

Article

Exploring the Use of Digital Resources and Tools in Improving Igbo Language Learning in Nigerian Universities

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Abstract

Digital resources and tools can facilitate the acquisition of language proficiency in indigenous Nigerian languages. However, many Nigerian universities running language programmes are yet to leverage this. Of concern is the universities in Southeast Nigeria, where Igbo is predominantly spoken. This research explores the availability/accessibility of digital resources and tools in learning the Igbo language, its impact on learning, and its implications as instructional materials for disseminating Igbo language knowledge in Southeast Nigerian universities. Three universities in Southeast Nigeria were purposively sampled and participants, comprising 239 students in the Igbo linguistics programme, were randomly selected for the experiment. As a quasi-experimental study, pre-tests and post-tests were administered with the hypothesis tested at $P < 0.05$ probability level, using ANCOVA, and the findings were analysed qualitatively. Findings reveal that digital resources and tools like language software, gamification, and other online platforms that enhance interaction and synchronous engagements abound. However, some are inaccessible and more available in the teaching and learning of globally recognised languages. Also, using digital resources in Igbo language knowledge dissemination positively impacts students' learning outcomes, hence the advocacy for them to be adapted as classroom instructional materials.

Keywords: Igbo language, culture, digital resources, digital tools, learning

Introduction

Igbo (ISO 639-3) is a language in Nigeria with native speakers, who predominantly occupy South East Nigeria. It is the native language of about 30-80 million Nigerians living in the country and the diaspora (Nwokedi, 2015), which affirms why it is being referred to as one of Nigeria's major languages. Despite this, the language is often overlooked in higher education institutions in Nigeria, even among universities that teach linguistics and Nigerian languages. This has resulted in limited access to digital resources that enable knowledge creation and dissemination of Igbo in the country's universities. Nigeria has renowned universities where the Igbo language is taught. Yet, there is hardly any course that is taught in the classroom with the use of digital resources and tools. This makes it difficult for the Igbo students and the language to compete favourably on the global linguistic stage amongst other languages in Africa and beyond. This justifies the argument that there is a low turnout of knowledge creation and dissemination on the Igbo language even within Southeast Universities.

Again, a cursory 'walk' into academic research sites to look for systematically documented investigations in the Igbo language has shown that there is a limited number of digital resources that can give students, lecturers, and other researchers a good foundation to build on or up-to-date information about the language, especially by native-speaker scholars in comparison to its contemporaries – Hausa and Yoruba. This brings up a series of questions - how do our students get grounded in the requisite and state-of-art literature on the Igbo language? How do teachers bring new information and revisions to teaching practices in class? How do researchers develop

and make the language accessible and viable for native and non-native speakers? How can the study of Igbo language and culture be promoted and made attractive? How can the labour of Igbo scholars and researchers be visible to attract collaborations between the department/University and others within and outside the country? Based on these concerns this study explores how digital resources and tools can improve Igbo language learning in Southeast Nigerian Universities.

Digital resources and tools have become increasingly important in teaching, learning, and academic research, as they allow for quick and easy access to a wide range of information from various sources. The recent rapid technological advances have profoundly impacted Nigerian universities, particularly regarding digital resources and their role in knowledge creation and dissemination. The 'new normal' since after the COVID-19 pandemic added its flair into the mix and has opened the eyes of many teachers, scholars, and students in Africa to decolonise previous concepts and strategies of teaching and learning. From a critical observation, there is a huge deposit of digital tools and resources that can enable African universities to explore new ways of teaching and learning. Unfortunately, many Nigerian universities are yet to leverage this wholistically.

The Arts and humanities are no exception to the recent trend in digitisation, as is obvious from numerous workshops, conferences, and institutes that have emphasised the need to incorporate digital humanities in different facets of research and teaching. Specifically, in the aspect of languages, it is obvious that digital resources and tools can facilitate the acquisition of language proficiency, and learning of indigenous Nigerian languages. In addition, digital resources and tools can enable universities to create and share valuable language learning materials between universities and with the wider language-speaking public. This study started as a journey that sought answers on the availability of state-of-the-art digital resources and tools in the Igbo language, the accessibility of these resources and tools to students and lecturers, the suitability of available digital resources to meet the requisite needs of students and teachers, and the factors that (de)motivate lecturers and Igbo scholars from making their research available as digital resources. It was of great interest to hear the same negative mantra sung by many students and lecturers in response to the above queries even in departments of different universities where Igbo is taught and learnt. This, informs the need to accentuate, the importance of digital resources and tools in teaching and learning the Igbo language and culture if the goal of developing, promoting, and preserving the language must be achieved.

