Digitized Pedagogy: The Case of Ikwere Phonology and Orthography

By

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Abstract

The reality of today's world is one where technological innovation holds such vast influence, so much that there is hardly any facet of human experience that cannot be augmented through technology. This notion is what underscores the undertaking of this study, Digitized Pedagogy: The Case of Ikwere Phonology and Orthography. The study was conceived to design a digital pedagogical guide that details the intricacies of the sound and writing systems of Ikwere. More specifically, its objectives encompass the gathering of available data on the phonology and orthography of Ikwere and creating a lesson note on said aspects of the language, creating a Computer Assisted Language Learning platform that enables a virtual personalized learning of the sound writing systems of Ikwere, and providing a framework for the virtual bolstering of Ikwere grammar via Computer Assisted Language Learning. The study is anchored on the Computer Assisted Language Learning (CALL) framework, with reliance on the qualitative research design. Primary data for the research were sourced from the Obio dialect of Ikwere using a modified SIL Comparative African Wordlist (SILCAWL). Purposive sampling was utilized to select four competent language consultants that provided the data. The study's findings reveal that the specificities of the sound and writing systems of Ikwere notwithstanding, features of the Ikwere phonology and orthography and by extension, grammar can be

adequately deployed digitally via software codes. Also, this study proved that the creation of digitized Ikwere pedagogical contents is achievable. Following its findings, the work recommends broader adoption of CALL in shoring up the pedagogy of the grammars of Ikwere and other indigenous languages.

Keywords: Phonology, Orthography, Pedagogy, Computer Assisted Language Learning, Digitized, Ikwere

1. Introduction

The phonology and orthography of a language cannot be dissociated from each other, especially, in alphabetical writing systems. Davenport and Hannahs (2010) in expatiating phonology note that at the level of phonological analysis, the phoneme is the focus. The phoneme encapsulates the abstract underlying level of the sound inventory of a language; the level that houses the significant segments of any language. On their part, Ashby and Maidment (2012) characterize the phoneme as one of the basic phonological units of which all words in a language are composed. The phoneme represents the core of the sounds utilized in the formation of speech in a language, and although we do not utter phonemes (whatever we utter is an allophone of a given phoneme), they provide the basis of orthography, particularly, in an alphabetic writing system.

Camenev and Melenciuc, (2019) describe orthography as the study of the conventional spelling system of a language. Adding, they note that it involves the rules and principles that govern how words are spelled, including the use of letters, diacritics, and punctuation. While the orthography of a language provides the symbols and conventions for writing that language, it does not do this arbitrarily. The orthography represents the phonemes of a language through written symbols, and ideally, there is usually a consistent relationship between the written symbols and the phonemes that they represent. The relationship between phonology and orthography can, therefore, be described as a feeding relationship. Phonology, which deals with the study of the sound system of a language, provides the foundation for orthography by determining which sounds are significant enough to be reflected in the writing system, although the extent of this reflection can vary depending on the writing system. It is this intertwining

relationship between phonology and orthography that underlines this study's approach; the approach of providing in-depth digitized elucidation of the significant sounds of Ikwere, alongside its writing system.

Language is primarily spoken, and while it is possible to acquire spoken language, it is a near impossibility to acquire knowledge of the workings of the phonological structure and writing system of any language without instruction. The import of this assertion is that the intricacies of the Ikwere phonology and orthography cannot be understood if not taught. Therefore, this study on the pedagogy of the phonology and orthography of Ikwere falls within the domain of language teaching. It, however, takes a different approach. It adopts the Computer Assisted Language Learning technique, thereby, harnessing the vast potentials of virtual/digitized language teaching.

The need to digitize the pedagogy of the grammars of indigenous Nigerian languages cannot be overemphasized. Nigeria is a vastly multilingual society with a large number indigenous languages that are under constant threat. With the effects of globalization and the large youthful population Nigeria boasts, the reinforcement and intergenerational transmission of most indigenous languages stand on precarious grounds. A predominantly youthful population is more inclined to technological trends and since these trends are mostly foreign and are hardly ever localized, they go on to erode our indigenous ways of life as evident in the declining interest in indigenous languages among the younger demography. In a nutshell, the scarce availability of digital language teaching and reinforcement tools for indigenous languages makes the languages less attractive to the younger digital native population and this in-turn heightens the endangerment of the languages.

