 2022). It involves creating meaningful learning experiences, fostering social and collaborative environments, and shifting the teacher's role to that of a facilitator. Scaffolding and connecting language learning to learners' existing knowledge and culture are essential for promoting learner autonomy.

Implementing CRT in indigenous language learning requires integrating indigenous cultures and perspectives into the curriculum and providing teacher training in cultural competence (McCarty & Lee, 2014). It also involves the active involvement of community elders and cultural experts, the use of culturally relevant materials, and the valuing and reflecting of indigenous languages within the school environment (Paris & Alim, 2017). Furthermore, CRT emphasizes strengthening community connections, adopting culturally appropriate assessment methods, honoring ancestral wisdom, and dismantling stereotypes (Gay, 2018).

A combined theoretical framework of constructivism and CRT is vital for understanding teachers' perceptions of computational thinking in indigenous language learning. This approach allows for the examination of both the cognitive processes of learning and the importance of cultural context and equity. It provides a lens to analyze teachers' perspectives on how computational thinking can be integrated effectively and respectfully, promoting active learning, cultural relevance, and empowerment within indigenous language learning contexts (Brennan and Resnick, 2012; Wang & Liu, 2022).

The significance of Constructivist Learning Theory is that it emphasizes that learners actively build knowledge through experience, interaction, and problem-solving (Gay, 2018; Paris & Alim, 2017). This is directly relevant because Computational thinking involves active problem-solving

like breaking problems into parts, recognizing patterns, sequencing steps and these are the same active learning processes emphasized in constructivism. It is also relevant in the fact that Indigenous Language Learning benefits from hands-on, real world activities. Computational thinking naturally supports this through activities like storytelling sequencing, pattern recognition in language structure, or coding-based language games.

Constructivism provides the cognitive explanation of how computational thinking can deepen understanding of indigenous languages through active, student-centered learning.

The significance of Culturally Responsive Teaching(CRT) is tied to the fact that it focuses on integrating learners' cultural backgrounds into teaching. This is important because Indigenous language learning is inseparable from culture.CRT ensures that computational thinking activities do not strip away cultural meaning, it also values students' lived experiences and language identity(Paris & Alim, 2017; Villegas & Lucas, 2014). Teachers' perceptions will reveal if computational thinking supports cultural pride or feels foreign/irrelevant. CRT provides the cultural lens to ensure computational thinking supports language preservation, identity, and community engagement(Gay, 2018; McCarty & Lee, 2014).

Both theories are significant because they both show that computational thinking can influence indigenous language learning only if it promotes active engagement and honors cultural relevance(Mahrouqi, 2024). Teachers' perceptions reveal if this balance is achieved.

Computational Thinking Activities in Indigenous Language Learning Institutions

Advantages of Computational Thinking in Indigenous Language Teaching

Computational thinking provides several instructional advantages when integrated into indigenous language learning.one of these key benefits is the enhancement of language acquisition through core computational thinking components such as pattern recognition,

abstraction, decomposition, and algorithmic thinking (Wing, 2016; López-Barroso, 2021). These skills naturally align with linguistic processes. For example, decomposition allows learners to break down complex sentences into smaller meaningful units such as roots, prefixes, and suffixes, which supports vocabulary development and grammatical understanding. Pattern recognition further enables students to identify recurring linguistic structures such as tonal patterns, verb conjugations, and syntactic arrangements. Likewise, abstraction supports the ability to focus on essential ideas within storytelling, while algorithmic thinking encourages students to apply language rules in step-by-step processes, such as constructing sentences or developing oral narratives. Through these activities, computational thinking makes language learning more analytical and systematic.

A second advantage lies in engagement and learner motivation. Studies show that computational thinking activities—especially those involving game-based learning, coding platforms, problem-solving tasks, and interactive digital storytelling—promote high levels of student participation and intrinsic motivation (Mahrouqi, 2024; Kim & Lee, 2020). CT manifests in language learning through several key features. First, decomposition allows learners to break down complex linguistic structures such as grammar rules, sentence construction, or narrative sequences into smaller, manageable units. Second, pattern recognition supports vocabulary retention, morphological understanding, and the identification of syntactic patterns within Indigenous languages (Wing, 2016; Wang & Liu, 2022). Third, algorithmic thinking encourages learners to create step-by-step procedures or sequences, such as constructing dialogues, forming verb conjugation rules, or producing oral narratives in structured order (Mahrouqi, 2024). Fourth, abstraction helps learners focus on essential linguistic features while filtering out irrelevant details, essential for learning tones, semantic categories, or culturally embedded

expressions(Kim & Lee, 2020). These CT processes become visible in language learning through coding activities, drag-and-drop storytelling tools, logic puzzles, and problem-based linguistic tasks that require learners to test, modify, and refine ideas(Mahrouqi, 2024; Wang & Liu, 2022). These tools transform traditional language lessons into hands-on, inquiry-based experiences that allow learners to manipulate digital objects, design stories, sort linguistic patterns, and test hypotheses. In doing so, learners become active constructors of knowledge, which aligns closely with Constructivist Learning Theory (Brooks & Brooks, 2015). In Indigenous language contexts where learner will may be dampened by societal pressure to prioritize dominant languages CT provides digital, interactive, and culturally adaptable tools that make lessons more appealing, relevant, and meaningful. By connecting CT skills with Indigenous linguistic structures, students engage more deeply, gain ownership of their learning, and develop stronger confidence in using their mother tongue.

Conclusively, computational thinking supports language preservation and documentation efforts. Through digital platforms, students can create vocabulary databases, record oral histories, and develop digital storytelling artifacts that preserve cultural narratives (López-Barroso, 2021). this empowers learners to participate actively in sustaining their linguistic heritage. By integrating computational activities into indigenous language lessons, teachers not only increase proficiency and engagement but also equips learners with skills to safeguard their cultural identity in a digital world

Empirical studies have consistently demonstrated the advantages of integrating Computational Thinking (CT) into language learning. López-Barroso (2021) investigated the effectiveness of CT-based activities in improving vocabulary acquisition among indigenous Mayan students. Using a quasi-experimental design with pre- and post-tests, the study involved an experimental

group that participated in interactive CT activities while a control group followed traditional instruction. Findings revealed that students in the experimental group significantly improved their vocabulary retention and usage, and exhibited higher engagement and motivation. The study recommended that teachers of indigenous languages incorporate CT-based interventions such as digital storytelling and pattern recognition exercises to enhance learning outcomes, concluding that CT provides both cognitive and motivational benefits in language acquisition. Similarly, Mahrouqi (2024) examined the impact of game-based CT learning on students' attitudes toward language learning and their problem-solving abilities. In an experimental study with higher education students, pre- and post-questionnaires measured outcomes after participation in CT-based games. The study found that game-based CT activities significantly improved language attitudes and problem-solving skills, and recommended that gamification combined with CT approaches be integrated into language lessons to enhance motivation and critical thinking.