This study, therefore, examines the role of digital resources and tools in facilitating and improving the learning of the Igbo language in the departments of Linguistics and Igbo at the University of Nigeria, Nsukka (UNN), Nnamdi Azikiwe University (NAU) and Alex Ekwueme Federal University, Ndufu-Alike Ikwo (AEFUNAI).

Literature Review

Digital resources are any information or media stored or transmitted digitally, like the computer or internet. This can include text documents, images, audio/video files, and data sets. On the other hand, digital tools refer to various software, applications, and online platforms that enhance productivity in different fields such as language learning, communication, collaboration (multidiscipline), learning, and design (Vaia,

2023; Noor, 2023). These digital tools can facilitate learning in small groups or pairs enhance interaction and are used for synchronous engagements. Some include videoconferencing tools like Zoom, Google Meet, Skype, Facetime, WhatsApp video calls, Line, Google Docs, forums, VoiceThread, and Extempore for asynchronous engagement. These resources also include platforms where students can collaborate without being connected simultaneously (González-Lloret, 2020). Additionally, language learning tools and linguistic software abound that can be used to understand the workings of different aspects of language study better.

The development of technology has had an impact on how we study and gain knowledge. New approaches to learning and education emphasise using online technologies, which is crucial for the younger generation of learners who rely on the internet for entertainment, information, and many other forms of learning. (Szymkowiak, Melović, Dabić, Jeganathan, & Kundi, 2021). According to Luthfia, Handayani, Gasa, Ramadanty & Ridzuan (2023), the internet is a significant resource for broadening horizons. In particular, the network offers quick access to information technology across many industries because of its widespread use. Information systems increase productivity, save time, and can be instrumental in contemporary teaching and learning approaches. The "flood" of information and resources brought on by revolutionary technological advancement fundamentally alters how individuals learn, educate themselves, operate enterprises, keep in touch with others, effectively access knowledge, and for other formal educational reasons. (Turner, 2015). Over the past 20 years, several well-known models of internet-based education have evolved. The open dissemination of academic content produced by individuals and institutions is a form of internet content sharing. For instance, millions of educational films created by individual teachers and students are accessible through the YouTube EDU service (Pratama, Arifin, & Widianingsih, 2020; Greenhow & Galvin, 2020; Malik, & Asnur, 2019; Duffy, 2008).

Additionally, it is no news that technology is being implemented by educational institutions, and many universities in different climes have embraced it as an important tool that has come to stay. Ajmal and Kumar (2020) and Kumar (2020) rightly note that technology is among the major forces of change at linguistic and societal levels. The creation and dissemination of indigenous knowledge especially as it has to do with language teaching, learning and researching has to recognise that the world is changing and that language and education must become part of the drivers. Abbas (2017) agrees that individual knowledge is important but knowledge must be shared effectively, digital knowledge sharing and dissemination amongst Nigerian academics is low, though he claims it may be a result of the need to adapt to certain social dynamics of a workplace rather than technology. On the other hand, Adeyemo and Adebayo (2018) believe that with the emerging digital tools much of the invaluable traditional knowledge can be saved, documented, improved upon, digitised, shared, and transmitted for the use of communities within and outside a particular country. One of such is the use of virtual language labs that simulate virtual immersive language experience allowing learners to improve on different language skills and enhancing language proficiency in all aspects. Another also is the language exchange platform. Ogwudile (2020) adds that development is mediated through Indigenous knowledge inculcated through Indigenous languages and that the use and teaching of Indigenous languages, like Igbo, can bring about revival and

vigour in the quest for national development, how much more when it is steered through the use of digital resources and tools.