2. Statement of the Problem

Granted, the phonology and orthography of Ikwere have been almost exhaustively studied and documented as evident in Alerechi (2007), Williamson et al. (2010) and others, however, regardless of the in-depth research that has been done on these aspects of Ikwere, many native speakers of the language are barely knowledgeable in the sound and writing systems of Ikwere. This is not unconnected to the fact that there are very few professionally managed platforms

(both online and offline) that address literacy in Ikwere. Additionally, given the proliferation in the usage of smart digital devices locally and the rapid innovations occurring in pedagogy (the shift from traditional teaching techniques towards digitized/virtual and blended approaches), it is unfitting that Ikwere pedagogy is not being considerably handled via digital channels. With research accomplishments in the grammar of Ikwere not substantially digitized and scarcely existing on interactive virtual platforms that conform to current technology-mediated pedagogical techniques, it can be concluded that the teaching of Ikwere falls short of the expectations of the times. Therefore, in view of these gaps, this study makes a contribution to the professional teaching of Ikwere and the digitization effort of the pedagogy of the grammar of the language. This research is guided by the notion that if literacy in Ikwere is to be entrenched and the intergenerational transmission of the language is to be sustained, Computer Assisted Language Learning techniques MUST be vastly exploited to achieve both goals.

3. Objectives of the Study

The study was conceived to design a digital pedagogical guide that details the intricacies of the sound and writing systems of Ikwere. Specifically, its objectives are to:

i. gather available data on the phonology and orthography of Ikwere and create a lesson note on said aspects of Ikwere;
ii. create a Computer Assisted Language Learning platform that enables a virtual personalized learning of the sound writing systems of the Ikwere;
iii. provide a framework for the virtual teaching and bolstering of Ikwere grammar via the adoption of the Computer Assisted Language Learning.

4. Review of Related Literature

This study is anchored on the Computer Assisted Language Learning (CALL) framework. It is, therefore, fitting that an overview of the framework and a justification of its relevance to this study be carried out.

4.1 Computer Assisted Language Learning (CALL) Theory

Computer Assisted Language Learning (CALL) emerged as a result of advancements in computer technology, and over the years, it has evolved to

incorporate the use of smart hand-held devices in instructing language learners. As a branch of Applied Linguistics, CALL has interdisciplinary relations with the fields of Computer Science and Software Development. It integrates varied computer programming and technological techniques in the optimization of language learning.

Levy (1997) provides a broad definition of CALL by noting that it is "'the search for and study of applications of the computer in language teaching and learning" (p. 1). More precisely, Davies (2006) describes CALL as "an approach to language teaching and learning in which computer technology is used as an aid to the presentation, reinforcement, and assessment of material to be learned, usually including a substantial interactive element" (p. 1). Davies goes on to note that the application of computers for the teaching and learning of language tend to fall into two distinct categories: a) those that involve the use of generic software tools such as word processors, presentation software, e-mail packages, and Web browsers, and b) those designed specifically to promote language learning. According to him, this latter category of computer application adequately defines CALL.

The use of computer programs for the purpose of language learning has been shown to be a generally effective strategy even among advanced learners. For example, in a study by Linda L. Chang at Brigham Young University, eight advanced students of Chinese participated in a semester long course utilizing a CALL program while a control group of eight students learned the same material in a typical classroom setting. Pre and posttests measured student improvement in terms of grammatical accuracy, attitude, and perceived learning gains. The CALL program utilized multimedia in the form of video and audio components to enhance the learning experience and allowed for the collection of user generated audio for testing purposes. Both groups conducted assessment using the audio capture feature of the CALL program but only the test group received instruction from the program. The results of the pre and posttests show a significantly higher growth in the experimental group over the control group. Experimental group participants outperformed control group participants on both idiom definition and open-ended questions which typically require a more sophisticated understanding of the language. Moreover, near totality of the students agreed that

the CALL system was helpful in solidifying their knowledge of Chinese (Chang, 2007).