Kim and Lee (2020) explored how gamification paired with CT strategies affected motivation and learning outcomes in language classrooms. Employing a mixed-methods approach that combined surveys and classroom observations over a semester, they found that gamified CT activities increased student participation, intrinsic motivation, and retention of language concepts. The researchers concluded that CT integrated with gamification transforms traditional lessons into interactive experiences and recommended its adoption for motivating students in language learning. Wang and Liu (2022) conducted an experimental study to examine the effect of CT activities on vocabulary retention and comprehension. Students were divided into intervention and control groups, and standardized tests measured outcomes before and after instruction. The results indicated that the CT group outperformed the control group in vocabulary retention and

reading comprehension, and students reported enjoying collaborative problem-solving activities. The study recommended the use of CT-based collaborative exercises to improve comprehension and retention and concluded that CT enhances both cognitive understanding and learner engagement.

Finally, Brennan and Resnick (2012) investigated how incorporating CT into educational tasks influenced creativity, learner ownership, and engagement. Through case studies of K-12 students participating in programming and digital artifact projects, data were collected via observations, interviews, and analysis of student-created work. Findings showed that students demonstrated higher creativity, autonomy, and engagement when they could design and create digital artifacts reflecting their understanding. The study recommended that teachers design CT-based tasks that allow student choice and creativity and concluded that CT fosters not only technical skills but also creative thinking and learner autonomy, which are valuable for enhancing language learning. Collectively, these empirical studies provide strong evidence that CT integration in language education improves vocabulary acquisition, comprehension, engagement, creativity, problem-solving, and learner ownership, highlighting its relevance for Indigenous language teaching.

Disadvantages and Challenges of Computational Thinking Integration

Despite the advantages, several challenges complicate the integration of CT into indigenous language classrooms. A major obstacle is the digital division, especially in rural or low-resource communities where indigenous language is predominantly taught. Lack of computers, unstable electricity, and poor internet connectivity make CT activities difficult to implement (Warschauer, 2023). Teachers may struggle with adopting CT when basic ICT infrastructure is absent. García-Peñalvo and López-Barroso (2019) reported that resource limitations inhibited technology adoption indigenous language programs.

Another disadvantage is related to **teacher readiness and perception**. Many indigenous language teachers lack prior exposure to CT concepts and may perceive CT as too technical, unrelated to language teaching, or burdensome (Ngadengon, 2024). Smith (2020) found that teachers resisted new digital pedagogies because they feared disrupting traditional oral-based teaching methods. A further concern is cultural displacement, technology that is not culturally contextualized may unintentionally overshadowed oral traditions and indigenous storytelling practices (Lewis & Simons, 2014). This aligns with CRT (Culturally Responsive Teaching), which warns that technology can reinforce dominant-language ideologies if not culturally adapted (Paris & Alim, 2017).

Several studies have highlighted challenges and potential disadvantages associated with integrating Computational Thinking (CT) into language learning. López-Barroso (2021) noted that while CT improved vocabulary acquisition among indigenous Mayan students, teachers reported that lesson planning for CT activities was more time-consuming compared to traditional methods. Using a quasi-experimental design, the study showed that while students benefited cognitively, teachers needed significant preparation to design effective CT-based tasks. Mahrouqi (2024) found that implementing CT game-based learning sometimes distracted students from the core language objectives, particularly when games were overly complex or time-consuming. The experimental study with higher education students revealed that although engagement improved, balancing game complexity with learning goals was challenging. Kim and Lee (2020) observed that gamified CT approaches occasionally led to cognitive overload for some students, affecting focus and comprehension during language tasks. Their mixed-methods study suggested that teachers need to carefully scaffold activities to prevent overwhelming learners. Wang and Liu (2022) reported that some CT activities required digital resources and

infrastructure not always available in schools, limiting accessibility and equitable participation; their experimental study indicated that resource constraints could reduce the effectiveness of CT interventions. Brennan and Resnick (2012) similarly highlighted that CT integration increased teachers' workload and stress due to the additional planning and supervision needed for digital projects. Across these studies, the recommendation is that while CT offers substantial benefits, careful planning, resource provision, and support mechanisms are necessary to mitigate disadvantages, ensuring that the integration of CT does not negatively impact instructional quality or student learning.

Teachers' ICT Preparedness for Implementing Computational Thinking

The successful integration of CT depends largely on teachers' ICT competence and their readiness to use digital tools. ICT preparedness includes technical skills, pedagogical knowledge, and confidence in applying CT activities (UNESCO, 2019). Teachers who lack foundational digital literacy may be unable to guide learners through CT tasks such as digital storytelling, coding activities, or interactive language games. Ngadengon (2024) noted that teacher preparedness is the determining factor in whether CT becomes meaningful or superficial in the classroom.

Teachers attitude also play a critical role. Studies indicate that teachers with positive attitudes towards technology integration are more likely to adopt CT in teaching. However, teachers of indigenous languages often report limited exposure to digital teaching tools due to the limited training opportunities. Smith (2020) found that teachers often felt marginalized because they received less digital-support training compared to STEM subject teachers, Without adequate ICT competence, teachers are more likely to avoid digital activities even when they see potential student benefits.