The term digital resources and tools may have been reflected in classroom teaching and learning studies. Nevertheless, different studies have different perspectives on the forms of digital resources or tools used to create and disseminate language-related knowledge. Kumar, Malabar, Benyo, and Amal (2021) advocate for the need to move into the realm of multimedia technologies to keep pace with the global trend in the teaching of English. By *multimedia technology*, they mean any “computer-based interactive software that enables individuals to communicate ideas and information through hardware and software, alongside texts, images, animations, videos, and sounds” (p. 332). Another is the use of blended learning. *Blended learning* combines face-to-face and online learning into one activity to provide wider student learning and promote student-centred learning (Graham, 2006). Another learning model that utilises digital technology is the flipped classroom model (Mandasari & Wahyudin 2021). The *flipped classroom* is a learning model that uses video as a teaching medium. The video usually contains explanatory materials that will be discussed in class. Students and lecturers could access the videos with the help of the internet. In addition, these learning videos can also be studied over and over again at any time and anywhere, so that it makes it easier for students to understand the material presented. Furthermore, lecturers can take advantage of class time to reinforce the form of practice questions and other instructions. In other words, the role of video in the flipped classroom learning model is to minimise the time for lecturers to explain other learning materials during class sessions (Mandasari & Wahyudin, 2021:151).

Again, social media as a digital tool can be leveraged for digital teaching practices and for teachers and students to communicate instantly (Onuh 2022; Greenhow & Lewin, 2019; Faizi, El Afia & Chiheb, 2013). Some other studies have employed game-based learning as a more suitable approach to teaching and engaging children in education. Such language learning apps that provide gamified lessons include Duoling, Babbel, and Rosetta Stone among others, but they were mostly designed for the English language. However, studies have claimed that it is more successful than traditional learning methods, especially in an era where children and young adults are now proficient in handling digital information, communicating with others via mobile technologies, and playing more games than previous generations (Alam 2022). This shows that education and digital technology have been engaged together over the past decades. This confirms also that many empirically-based studies abound that have employed the use of digital resources and tools in language learning.

Using digital resources and tools in learning may look informal in a classroom setting, but its integration into classroom teaching and learning can have significant benefits (Carraro & Trinder, 2021). Some include more motivation for language learners, enhancement of communicative abilities, increased familiarity with the language’s culture, increased efficiency for both teachers and learners, enhanced engagement between teachers and students, a more conducive learning environment, and learning not constrained by time and space. However, downsides also exist like, over-dependence on supplementary tools, less student-teacher interaction, “reduced real-time teaching, less logical reasoning, and increased expenses for the school as well as the students, and teachers, when the school cannot provide the technological

support needed” (Kumar, Malabar, Benyo & Amal, 2021: 335-6). Teachers therefore get to play the role of designers of the learning experience, as they are responsible for guiding the process (Klimova, & Polakova, 2020; Poláková, & Klímová 2019). In other words, teachers' digital technology skills are essential to the advancement of digital education because they need to integrate new technological advancements into their daily teaching, serve as role models for their students, and increase students' motivation to use available digital tools as learning resources. This suggests that if teachers are poorly motivated to use digital resources and tools to teach, their students may also have such an attitude to learning (Backfisch, Lachner, Stürmer, & Scheiter 2021; Szymkowiak, Melović, Dabić, Jeganathan & Kundi, 2021). It is then pertinent that language teachers and instructors know the digital resources and tools that are available and accessible to teach students correctly.

The study believes that technological developments should go alongside the documentation and promotion of Nigerian languages, especially the Igbo language and culture. To establish this, the study is guided by the following research questions: what are the available and accessible digital resources and tools for Igbo language teaching and learning? How does using digital resources and tools impact the performance of students learning the Igbo language and culture? What are the implications of inclusive digital resources as instructional materials for classroom teaching and learning of the Igbo language and culture? To this end, the following null hypotheses are tested: i) There are no available and accessible digital resources and tools for the teaching and learning of the Igbo language and culture. ii) The use of digital resources and tools has no significant impact on the performance of students' learning of the Igbo language and culture. iii) Inclusive digital resources and tools have no significant implications as instructional materials for classroom teaching and learning of the Igbo language and culture.

Methodology

The study adopted a quasi-experimental research design. The study population comprised all students offering Igbo linguistics at the selected Southeast universities. However, 239 students in the Igbo linguistics programme constituted the sample size for the study. The distribution of students comprised the study participants from the selected universities included- 90 from the University of Nigeria, Nsukka, 89 from Nnamdi Azikiwe University, Awka, and 60 from Alex Ekwueme Federal University, Ndufu Alike Ikwo. The study used a multi-stage sampling technique. Purposive sampling was adopted to select the universities accredited to run Igbo linguistics programmes while simple random sampling was used for the participants, from each of the three universities that constituted the study area. The same group of participants was used as the control and experimental group.