The fundamental endeavor of this study falls within the boundaries of computer assisted language learning (CALL), specifically, what is called the Integrative CALL typology. The research broadly adopts multimedia and software techniques in the design of a virtual teaching platform that addresses the phonology and orthography of Ikwere.

4.2 Overview of Online/E-Learning

It is widely believed that we are in the golden age of technological revolution because its radical and stupendous advancement in recent years have vastly reshaped our actuality in incredible ways. All facets of human engagement have been immensely impacted by technology and will continue to be transformed by it. Technology has recreated our world fundamentally and the structural changes it has entrenched are pivotal to the actualization of significant improvements in all sectors.

In education, technology has refashioned teaching and learning by infusing the learning experience with digital learning tools, such as computers and smart hand-held devices and the ensuing result being online/e-learning. Technology has expanded course offerings, experiences, and learning materials; it is increasing student engagement and motivation and accelerating learning holistically. Technology has also displayed great potential in the transformation of teaching by ushering in a new model of connected teaching. This model links teachers to their students and to professional contents, resources, and systems to help them improve their own instruction and personalize learning (US Department of Education, 2021).

E-learning is commonly viewed as the intentional use of networked information and communications technology in teaching and learning. Other related terms are also used to describe this mode of teaching and learning; terms such as: online learning, virtual learning, distributed learning, network and web-based learning, etc. Some schools of thought believe that e-learning encompasses a lot more than online learning, as the letter “e” in e-learning stands for the word “electronic”. It,

therefore, means that it incorporates all educational activities that are mediated by electronic channels, whether online or offline (Naidu, 2006).

On their part, Cojocariu et al. (2014) see network access as an invaluable characteristic of e-learning and they posit that most of the terms associated with e-learning (online learning, open learning, web-based learning, computer-mediated learning, blended learning, m-learning, etc.) have this in common: the ability to use computers and somewhat recently, hand-held devices connected to a network (the internet), that offer the possibility to learn from anywhere, anytime, in any rhythm, with any means. Indeed, with how integral the internet has become, it is almost impossible to conceive e-learning as being devoid of the internet. This scenario has made e-learning to be almost synonymous to online learning.

Discussing online learning, specifically, Singh and Thurman (2019) emphasize that online learning can be termed a tool that can make the teaching–learning process more student-centered, more innovative, and even more flexible. They go on to define online learning as learning experiences in synchronous or asynchronous environments using different devices (e.g., mobile phones, laptops, etc.) with internet access and in these environments, students can be anywhere (independent) while learning and interacting with instructors and other students. Their conceptualization of online learning divides it into two types: synchronous and asynchronous online learning.

4.2.1 Synchronous and Asynchronous Online Learning

The synchronous learning experience is structured in such a way that students attend live lectures, there are real-time interactions between educators and learners, and there is a possibility of instant feedback. However, asynchronous learning does not have the real-time experience as a feature. In an asynchronous online learning environment, learning content is not available in the form of live lectures or classes; it is available at different learning systems and forums as prerecorded or encoded messages. Instant feedback and immediate response are not possible under such an environment but they are not totally absent, only delayed. (Dhawan, 2020).

4.3 Online Language Learning

Just as technology has disrupted the norm in other aspects of learning, it has done same in language learning. Indeed, technology is changing the way we teach and learn languages, as it has provided teachers with new facilities and approaches to teaching that can rouse learners' interests while challenging their intellect (Blake, 2013, 2016; Stanley, 2013). To Larsen-Freeman and Anderson (2011), technology contributes to language learning in two important ways: a) it provides teaching resources such as podcasts, vodcasts, online dictionaries, weblogs, WebBoards etc. and b) it enhances learning experiences, by increasing access to the target language and opportunities that will enable learners to work at their own level and pace, and choose when and where to learn. Buttressing the views stated above, Jabeen and Thomas (2015) assert that the use of the internet (and related technologies) with regards to teaching and learning has spread rapidly in the education sector. They note that in the field of language teaching and learning, educators have taken interest to model student-oriented courses using the latest web and related tools for courses which have been largely instructor oriented.