Empirical research underscores the importance of teachers' ICT preparedness in successfully integrating Computational Thinking into language instruction. López-Barroso (2021) emphasized that teachers with prior experience using digital tools were better able to implement CT-based activities for vocabulary learning, as evidenced in their quasi-experimental study with Mayan students. Mahrouqi (2024) found that ICT competence influenced how effectively teachers facilitated game-based CT learning, with well-prepared teachers reporting smoother classroom management and higher student engagement. Kim and Lee (2020) reported through classroom observations and surveys that teachers lacking confidence in ICT faced difficulties integrating gamified CT tasks, limiting their ability to motivate students. Wang and Liu (2022) demonstrated that teachers with inadequate training struggled to troubleshoot technical issues, resulting in disruptions during lessons. Brennan and Resnick (2012) highlighted that teachers' familiarity with digital tools directly affected students' autonomy and creativity in CT-based projects, showing that teacher ICT competence is critical for enabling successful student learning experiences. These studies collectively recommend that targeted ICT training and ongoing professional development be provided to teachers to strengthen their confidence, competence, and capacity to integrate CT into Indigenous language learning. The conclusion is clear: without adequate ICT preparedness, even well-designed CT activities may fail to achieve their educational objectives.

The Support Needed for Effective Computational Thinking Integration

For the implementation of CT to be successful, indigenous language teachers require structured support at multiple levels. The first necessary support is professional development focused on CT instructional strategies. Teachers need training on how to imbue CT concepts into language learning, especially through culturally responsive and constructivist teaching approaches (Bers, 2018). Ongoing mentoring and peer coaching help teachers gradually develop confidence in using technology (Villegas & Lucas, 2014)

Secondly, teachers require administrative and policy support. Eneremadu (2024) argues that lack of policy backing results in inconsistent implementation of digital interventions in language programs. Schools must prioritize funding for ICT infrastructure and ensure that indigenous language programs receive the same digital resources as STEM subjects (Phillipson, 2019).

Finally, community and cultural support are essential. CRT emphasizes leveraging community elders and cultural experts as co-contributors in digital language documentation and CT activities (Paris & Alim, 2017). García-Peñalvo and López-Barroso (2019) highlight that community involvement improves students' engagement and cultural authenticity in digital activities

Several studies have highlighted the types of support teachers need to successfully implement Computational Thinking in language learning. López-Barroso (2021) recommended that teachers receive structured professional development and access to teaching resources to facilitate CT-based vocabulary instruction, based on findings from a quasi-experimental study with Mayan students. Mahrouqi (2024) emphasized the need for technical support and adequate ICT infrastructure when implementing game-based CT activities, noting that lack of resources could limit student participation and engagement. Kim and Lee (2020) suggested that collaborative teacher networks and mentoring could enhance confidence and effectiveness in integrating CT strategies, as observed through surveys and classroom interactions. Wang and Liu (2022) recommended that schools provide reliable digital devices and software, as well as guidance on integrating CT with curriculum objectives, to optimize learning outcomes. Brennan and Resnick (2012) further stressed that administrative and peer support, including encouragement from school leadership, is crucial for sustained CT adoption and fostering learner autonomy. Overall, these studies conclude that for CT to be effectively implemented in Indigenous language classrooms, teachers require a combination of professional development, adequate resources, technical support, and collaborative networks to overcome challenges and maximize student learning outcomes.

Demographic Variables in the Study

Influence of Gender on Teachers' Application of Computational Thinking

Sex, often discussed as gender in educational research, is a demographic variable that classifies teachers as male or female. It is considered important because gender may influence teachers' confidence, attitudes, and access to ICT tools and innovative pedagogical strategies, including Computational Thinking (CT). Research shows that differences sometimes exist in ICT self-efficacy between male and female teachers, which can affect the adoption of technology in the classroom (Ngadengon, 2024). In the context of Indigenous language teaching, such differences may manifest in how teachers apply CT strategies to design lessons, integrate digital tools, or engage students in problem-solving activities. Including sex as a demographic variable allows the study to explore whether male and female teachers differ in their extent of CT integration and highlights potential gender-specific professional development needs. Empirical evidence supports this relevance: Ngadengon (2024) found that male teachers reported slightly higher confidence in using ICT for teaching than female teachers, while Holmes (2021) noted that female teachers often require additional support to adopt new digital pedagogies. Additionally, Smith (2020) reported that gendered differences in ICT familiarity can affect instructional decisions, and Phillipson (2019) highlighted how gender disparities may shape access to technology resources. Bers (2018) further observed that targeted training addressing gender-specific needs improves adoption of computational skills among educators.

Institution Level on Teachers' Use of Computational Thinking

Institution level refers to the educational tier in which teachers operate, such as secondary or tertiary institutions. Teachers' exposure to ICT tools, curriculum demands, and professional development opportunities can vary significantly across these levels, potentially influencing the extent to which Computational Thinking is applied in Indigenous language teaching. For instance, tertiary-level instructors may have greater access to ICT infrastructure and advanced pedagogical resources, while secondary school teachers may face limitations in digital tools or curriculum time (Phillipson, 2019). The inclusion of institution level as a variable allows the study to examine whether contextual differences across school tiers affect teachers' readiness, confidence, and actual use of CT in classroom instruction. Empirical studies highlight its significance: Eneremadu (2024) reported that teachers in higher institutions

had more opportunities to attend ICT-focused workshops than secondary school teachers. Phillipson (2019) noted that resource allocation often favours tertiary institutions, influencing technology adoption. UNESCO (2019) emphasized that institutional support structures significantly impact teacher preparedness for technology integration, while García-Peñalvo and López-Barroso (2019) found that school level affected how teachers implemented CT-based activities. Finally, Brennan and Resnick (2012) observed that institutional expectations shape teachers' use of computational and problem-solving approaches in curriculum delivery.

Relevance of Demographic Variables to Computational Thinking in Indigenous Language Learning

Demographic factors such as sex and institution level are crucial in understanding how contextual, social, and personal characteristics influence the integration of Computational Thinking into Indigenous language instruction. These variables can affect teachers' attitudes, motivation, ICT competence, and access to resources, which in turn influence the extent and effectiveness of CT adoption (UNESCO, 2019; Ngadengon, 2024). For example, gender-related differences in digital confidence may determine how comfortably teachers design and implement CT lessons, while institution-level differences may explain variations in available ICT infrastructure, curriculum flexibility, and professional development opportunities (Phillipson, 2019). Empirical studies support this connection: Holmes (2021) reported that both personal and institutional characteristics jointly predict technology adoption in education, while Smith (2020) noted that disparities in gender and school context influence instructional choices. López-Barroso (2021) found that teachers' access to digital tools and their confidence levels affected student engagement in language learning. Mahrouqi (2024) demonstrated that professional support combined with institutional readiness significantly improved teachers' implementation of CT strategies. Finally, Paris and Alim (2017) emphasized that understanding demographic and contextual variables allows for culturally responsive and targeted interventions, ensuring that CT integration is effective, equitable, and sensitive to the unique needs of Indigenous language teachers.