A pretest was administered to the participants before the traditional method of teaching (by this, we mean the use of non-digital tools) was first used to teach aspects of the Igbo language and culture. This covers – aspects of phonetics, morphology, and translation (using proverbs) after which a post-test was administered. The participants were then taught the same aspects using digital online tools like the IPA interactive online charts (<https://jbdowse.com/ipa/>, <https://www.internationalphoneticassociation.org/content/phonetics-resources-and-tutorials>, <https://www.internationalphoneticassociation.org/> and

<http://www.jiscmail.ac.uk/lists/fonetiks/html>), Omenka App (Omenka - Apps on Google Play), YouTube resources [SECRET TO MASTERING IGBO WITH THE RIGHT ACCENT \(youtube.com\)](#), [LEARN TO SPEAK IGBO LANGUAGE {TONE MARKING} \(youtube.com\)](#), [How to Tone Mark in Igbo \(youtube.com\)](#) and [Igbo lesson 9: Udaolu \(Tone marking \) \(youtube.com\)](#) and [English to Igbo Translator for Android - Free App Download \(appbrain.com\)](#) and online Bilingual translator [Igbo - English Translator for Android - Free App Download \(appbrain.com\)](#). After this, another post-test was administered using a digital evaluation tool (<https://quizizz.com/join>). Finally, a survey questionnaire which was face validated by three experts was administered to the participants after the pre- and post-tests. The research questions were analysed using mean and standard deviation scores, while the hypotheses were tested at $P < 0.05$ probability level, using the analysis of covariance (ANCOVA). The quantitative analysis was done with the Statistical Package for Social Science Research (SPSS version 26.0) while the results were qualitatively analysed subsequently.

Ethical clearance to conduct this research was obtained from the Faculty of Arts Ethics Committee, University of Nigeria, Nsukka. Sufficient information on the research was available to participants from the start so that they could make an informed decision to voluntarily participate in the experiment sessions and withdraw at will without prejudice. Participants were made to understand that all the data provided would be treated as confidential and anonymised.

Results

4.1 Availability and accessibility of digital resources and tools for Igbo language and culture learning

This section presents results that answer research question 1: What are the available and accessible digital resources and tools for Igbo language and culture learning? First, a table representing the frequency distribution of the participants and the universities used in this study is presented, followed by a table showing the percentage of Igbo student learners who have access to digital tools and learning.

Table 4.1: Frequency Distribution of Participants (Igbo language students) by School

Universities		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	UNN	90	37.7	37.7	37.7
	UNIZIK	89	37.2	37.2	74.9
	AE-FUNAI	60	25.1	25.1	100.0
	Total	239	100.0	100.0	

Source: SPSS output version 26.0

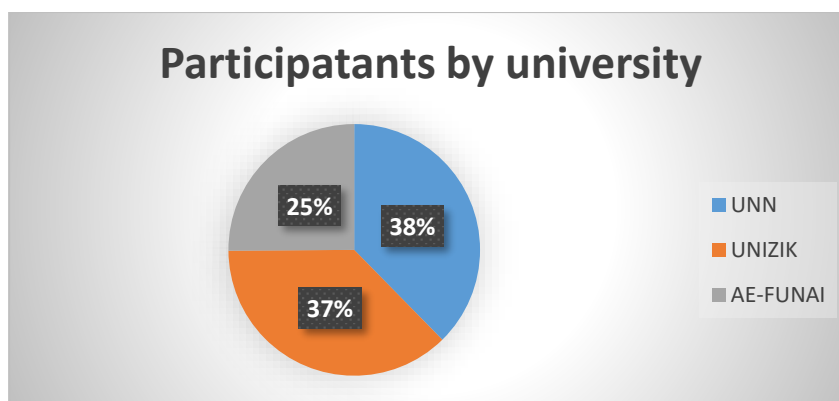


Figure 4.1: Pie chart showing students' participation from each university

From the table and figure above, **UNN** has the highest number of participants with **90** students. **UNIZIK** closely follows with **89** students while **AE-FUNAI** has the smallest group of participants, with **60** students.