On the tools enabling online language learning, over a decade ago, Keegan (2003) drew attention to the fact that M (mobile)-learning, a feature subsumed under e-learning would shape the future of learning. In a similar vein, Wagner (2005) states that "the mobile revolution is finally here. Wherever one looks, the evidence of mobile penetration and adoption is irrefutable…. No demographic is immune from this phenomenon," (p. 40). Of all the hardware technological innovations available in the world today, devices such as smartphones, tablet computers, laptops, MP3 and MP4 players and iPads, occupy a strategic position in online language learning, given that they allow learners study anytime, anywhere and at their own pace and convenience, an experience called 'ubiquitous' learning (Ogata and Yano, 2004; Yang, 2006).

Beyond hardware online language learning tools, there are several software tools available to the online language learner. The Yale Centre for Language Study broadly categorized these tools into audio recording and editing (e.g., Vocaroo), photo editing (e.g., Pixir), multimedia projects (e.g., CLEAR's rich Internet applications), collaborative working and writing (e.g., GoogleDocs), presentation (e.g., Prezi), videoconferencing (e.g., Skype), dictionaries and vocabulary learning

(e.g., Wordreference), video-production and editing (e.g., Amara), and website and e-portfolios (e.g., Weebly). On his part, Son (2011) listed some online learning possibilities that are currently available and freely accessible on the Internet: learning/content management systems; communication; live and virtual worlds; social networking and bookmarking; blogs and wikis; presentation; resource sharing; Website creation; Web exercise creation; Web search engines; dictionaries and concordances; and utilities. The vast array of hardware and software online language learning tools and possibilities that have been available through technological advancements are only a testament of the fact that language learning has moved beyond the physical classroom into the virtual space.

5. Digitized Pedagogy of Ikwere Phonology and Orthography

In this section, an overview of how the study actualized its aim has been carried out. The study does this by undertaking a detailed description of the digital language learning tool designed for its purpose. The study built a progressive web application that uses voice accompaniments and visual aid to discuss the specifics of the phonology and orthography of Ikwere. The succeeding subsections present a page-by-page breakdown of the Ikwere phonology and orthography pedagogy-centric progressive web application, named, **Ọ̀kwụ́kwọ̄** ('book').

It is pertinent to note that, in the design of the progressive web application, the study precludes any prior knowledge of Linguistics on the part of the learner. It takes an elementary approach.

5.1 Description of the Progressive Web Application (Ọ̀kwụ́kwọ̄)

A progressive web application (PWA) is a web platform that combines the key features and functionalities of native applications and web applications. PWAs are delivered through the web using common web technologies such as HTML, CSS, JavaScript, etc. PWAs are designed to work on any platform that supports a standards-compliant browser including personal computers and mobile devices.
With a passing focus on the phonology of Ikwere and an emphasis on Ikwere orthography, the platform created by this study platform provides in-depth information in an easy-to-understand format about the sound and writing systems of Ikwere. Lessons on Ikwere sounds (consonants and vowels), their attributes, the Ikwere alphabet, its peculiarities and governing principles and how tone factors

into the writing of Ikwere were provided and each topic is reinforced with rich examples. Additionally, sound accompaniments were embedded into aspects of the lessons that require such. Taking into account that questions will arise as users engage with the platform, a chat functionality was structured into the architecture of the platform. What this does for the learner is that, at any point that a learner has questions, he/she can easily contact a language professional directly from the platform and his/her inquiry will be adequately addressed. The progressive web application designed by the study is hosted on a web server and can be accessed via the domain: https://okwukwo.netlify.app/.

The lessons that constitute the content of the progressive web application are broadly grouped under three sections, and are housed in a menu on the platform. Each of the broad groupings has subtopics contained within it and listed accordingly on the menu of the platform. Below is a synopsis of the broad groupings of the lessons on the platform:

A Bit on Ikwere Phonology: This section of the platform undertakes a cursory look at the sound system of Ikwere, presenting and describing the consonants and vowels of the language. The researcher thought it necessary to discuss the sound system of Ikwere so that a sturdy background can be established before addressing the writing system of the language.

Ikwere Orthography: This subdivision of the platform is focused on more extensively. It introduces the learner to the alphabet of Ikwere, distinguishes between writing phonetically and orthographically, shows the correspondence between the consonants and vowels of Ikwere and the letters of Ikwere alphabet, and gives instances of actual Ikwere words that contain the letters of the alphabet. It also highlights key peculiarities of the Ikwere alphabet; peculiarities such as the digraphs in the alphabet of Ikwere and orthographic representation of narrow vowels and nasal vowels in the language.