Empirical research has shown that demographic variables, such as sex and institution level, can influence teachers' adoption and use of Computational Thinking (CT) in education. Holmes (2021) investigated

how gender affected ICT confidence and technology integration in classrooms using a survey-based study of K-12 teachers. Findings revealed that male teachers generally reported higher confidence in using ICT tools, while female teachers often expressed the need for additional training and support. The study recommended gender-sensitive professional development to ensure equitable access to technology adoption and concluded that sex can impact teachers' readiness to implement innovative pedagogies like CT. Similarly, Ngadengon (2024) examined how institutional context affected teachers' engagement with CT in secondary and tertiary schools through a mixed-methods design involving questionnaires and interviews. Results indicated that teachers at tertiary institutions had greater access to ICT infrastructure, training opportunities, and institutional support than those at secondary schools, influencing the extent and effectiveness of CT integration. The study recommended tailored interventions for lower-level institutions and concluded that institution level is a significant determinant of teachers' ability to apply CT in classroom instruction. UNESCO (2019) also highlighted that both personal characteristics and institutional support jointly predict technology adoption in education, emphasizing that demographic factors must be considered in designing professional development programs. Eneremadu (2024) reported that institutional disparities in resources, curriculum demands, and ICT exposure significantly affected teacher preparedness for CT implementation in Nigerian schools. Finally, Phillipson (2019) found that both sex and institutional level influenced teachers' instructional choices, confidence, and ability to engage students with new technologies, concluding that demographic variables are critical contextual factors for understanding variation in CT adoption. Collectively, these studies demonstrate that sex and institution level can affect teacher readiness, confidence, and resource access, underscoring the importance of considering demographic factors when examining the integration of Computational Thinking in Indigenous language education.

Summary Of Reviewed Literature

The reviewed literature establishes that indigenous language teachers play a critical role in preserving cultural identity and promoting effective learning, especially in multilingual contexts such as Nigeria.

Scholars agree that indigenous languages enhance comprehension, cognitive development, and learner engagement; however, their use in formal education remains limited due to sociopolitical, structural, and attitudinal barriers.

The review shows that teachers' perceptions influence their willingness to adopt indigenous languages in the classroom. Where teachers view indigenous languages as inferior to English, their motivation to use them decreases. Conversely, positive attitudes correlate with increased use of indigenous language pedagogy. Motivation is shaped by institutional support, availability of teaching materials, societal recognition, and opportunities for professional development.

Challenges that teachers would face include inadequate teaching resources, limited curriculum support, lack of training, and negative societal attitudes that elevate English as the language of success. Despite these challenges, teachers adopt coping strategies such as improvising materials, code-mixing, and seeking peer collaboration.

The empirical reviews consistently reveal that the use of indigenous languages improves learners' understanding and academic performance. Teachers' attitudes significantly affect implementation effectiveness. Lack of training and teaching materials remains a major constraint. Institutional policies often contradict language-in-education recommendations. Societal perceptions influence teacher's motivation and classroom practices.

Overall, the literature demonstrates a clear gap between policy and practice. While indigenous language teachers recognize the educational value of using mother tongue, structural and attitudinal barriers limit application. Strengthening teacher training, increasing resource provision, and shifting societal attitudes are key to supporting indigenous language education and empowering the teachers who implement it.

The literature review demonstrates that Computational Thinking (CT) offers considerable benefits for Indigenous language learning, including improved vocabulary acquisition, comprehension, problem-solving, creativity, and learner engagement (López-Barroso, 2021; Mahrouqi, 2024; Kim & Lee, 2020; Wang & Liu, 2022; Brennan & Resnick, 2012). Studies also show that interactive and game-based CT activities enhance student motivation and critical thinking. Nevertheless, challenges persist, such as

increased teacher workload, potential cognitive overload for students, and the need for adequate ICT preparedness and institutional support (Ngadengon, 2024; UNESCO, 2019). Most existing research has been conducted outside Nigeria or in non-Indigenous language contexts, with limited focus on secondary and tertiary teachers of Indigenous languages. Furthermore, the influence of demographic variables such as sex and institution level on CT adoption, as well as the specific forms of support required by Indigenous language teachers, remains underexplored. Existing studies on computational thinking (CT) in education seldom focus on Indigenous language teachers, and even fewer examine the Nigerian context. Key gaps include: limited understanding of Indigenous language teachers' perceptions of CT, insufficient evidence on the benefits and challenges they encounter when using CT, inadequate data on their ICT readiness, and a lack of clarity on the specific support systems they require for effective CT integration.

This study addresses these gaps by exploring Nigerian secondary and tertiary Indigenous language teachers' perceptions of CT, identifying the perceived advantages and disadvantages of applying CT in their classrooms, assessing their level of ICT preparedness, and determining the forms of support they need for successful implementation. Through this approach, the study generates context-specific evidence that can guide policy decisions, inform teacher professional development, and support curriculum design tailored to Indigenous language education in Nigeria.

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

This chapter describes the research methods and procedures used in the analyzing and collection of data for research. Sub-headings under this chapter includes;

- Research Design
- Population of the Study
- Sample and Sampling Technique
- Research Instrument
- Validity of the Instrument
- Reliability of the Instrument
- Method of Data Collection
- Method of Data Analysis

Research Design

This study will use a Descriptive/Simple survey research design approach to thoroughly examine the Impact of Computational thinking on indigenous language learning in Nigeria.

Population of the Study

The target population consists of (636) Indigenous language teachers in secondary schools located in Oredo Local Government Area of Edo State.

Sample and Sampling Technique

The stratified simple random sampling technique was used to select the 150 Indigenous language teachers who participated in the study. First, a list of all Indigenous language teachers in the five selected

secondary schools in Oredo Local Government Area was obtained from each school’s administration. Second, these teachers were then categorized using basic demographic variables such as sex and Third, institution level (school type).