Table 4.2: Percentage of Igbo student learners who have access to digital tools and learning. (n= 239)

S/N	Item Statement		Frequency (n=239)	Percentage %	Decision
1.	Interactive IPA Charts	Yes	140	58.57	Accessible
		No	99	41.42	
2.	YouTube	Yes	220	92.05	Accessible
		No	19	7.94	
3.	Google Classroom	Yes	150	62.76	Accessible
		No	89	37.23	
4.	Online (Bilingual) Dictionaries	Yes	210	87.86	Accessible
		No	29	12.13	
5.	Chat Platforms	Yes	159	66.52	Accessible
		No	80	33.47	
6.	Laptop	Yes	110	46.02	Not Accessible
		No	129	53.97	
7.	Smartphones	Yes	225	94.14	Accessible
		No	14	5.85	
8.	Kahoot Game	Yes	09	3.77	Not Accessible
		No	230	96.25	
9.	Zoom	Yes	190	79.49	Accessible
		No	49	20.50	
10.	Quizziz Game	Yes	145	60.66	Accessible
		No	94	39.33	
11.	Google Forms	Yes	170	71.12	Accessible
		No	69	28.87	
12.	Edpuzzle	Yes	60	25.10	Not Accessible
		No	179	74.89	
13.	Smartzr	Yes	85	35.56	Not Accessible
		No	154	64.43	
14.	Online Translators	Yes	130	54.39	Accessible

	No	109	45.60	
15. Omenka App	Yes	200	83.68	Accessible
	No	39	16.31	

Criterion: 50 -100 % Accessible; 1- 49% Not accessible

Table 4.2 above highlights the accessibility of various digital learning resources among 239 participants, revealing both highly accessible resources and notable gaps. Resources/tools like smartphones (94.14%), YouTube (92.05%), online bilingual dictionaries (87.86%), Omenka app (83.68%) and Google forms (71.12%) are widely accessible, emphasising the prominence of mobile technologies and multimedia platforms in Igbo language and culture teaching and learning. In contrast, Kahoot (3.77%), Edpuzzle (25.10%) and Smartzer (35.56%) have limited accessibility.

H₀₁: There are no available and accessible digital resources and tools for learning the Igbo language and culture.

The result demonstrates that while many digital resources are accessible, significant gaps remain that require targeted efforts to enhance availability and usage among learners. Hence, the null hypothesis is rejected.

4.2 Impact of using digital resources and tools for Igbo language and culture learning

Here, we address another research question: how does using digital resources and tools impact the performance of students learning the Igbo language and culture?

Table 4.3: Tests between Pre-test and Post-test

Tests of Between-Subjects Effects						
Dependent Variable: Post-test Experimental						
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	26458.885 ^a	3	8819.628	60.759	.000	.437
Intercept	27048.952	1	27048.952	186.341	.000	.442
Pre-test	25238.198	1	25238.198	173.866	.000	.425
School	403.894	2	201.947	1.391	.251	.012
Error	34112.295	235	145.159			
Total	866192.000	239				
Corrected Total	60571.180	238				

a. R Squared = .437 (Adjusted R Squared = .430)

Source: SPSS output version 26.0

The ANCOVA results indicate a significant relationship between pre-test scores and post-test performance in students learning the Igbo language using digital resources. The corrected model explains 43.7% of the variance in post-test scores, as evidenced by a highly significant F-value of 60.759 ($p < .001$). The pre-test scores are a strong predictor of post-test performance, with a significant F-value of 173.866 ($p < .001$), indicating that prior knowledge substantially influences learning outcomes. This variable accounts for 42.5% of the variance in post-test scores, underscoring its importance in understanding student performance.

Ho₂: The use of digital resources and tools has no significant impact on the performance of students learning the Igbo language and culture

The results reveal that integrating digital resources and tools significantly enhances students’ performance in learning the Igbo language and culture, in all the universities, while being influenced by students' initial proficiency levels. This justifies the rejection of the null hypothesis in favour of the alternative hypothesis stating that digital resources and tools positively impact learning outcomes.

4.3 Implications of incorporating inclusive digital resources and tools as classroom instructional materials for Igbo language and culture learning

The last research question is examined in this section. What are the implications of incorporating inclusive digital resources into instructional materials for classroom teaching and learning of the Igbo language?