Tone: This section discusses the Ikwere tonal structure and its implication for orthography. It discusses the high, low and downstep tones and as well the falling and rising tones in Ikwere. In this section, the ability of tone to cause otherwise orthographically similar words to have different meanings was also underscored.

The remainder of this section will now embark on a pictorial page-by-page description of the progressive web application, Ọ́kwụ́kwọ̄. All the screen shots of the progressive web application used in the description are in the mobile format.

5.1.1 The Preliminary Pages of the Progressive Web Application (Ọ́kwụ́kwọ̄)



Fig. 5.1
Screenshot of the Landing Page

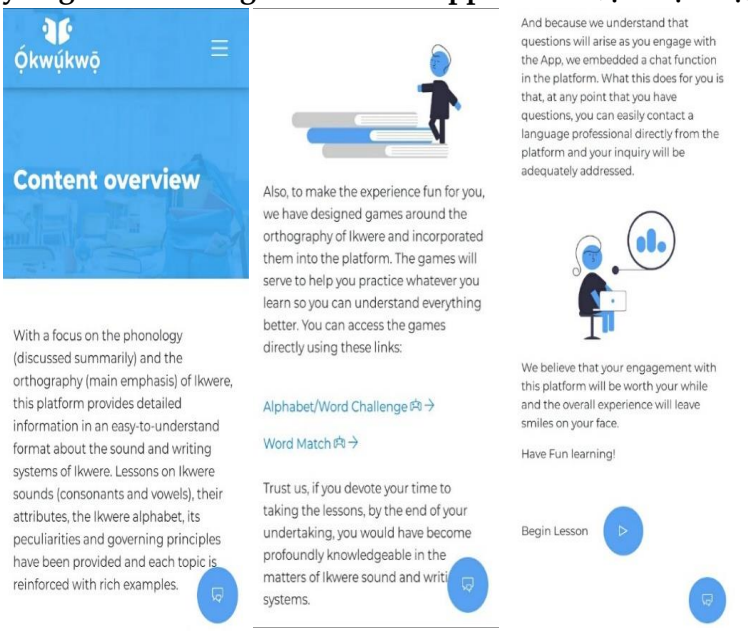


Fig. 5.2
Screenshots of Content Overview Page

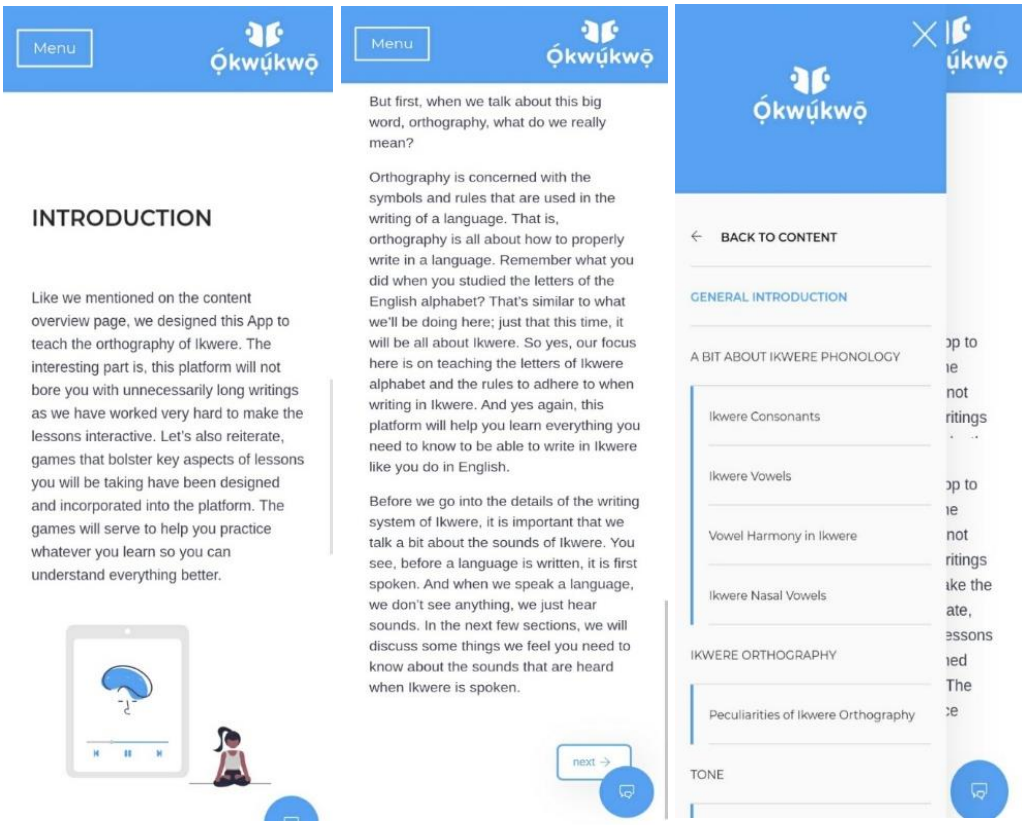


Fig. 5.3
Screenshots of the Introduction Page

The landing page, as seen in Fig. 5.1 is the first page a learner encounters upon visiting the platform. This page welcomes the learner with a message that summarizes the focus of the platform. Included on the landing page is a button that direct the learner to proceed to the lessons.

Upon tapping on the *Proceed to Lesson* button on the landing page, a learner engaging with this platform gets directed to the Content Overview Page, seen in Fig. 5.2. Here, a synopsis of the entirety of the content of the platform is presented to the learner, helping him/her get a grip of what to expect as he/she progresses.

As seen in Fig. 5.3, the platform's Menu is the segment that houses all the lesson topics available to the learner. Using the menu, the learner can navigate through the entire platform to explore the lessons. It is from this point actual learning on the platform starts. This page gives a background to the lessons on the platform; it introduces the learner to the concept of orthography and highlights the need to walk the learner through aspects of the sound system of Ikwere.

Beyond the preliminary pages, the first lesson the learner encounters, is the bit on Ikwere phonology. What follows presents screenshots and description of this section of the application.