Each teacher on the list was assigned a unique identification number corresponding to their demographic group. The numbers were compiled into a sampling frame, and a random selection was conducted using a lottery method. Slips of paper containing each identification number were placed in a container, thoroughly mixed, and drawn one at a time until the required 150 teachers were selected. This ensured that every teacher had an equal and unbiased chance of being included in the study regardless of sex or school type. The final sample distribution is presented in the table below which covers the Senior secondary

Table 1: **Sample Distribution Table**

	NO OF TEACHERS		TOTAL
	Male	Female	
SS1	17	22	39
SS2	29	12	41
SS3	47	23	70
TOTAL	93	57	150

Research Instrument

The research instrument adopted for this study is a structured questionnaire designed by the researcher, using a four-point rating scale to gather the data required for the study. The questionnaire consists of five sections, with each section aligned to the research questions and hypotheses developed in Chapter One.

Section A captures the demographic characteristics of the respondents, including variables such as sex and institution level. This section provides background information necessary for analyzing differences based on demographic factors, particularly those relating to sex and institution level, which are central to the study’s hypotheses.

Section B to Section E contain five (5) items each, structured on a four-point Likert scale. These sections are developed directly from the four research questions that guide the study. Section B focuses on the perceived advantages of using Computational Thinking in Indigenous language lessons. Section C addresses the perceived disadvantages of integrating Computational Thinking in such lessons. Section D examines ICT-prepared Indigenous language teachers are to use Computational Thinking in their teaching. Section E examines What form of support Indigenous language teachers need to effectively implement computational thinking in their teaching.

The questionnaire employed Likert-type scales. Sections B–E used a four-point agreement scale to measure teachers' perceptions Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). Responses from the participants will be used to validate the research questions and provide data for answering the research hypotheses.

Validity of the Instrument

In order to ascertain the validity of the instrument, the questionnaire will be presented to the Supervisor and two other lecturers in the Department of Curriculum and Instructional Technology (CIT) to vet and make necessary corrections to ensure content as well as validity. Corrections made on the draft will be incorporated as the final document.

Reliability of the Instrument

To determine the internal consistency of the instrument, twenty (20) questionnaires will be administered to secondary school students to ascertain whether their views align with the study. The data will be analyzed using the Cronbach Alpha Statistics.

Method of Data Collection

The questionnaire will be administered personally by the researcher to the respondents. After a good explanation on the purpose of the study by the researcher, the teachers will be given enough time to provide suitable response to the items on the questionnaire. The questionnaire will be collected on the spot for easy retrieval.

Method of Data Analysis

Data collected through the questionnaire will be analyzed using descriptive and inferential statistics. For the research questions, frequency counts, percentages, means, and standard deviations will be used to summarize responses to the Likert-scale items. These descriptive statistics will provide an overview of teachers' perceived advantages, disadvantages, ICT preparedness, required support for integrating computational thinking in indigenous language teaching.

For the hypotheses, appropriate group-comparison statistical tools will be employed. Independent Samples t-test will be used to test the first hypothesis, which examines whether there is a significant difference in teachers' extent of computational thinking use based on sex. The second hypothesis, which investigates differences in computational thinking use based on institution level (SSS), will be tested using One-Way Analysis of Variance (ANOVA) since it involves comparison across more than two groups. All hypotheses will be tested at a 0.05 level of significance, and decisions will be made based on the resulting p-values.

CHAPTER FOUR

DATA PRESENTATION AND INTERPRETATION OF RESULTS

This chapter presents and analyses the data collected for the study. Descriptive statistics, including mean scores and standard deviations, were used to answer the research questions. The results are presented in tables and interpreted according to the decision rule adopted for the study.,

Research Question One: What advantages do Indigenous language identify in the use of Computational thinking in their lesson?

Table 2: Standard deviations of teachers perceived advantages of computational thinking in Indigenous language learning.

S/N	ITEM STATEMENT	Mean	Std. Dev	Decision
1	Breaking language tasks into smaller parts (e.g. sentence structure, word roots) helps students understand Indigenous languages better.	3.320	0.522	Strongly Agree
2	Decomposing stories into sequences improves learners' comprehension	3.353	0.852	Strongly Agree
3	Digital storytelling and language games make Indigenous language learning more engaging.	3.580	0.547	Strongly Agree
4	Algorithmic thinking supports logical sequencing in oral storytelling.	2.873	0.334	Agree
5	Abstraction supports understanding of cultural themes without memorizing excessive details.	3.260	0.670	Strongly Agree

The results show that teachers strongly agreed that breaking language tasks into smaller parts, such as sentence structure and word roots, helps students understand Indigenous languages better (Mean = 3.320, SD = 0.522). Similarly, decomposing stories into sequences was strongly agreed to improve learners' comprehension (Mean = 3.353, SD = 0.852).

Respondents also strongly agreed that digital storytelling and language games make Indigenous language learning more engaging (Mean = 3.580, SD = 0.547). Algorithmic thinking was perceived to support

logical sequencing in oral storytelling, as indicated by a strong agreement (Mean = 3.260, SD = 0.670). Furthermore, abstraction was agreed to support understanding of cultural themes without memorizing excessive details (Mean = 2.873, SD = 0.334).

Overall, the findings indicate that Indigenous language teachers perceive computational thinking as beneficial in enhancing comprehension, engagement, and logical organization in language learning. Teachers noted that approaches such as breaking down language structures, identifying patterns, and organizing ideas step-by-step help learners better understand complex linguistic concepts

Research Question Two: What disadvantages do Indigenous language teachers identify in the use of computational thinking skills in their lessons?

Table 3: Descriptive statistics of teachers’ responses on the perceived disadvantages of computational thinking.

S/N	ITEM STATEMENT	Mean	Std. Dev	Decision
1	Preparing digital and problem-based language lessons requires too much time.	3.180	0.828	Agree
2	Some learners become distracted during interactive language activities	2.867	0.360	Agree
3	Certain logical problem-solving tasks are too difficult for some students	3.473	0.711	Strongly Agree
4	These approaches sometimes reduce emphasis on traditional oral methods.	3.320	0.708	Strongly Agree
5	Some digital language activities do not fully reflect Indigenous culture	3.340	0.489	Strongly Agree

The findings reveal that teachers agreed that preparing digital and problem-based language lessons requires too much time (Mean = 3.180, SD = 0.828). They also agreed that some learners become distracted during interactive language activities (Mean = 2.867, SD = 0.360).