Table 4.4: Statistical survey of students’ perception of the inclusive use of digital resources and tools in classroom learning

Statistics						
	Which aspect(s) of the pre-test gave you the most problems?	Which aspect(s) of the pre-test gave you the least/no problems?	Which aspect(s) of the post-test showed that you have improved?	Does using digital resources/ tools make learning the Igbo language/ culture easier/better?	What aspect(s) of the digital resources used made learning the Igbo language/culture more fun?	Which of the teaching methods gives you a better insight into learning aspects of the Igbo language/culture?
Valid N (Missing)	239 0	239 0	239 0	239 0	239 0	239 0
Mean	1.7866	2.8494	2.5146	1.2678	2.4603	1.5105
Mode (n)	Transcription (120)	Translation (92)	Tone Marking (93)	Yes (194)	Evaluation Tool Game (103)	Digital Resource (168)
Std. Deviation	.96170	1.00540	1.02017	.59713	1.05594	.82433

SPSS output version 26.0

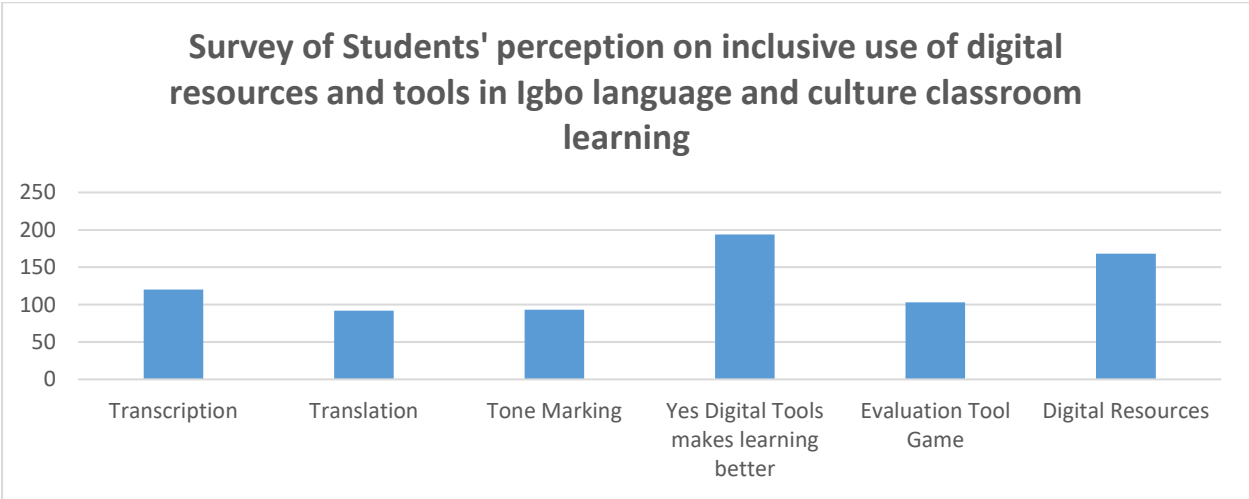


Fig. 4.2 Survey of students' perception of the inclusive use of digital resources and tools in Igbo language and culture classroom learning.

The survey of 239 respondents highlights key insights into learning the Igbo language using digital resources. Transcription was identified as the most challenging pre-test aspect (mode = 120, mean = 1.79), whereas translation posed the least difficulty (mode = 92, mean = 2.85). Post-test results showed improvement, particularly in tone marking (mode = 93, mean = 2.51), indicating effective skill enhancement. A substantial majority affirmed that digital resources/tools make learning easier and better (mode = 194, mean = 1.27), underscoring their positive impact. Using evaluation tool games significantly increased the fun aspect of learning (mode = 103, mean = 2.46), enhancing engagement. Additionally, digital resources were the preferred teaching method (mode = 168, mean = 1.51), suggesting they provide superior insights into Igbo language and culture. Low standard deviations across responses indicate consistent perceptions among participants, reinforcing the reliability of these findings.

Ho₃: Inclusive digital resources have no significant implications as instructional materials for classroom teaching and learning of the Igbo language and culture.

The results prove that inclusive digital resources enhance classroom teaching and learning of the Igbo language and culture. Therefore, the null hypothesis is rejected.