5.1.2 A Bit about Ikwere Phonology

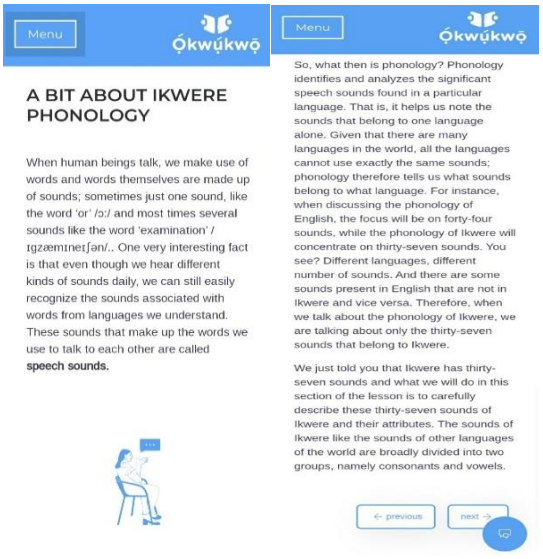


Fig. 5.4
Screenshots of the Pages on Ikwere Phonology

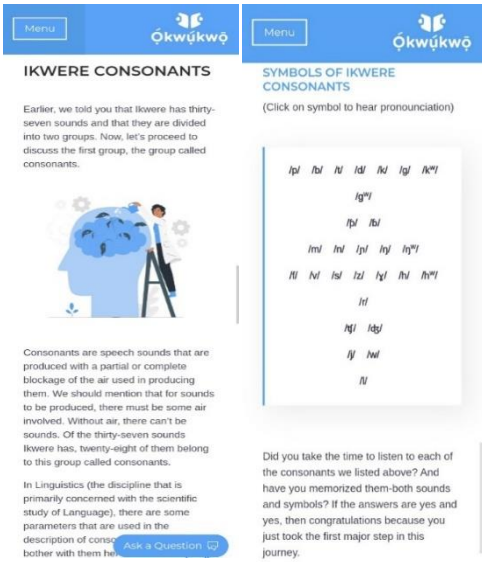


Fig. 5.5
Screenshots of the Page on Ikwere Consonants

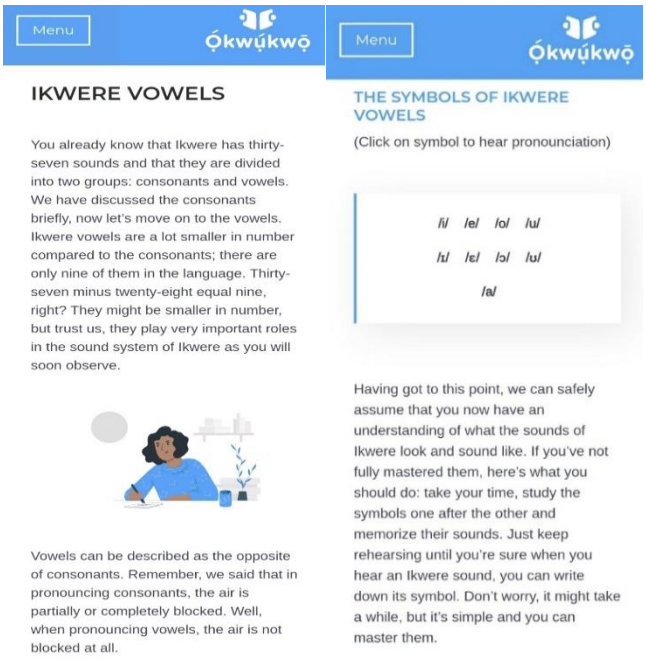


Fig. 5.6
Screenshots of the Pages on Ikwere Vowels

The page in Fig. 5.4 introduces the learner to the sound system of Ikwere. As mentioned prior, this section on Ikwere phonology is one of three major divisions of the lessons on the platform. Contained in this section are discussions on the consonants and vowels of Ikwere. To restate, the discussion on the sound system of Ikwere was only included on the platform to set the background for the main focus which is the teaching of the writing system of Ikwere