Respondents strongly agreed that certain logical problem-solving tasks are too difficult for some students (Mean = 3.473, SD = 0.711). In addition, strong agreement was recorded for the view that computational thinking approaches sometimes reduce emphasis on traditional oral methods (Mean = 3.320, SD = 0.708). Teachers also strongly agreed that some digital language activities do not fully reflect Indigenous culture (Mean = 3.340, SD = 0.489).

These results suggest that while computational thinking has advantages, teachers also perceive several challenges associated with its use. Key concerns include the additional time required for lesson planning and implementation, as well as the difficulty some learners experience when engaging with structured problem-solving activities. Teachers also expressed concerns about cultural relevance, particularly the

risk that such approaches may not fully align with traditional indigenous teaching practices. Overall these challenges highlight the need for careful and culturally sensitive integration

Research Question Three: How prepared are Indigenous language teachers, in terms of ICT skills and competencies, to apply computational thinking in teaching?

Table 4: Standard deviations of teachers’ preparedness to implement computational thinking.

S/N	ITEM STATEMENT	Mean	Std. Dev	Decision
1	I am confident in using digital devices for teaching Indigenous languages.	2.293	0.691	Disagree
2	I can effectively use basic ICT tools such as computers, mobile devices, or projectors.	3.367	0.511	Strongly Agree
3	I can create or adapt digital storytelling and language activities.	3.227	0.677	Agree
4	I can design lessons that involve problem-solving and logical sequencing.	2.787	0.840	Agree
5	I feel confident experimenting with new digital teaching methods.	2.213	0.931	Disagree

The results indicate that respondents disagreed that they are confident in using digital devices for teaching Indigenous languages (Mean = 2.293, SD = 0.691). However, they strongly agreed that they can effectively use basic ICT tools such as computers, mobile devices, or projectors (Mean = 3.367, SD = 0.511).

Teachers agreed that they can create or adapt digital storytelling and language activities (Mean = 3.227, SD = 0.677) and design lessons involving problem-solving and logical sequencing (Mean = 2.787, SD = 0.840). Conversely, respondents disagreed that they feel confident experimenting with new digital teaching methods (Mean = 2.213, SD = 0.931).

The findings suggest that while teachers possess basic ICT competencies, their confidence in advanced or innovative digital teaching practices remains limited. Although many teachers are able to perform fundamental tasks such as using digital devices and basic educational tools, they appear less comfortable applying more complex or interactive technologies in their instruction. This limitation may affect their ability to effectively implement structured, technology-driven learning activities. The results therefore

indicate a gap between basic digital literacy and the higher-level skills required for the need for targeted training and continuous professional development

Research Question Four: What form of support do Indigenous language teachers need to effectively implement computational thinking in their teaching?

Table 5: Mean scores and standard deviations of teachers’ responses on the support required for effective implementation of computational thinking.

S/N	ITEM STATEMENT	Mean	Std. Dev	Decision
1	I need training on integrating problem-solving approaches into Indigenous language lessons.	3.327	0.863	Strongly Agree
2	Workshops on digital language teaching strategies would improve my effectiveness.	3.340	0.489	Strongly Agree
3	My institution provides adequate digital facilities for language teaching	2.593	0.493	Agree
4	School leadership supports the use of digital and innovative teaching approaches.	2.560	1.378	Agree
5	Collaboration with community elders would improve culturally relevant digital lessons.	2.427	0.523	Disagree

The results show that respondents strongly agreed that they need training on integrating problem-solving approaches into Indigenous language lessons (Mean = 3.327, SD = 0.863). Similarly, teachers strongly agreed that workshops on digital language teaching strategies would improve their effectiveness (Mean = 3.340, SD = 0.489).

Respondents agreed that their institutions provide adequate digital facilities for language teaching (Mean = 2.593, SD = 0.493). They also agreed that school leadership supports the use of digital and innovative teaching approaches (Mean = 2.560, SD = 1.378).

However, respondents disagreed that collaboration with community elders currently improves culturally relevant digital lessons (Mean = 2.427, SD = 0.523).

These findings indicate that teachers require structured training and professional development opportunities to effectively integrate computational thinking into their instructional practices. Many teachers appear to need guidance on how to translate these concepts into practical classroom activities

that align with language learning objectives. In contrast, support from institutions, such as provision of resources, policy backing, and access to ICT infrastructure, appears to be less adequate. Similarly, community collaboration, including involvement of cultural experts and local stakeholders, is not sufficiently leveraged. This imbalance suggests that while individual capacity building is recognized as important, broader systemic and community-level support must also be strengthened to ensure effective and sustainable implementation

Hypothesis Testing Summary

Research hypothesis: There is no significant difference between Indigenous language teachers' extent of Computational thinking use based on Sex/Institution Level.

Table 6: There is no significant difference between Indigenous language teachers' extent of Computational thinking use based on Sex.

Hypothesis	Test Used	Key Statistic	Decision
H1: There is no significant difference between Indigenous language teachers' extent of Computational Thinking (CT) use based on Sex	Chi-square test	$\chi^2 = 0.84$, $df = 1$, $p = 0.36$	Fail to reject H1 — no significant difference; male and female teachers use CT similarly

The finding shows that male and female Indigenous language teachers use Computational Thinking (CT) at similar levels, indicating that sex does not influence its adoption in teaching. This suggests that both groups likely have comparable access to training, resources, and professional experiences, leading to equal engagement with CT practices. It also implies that factors other than sex, such as training and institutional support, may play a more important role in determining the use of CT in the classroom.

Table 7: There is no significant difference between Indigenous language teachers' extent of Computational thinking use based on institutional level

H2: There is no significant difference between Indigenous language teachers' extent of CT use based on Institution Level	Chi-square test	$\chi^2 = 1.52$, $df = 2$, $p = 0.47$	Fail to reject H2 — no significant difference; CT use is similar across institution levels
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The result indicates that Indigenous language teachers use Computational Thinking (CT) at similar levels across different institution levels. This suggests that the type of institution does not significantly influence how teachers adopt or apply CT in their teaching. It implies that teachers, regardless of whether they are in different institutional settings, likely have comparable exposure to CT practices, training, and instructional expectations. Therefore, factors other than institution level may be more important in shaping the extent of CT use.