Discussion of Findings

The findings from the study on the availability and impact of digital resources for Igbo language learning reveal a landscape that indicates that while some digital tools are available and accessible, significant gaps must be addressed to optimise their effectiveness. This is particularly relevant in the global context of contemporary educational practices, where the integration of digital resources is increasingly recognised as a vital component of language instruction. The use of digital resources and tools in classroom learning in Nigerian universities comes with a lot of challenges, which was a recurrent syndrome in all the universities examined. Lecturers and students had one silly or discouraging remark to give during the informal sessions (introduction of the research and feedback). These remarks point out that using digital resources and tools consistently in classroom learning is a 'near-impossible' feat in Nigerian public schools. This shows that there is a long road to this level of technology use in regular classrooms. That notwithstanding, this study did set out to highlight these challenges that have become a regular "sing-song", but to examine the practicability of using these resources amidst these challenges and its impact on students' learning outcomes.

The first hypothesis examined the availability of digital resources for learning the Igbo language, rejecting the null hypothesis. The Igbo language learning study results reveal several insights regarding the accessibility of digital resources and tools to learners. It shows that learning management systems like smartphones, YouTube, online bilingual dictionaries, the Omenka app, and Google Forms are widely accessible. This agrees with (Pratama, et al., 2020; Greenhow and Galvin, 2020; Malik & Asnur, 2019). It also emphasises the prominence of mobile technologies and multimedia platforms in language and culture teaching and learning, though used more in English and wider-spoken languages. Specialised tools such as Interactive

IPA Charts, Google Classroom, and Chat platforms likewise show some level of accessibility, hence the study advocates the need for increased awareness of its use and integration into Igbo language curricula. Laptops were accessible to less than half of the participants, indicating a significant digital divide favouring the use of mobile devices (Imo, Okorie, Nwachukwu & Nwizu, 2023). The high accessibility of gamified and interactive learning platforms like Quizziz reflects a growing preference for engaging game-based learning experiences. It also confirms Alam's (2022) opinion that game-based learning is a more suitable approach to teaching and is more successful than traditional learning methods.

Due to a lack of awareness and access to some game platforms that require paid subscriptions to enjoy their full functionalities, we see limited access to other gamified tools such as Kahoot, Edpuzzle, and Smartzer, which highlights an aspect for improvement. This is where universities are also needed to play the role of intervention, however, these universities complain of inability to fund such good projects. Nevertheless, the study believes that many free resources can be used in the Igbo language learning experience if teachers and students alike are aware of them and motivated to engage them in their classroom experience. This is because mobile technologies will continue to play a leading role in education. This aligns with Dinçer (2020) which emphasises the need for educators to bridge the gap between the classroom and virtual/online learning through digital tools. Also, integrating digital tools can enhance students' learning experience and significantly improve language acquisition (Bećirović et al., 2021). This counters part of the disadvantages of engaging digital resources in classroom language learning put forward by Kumar, et al. (2021) and gives credence to Klimova and Polakova (2020) and Poláková and Klímová (2019) that the integration of new technological advancements into teaching increases students' motivation to use available digital tools as learning resources. Therefore, we recommend that even with limited access to laptops, targeted efforts by teachers can focus on improvising ways to bridge access gaps and ensure digital resources' incorporation and usage among learners.

The second hypothesis focused on the impact of digital resources on student performance with results from the ANCOVA indicating a significant relationship between pre-test scores and post-test performance, with a corrected model explaining a substantial variance in post-test scores. This suggests that prior knowledge significantly influences learning outcomes, as evidenced by the strong predictive value of the pre-test scores. The pre-test scores are the students' baseline knowledge (sometimes used to assess IQ level), while the post-test scores are obtained after the experimental teaching. The results demonstrate that integrating digital resources and tools significantly enhances students' performance across all participating universities, while also being influenced by their initial proficiency levels. This supports the rejection of the null hypothesis, affirming that digital resources positively impact learning outcomes in the context of Igbo language and culture education, contradicting one of Gajek's (2023) conclusions that the intensive use of digital tools did not substantially impact students' learning habits. This finding is consistent with studies highlighting a positive correlation between digital competency and language learning outcomes, as students with higher digital skills tend to perform better. This implies that the effective use of digital tools leads to improved academic performance (Rafiq, Iqbal & Afzal, 2024, Haleem, Javaid, Qadri

& Suman, 2022; Jolselt, 2019). Moreover, emphasis on digital literacy among educators is crucial, as their ability to integrate technology effectively can significantly influence student engagement and learning success (Alakrash & Razak, 2021). This study confirms that using digital resources in Igbo language knowledge learning positively impacted students' performance in all the universities investigated.

The third hypothesis addressed the implications of inclusive digital resources as instructional materials. The survey results indicate that students perceive digital resources as enhancing their learning experience. For instance, a significant majority affirmed that digital tools make learning easier and more effective. Additionally, using digital evaluation tools or games was observed to increase engagement in learning, suggesting that digital resources contribute to a more interactive and enjoyable learning environment. This seems so because the idea of gamification in test writing introduces a relaxed state of mind, unlike the tension that follows handwritten tests. As such, students' full potential can easily be released. Additionally, this finding indicates that digital resources are the preferred teaching method among students, providing superior insights into learning aspects of the Igbo language and culture. This underscores the importance of integrating digital tools into the curriculum to foster a more inclusive and engaging educational experience. The results support the rejection of the null hypothesis, confirming that inclusive digital resources significantly enhance classroom teaching and learning of the Igbo language and culture. The low standard deviations across responses reinforce the reliability of these perceptions. This aligns with the findings of other research that suggest that digital storytelling and interactive digital content can significantly enhance student motivation and engagement in language learning (Eslit, 2023; Girmen et al., 2019), improve communicative abilities, and increase learners' familiarity with the language's culture (Carraro & Trinder, 2021). Furthermore, the incorporation of diverse digital resources and tools cater to different learning styles, thereby promoting a more interactive (Kumar & Nanda, 2022) and inclusive environment that is effective for learning (Ali et al., 2018).

The study was limited by a variable that was not anticipated. During the experiment sessions, a few students logged out mistakenly during the post-test, when they had not attempted all questions. Since each session was restricted to one attempt, this may have impacted a few students' performance. Nonetheless, we firmly believe that the results are valid. In all, the study contributes to the discourse on the nexus between the use of digital resources and tools for Igbo language knowledge dissemination in university classrooms and its impact on students' learning outcomes. The study observes a recurring complaint from participants about the scarcity of these digital resources, and inaccessibility to digital resources and tools due to lack of funds on the part of students, teachers as well as the university. Also, internet services and lack of constant electricity supply. However, we note that chief among these factors is the lack of awareness which Onuh (2022) agrees with, and foresight for improvisation. Many lecturers and educators do not know that it does not cost much to integrate digital resources into classroom teaching. Alternative sources of power, a projector, mobile 5G broadband router, and smartphones were used during the experimental teaching sessions as ways of mitigating the initial limitations that were posed by the idea of using digital resources and tools to teach the student participants and this

achieved much success, though there are still areas of improvement. Universities' management has a critical role in providing access to digital language learning materials and digital tools. However, students and lecturers can also play a good role in making private arrangements to access a few digital resources and tools, since it is for their development and future. This implies that universities in Southeast Nigeria, do not have an excuse to play a leading role in promoting Igbo language knowledge creation and dissemination, and create a more connected and engaged Igbo-speaking community.

Conclusion

The study underscores the importance of digital resources in learning the Igbo language in Southeast universities, revealing both potential and existing gaps that need to be addressed. The study shows that while there is a substantial availability of digital resources for learning the Igbo language and culture, accessibility varies significantly among different tools. Of particular reference is that many digital resources and tools for language knowledge creation and teaching are more available in learning ESL/EFL and other widely spoken languages and not many are used in teaching Nigerian languages like Igbo. Be that as it may, there is room for Igbo lecturers to learn about, adapt, and effectively integrate these digital resources and tools into their classroom teaching practices. This will help create interesting instructional materials that focus on student's needs and revamp the course content of the Igbo programme to meet global trends and needs. Also, future research can focus on developing strategies to enhance the accessibility of underutilised digital tools to foster digital literacy for educators and students and ensure that the benefits of digital resources are maximised in the context of Igbo language learning in Southeast and Other Nigerian universities.

Disclosure statements

The authors declare that they have no competing interests.

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