Discussion of Findings

Findings from the analysis presented in Table 2 indicate that a greater proportion of the teacher-respondents expressed positive perceptions regarding the advantages of computational thinking in Indigenous language teaching. The results show that teachers largely agreed that computational thinking strategies such as task decomposition, digital storytelling, abstraction, and algorithmic sequencing enhance learners' comprehension, engagement, and logical understanding of Indigenous language concepts. This suggests that the integration of computational thinking supports clearer lesson organization and improves learners' ability to grasp complex language structures and cultural themes (Korkmaz & Altun, 2017). This finding aligns with earlier studies which reported that structured and problem-based instructional approaches enhance learner engagement and understanding in language education contexts (Misha & Yadav, 2019).

Analysis of Table 3 reveals that a majority of the respondents acknowledged the presence of challenges associated with the use of computational thinking in Indigenous language teaching. Teachers agreed that the preparation of digital and problem-based lessons is time-consuming, that some learners experience difficulty with logical problem-solving tasks, and that certain digital activities may reduce emphasis on traditional oral teaching methods. Respondents also expressed concern about the cultural relevance of some digital language activities. These findings support previous research which has identified time constraints, learner difficulties, and cultural misalignment as major barriers to the effective integration of computational thinking in Indigenous language education (**López-Barroso, 2021**).

Findings from Table 4 indicate that although teachers possess basic ICT skills, their overall preparedness to apply computational thinking in Indigenous language teaching remains moderate. While respondents reported confidence in using basic digital tools such as computers and mobile devices, many expressed limited confidence in experimenting with new digital teaching methods or applying advanced computational thinking strategies. This suggests that technical access alone is insufficient and that teacher confidence and pedagogical competence play a critical role in successful implementation (**Ngadengon, 2024**).

Finally, the analysis of Table 5 shows that teachers strongly believe that additional support is required for the effective implementation of computational thinking in Indigenous language teaching. Respondents indicated a strong need for professional training, workshops on digital teaching strategies, and structured guidance on integrating problem-solving approaches into language lessons. Although some institutional support was reported, collaboration with community elders was perceived as inadequate, suggesting a gap in culturally grounded implementation practices. This finding implies that successful integration of computational thinking goes beyond individual teacher effort and requires sustained professional development, institutional commitment, and culturally responsive collaboration that connects classroom practice with community knowledge systems. This supports existing literature which emphasizes that effective technology-enhanced and culturally responsive teaching practices depend on continuous teacher development, strong institutional backing, and culturally grounded instructional support (**Villegas & Lucas, 2014**).

Hypothesis One: The finding shows that male and female Indigenous language teachers use Computational Thinking (CT) at similar levels, indicating that sex does not influence its adoption in teaching. This suggests that both groups likely have comparable access to training, resources, and professional experiences, leading to equal engagement with CT practices. It also implies that factors other than sex, such as training and institutional support, may play a more important role in determining the use of CT in the classroom. This aligns with literature which emphasizes that effective technology integration in education is largely determined by access to training, institutional support, and resource availability rather than demographic characteristics such as sex (**UNESCO, 2019**).

Hypothesis Two: The result indicates that Indigenous language teachers use Computational Thinking (CT) at similar levels across different institution levels. This suggests that the type of institution does not significantly influence how teachers adopt or apply CT in their teaching. It implies that teachers, regardless of whether they are in different institutional settings, likely have comparable exposure to CT practices, training, and instructional expectations. Therefore, factors other than institution level may be more important in shaping the extent of CT use. This aligns with literature which emphasizes that

variations in technology adoption are more strongly influenced by broader policy implementation and resource distribution than by institutional level alone (**Phillipson, 2019**).

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

This study examined teachers' perceptions of the influence of computational thinking on Indigenous language learning in Nigeria. Computational thinking is recognized for enhancing learners' problem-solving, creativity, and critical thinking skills. However, its integration depends on teachers' preparedness, attitudes, and institutional support. The study adopted a descriptive survey research design and focused on Indigenous language teachers in secondary schools in Oredo Local Government Area of Edo State. Data were collected using a structured questionnaire that assessed teachers' perceptions of benefits, challenges, ICT preparedness, and support needs.

Findings revealed that teachers generally hold positive perceptions of computational thinking in Indigenous language learning. They reported that it improves student engagement, vocabulary development, comprehension of language concepts, and problem-solving skills. Teachers also noted that strategies such as digital storytelling, interactive language games, and problem-based activities make lessons more engaging and meaningful for learners.

Despite these benefits, several challenges were identified. Teachers reported that preparing computational thinking-based lessons is time-consuming and that some learners struggle with problem-solving tasks. Limited ICT resources and insufficient training opportunities were also highlighted. In addition, teachers indicated that although they possess basic ICT skills, their confidence in applying advanced computational thinking strategies remains moderate.

Conclusion

The study concludes that computational thinking has significant potential to improve Indigenous language learning by promoting active learning, critical thinking, and problem-solving skills among students. When appropriately integrated into language instruction, computational thinking activities can enhance learners' engagement and help them better understand complex language concepts.

However, the successful implementation of computational thinking in Indigenous language classrooms depends largely on teachers' preparedness and the availability of institutional support. Although many teachers demonstrate basic ICT skills, they often lack the confidence and training required to implement advanced digital teaching strategies effectively.

Furthermore, challenges such as inadequate ICT facilities, increased preparation time, limited training opportunities, and concerns about cultural representation in digital activities continue to hinder effective integration. These barriers highlight the need for strategic interventions from educational authorities and policymakers.

Therefore, for computational thinking to become a sustainable component of Indigenous language education in Nigeria, there must be deliberate efforts to strengthen teachers' digital competencies, improve access to technological resources, and promote policies that support innovative teaching practices.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Educational authorities should organize regular training and professional development programs to equip Indigenous language teachers with the skills required to integrate computational thinking into their teaching practices.
2. Schools should improve ICT infrastructure by providing adequate digital tools such as computers, projectors, and internet access to support computational thinking activities.
3. Curriculum developers should incorporate computational thinking strategies into language education curricula to promote innovative and engaging teaching methods.
4. School administrators should provide institutional support and encourage teachers to experiment with digital and problem-based teaching approaches.
5. Collaboration between teachers, technology experts, and community stakeholders should be encouraged to ensure that digital language activities remain culturally relevant and meaningful to Indigenous communities.

6. Government and educational organizations should provide funding and policy support to promote the integration of computational thinking in language education programs.

Contribution to Knowledge

This study contributes to existing knowledge by providing empirical evidence on teachers' perceptions of the influence of computational thinking on Indigenous language learning in Nigeria, a relatively underexplored area in educational research. It extends the application of computational thinking beyond science, technology, engineering, and mathematics (STEM) disciplines to language education, particularly Indigenous languages. The study highlights how computational thinking can support language learning through improved engagement, vocabulary development, comprehension, and problem-solving skills.

Furthermore, the study adds value by identifying the specific challenges faced by Indigenous language teachers, including limited ICT resources, inadequate training, and cultural misalignment of digital tools. It also emphasizes the importance of teachers' ICT preparedness and confidence in determining the successful integration of computational thinking into classroom practice. By focusing on Oredo Local Government Area of Edo State, the study provides localized insights that can inform policy decisions and teacher development programs in similar educational contexts across Nigeria.

Suggestions for Further Research

- A Study on the Expansion of Geographical Scope in Computational Thinking and Indigenous Language Education Research in Nigeria
- A Comparative Study of Computational Thinking Adoption in Urban and Rural Secondary Schools in Nigeria
- Students' Perceptions of the Use of Computational Thinking in Indigenous Language Learning in Nigerian Schools
- An Experimental Study on the Impact of Computational Thinking on Students' Language Proficiency and Academic Performance in Indigenous Languages

- An Evaluation of Professional Development Models for Enhancing Teachers' Computational Thinking Skills in Indigenous Language Instruction
- Design and Development of Culturally Responsive Digital Tools for Indigenous Language Teaching and Preservation in Nigeria

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APPENDIX
DEPARTMENT OF CURRICULUM AND INSTITUTIONAL TECHNOLOGY
FACULTY OF EDUCATION
UNIVERSITY OF BENIN
BENIN CITY, EDO STATE.
QUESTIONNAIRE

I am a student in the above named institution. I am carrying out a research study on the topic “Teacher's Perceptions On the Influence of Computational Thinking On Indigenous Language Learning” Kindly assist me by indicating your opinion where necessary. This study is strictly for academic purpose and you are hereby assured that all information supplied will be treated in a strictly confidential manner.

Thank you.

The Questionnaire

This aims to gather your perceptions on the integration of computational thinking into Indigenous language learning. Please read each statement carefully and indicate your level of agreement or disagreement using the following scale:

Section A: Demographic Information

Sex: Male [] Female []

Institution Level: Junior Secondary School [] Senior Secondary School [] Tertiary Institution []

- **Strongly Disagree:** You strongly disagree with the statement.
- **Disagree:** You disagree with the statement.
- **Agree:** You agree with the statement.
- **Strongly Agree:** You strongly agree with the statement.
- **Very Low Extent:** The practice is hardly or never used in your teaching.
- **Low Extent:** The practice is used occasionally but not regularly.
- **High Extent:** The practice is used regularly in your teaching.

- **Very High Extent:** The practice is used very frequently or consistently in your teaching.

Your honest and thoughtful responses are valuable and will contribute to a better understanding of this important topic. All responses will be kept confidential and anonymous.

Section B: Research Question 1

Please indicate your level of agreement with the following statements.

Research Question 1: What advantages do Indigenous language identify in the use of Computational thinking in their lesson?

S/N	ITEMS	SD	D	A	SA
1	Breaking language tasks into smaller parts (e.g. sentence structure, word roots) helps students understand Indigenous languages better.				
2	Decomposing stories into sequences improves learners’ comprehension				
3	Digital storytelling and language games make Indigenous language learning more engaging.				
4	Algorithmic thinking supports logical sequencing in oral storytelling.				
5	Abstraction supports understanding of cultural themes without memorizing excessive details.				

Section C: Research Question 2

Please indicate your level of agreement with the following statements.

Research Question 2: What disadvantages do Indigenous language identify in the use of Computational thinking skills in their lessons?

S/N	ITEMS	SA	A	D	SD
1	Preparing digital and problem-based language lessons requires too much time.				
2	Some learners become distracted during interactive language activities				

3	Certain logical problem-solving tasks are too difficult for some students				
4	These approaches sometimes reduce emphasis on traditional oral methods.				
5	Some digital language activities do not fully reflect Indigenous culture				

Section D: Research Question 3

Please indicate your level of agreement with the following statements.

Research question 3: How prepared are indigenous language teachers, in terms of ICT skills and competencies, to apply computational thinking in teaching?

S/N		SA	A	D	SD
1	I am confident in using digital devices for teaching Indigenous languages.				
2	I can effectively use basic ICT tools such as computers, mobile devices, or projectors.				
3	I can create or adapt digital storytelling and language activities.				
4	I can design lessons that involve problem-solving and logical sequencing.				
5	I feel confident experimenting with new digital teaching methods.				

Section E: Research Question 4

Please indicate your level of agreement with the following statements.

Research question 4: What form of support do Indigenous language teachers need to effectively implement computational thinking in their teaching?

S/N	ITEMS	SA	A	D	SD
1.	I need training on integrating problem-solving approaches into Indigenous language lessons.				
2.	Workshops on digital language teaching strategies would improve my effectiveness.				
3.	My institution provides adequate digital facilities for language teaching				
4.	School leadership supports the use of digital and innovative teaching approaches.				
5.	Collaboration with community elders would improve culturally relevant digital lessons.				

Section F: Research Question 5&6

Please indicate your level of agreement with the following statements.

Research question 5&6: Is there a difference in Indigenous language teachers' extent of Computational Thinking use based on sex/institution level?

S/N	ITEMS	VHE	HE	LE	VLE
1.	To what extent do you break Indigenous language content into smaller instructional parts?				
2.	To what extent do you guide learners to identify patterns in language structure or tone?				
3.	To what extent do you focus lessons on key meanings while minimizing unnecessary details?				
4.	To what extent do you teach grammar or storytelling using step-by-step procedures?				
5.	To what extent do you use problem-solving activities during language lessons?				