The pages captured in Fig. 5.5 and Fig. 5.6, as a subpart of the section of the platform that take a passing look at the Ikwere sound system, are labelled Ikwere Consonants and Ikwere Vowels. They zero in on the consonants and vowels of Ikwere, introducing the learner to the attributes of these sounds in Ikwere. In the consonant section, all 28 Ikwere consonants are listed and same is done for the vowels also. The listed consonants and vowels have sound elements embedded in

them so that if the symbol of any of the sounds is tapped on or clicked, the learner hears the pronunciation of that particular sound segment.

5.1.3 Lesson on Ikwere Orthography

After an overview of the elementary issues of the sound system of Ikwere, the application then ushers the user into the writing system of the language.

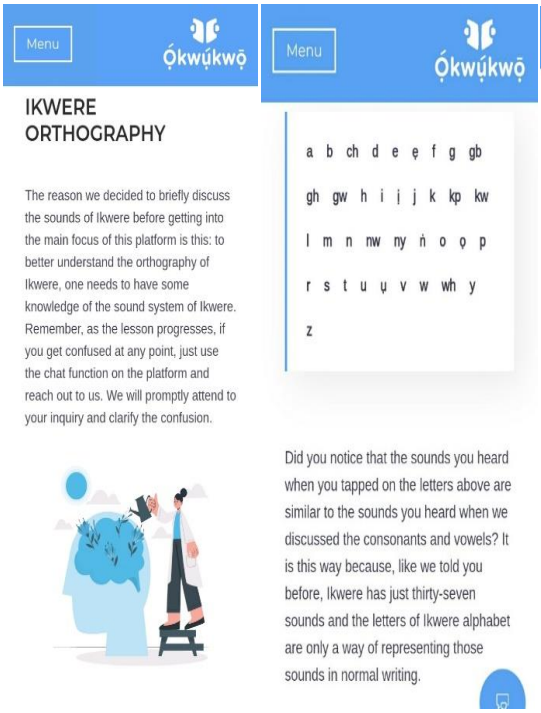


Fig. 5.7
Screen Shots of the Page on Ikwere Orthography

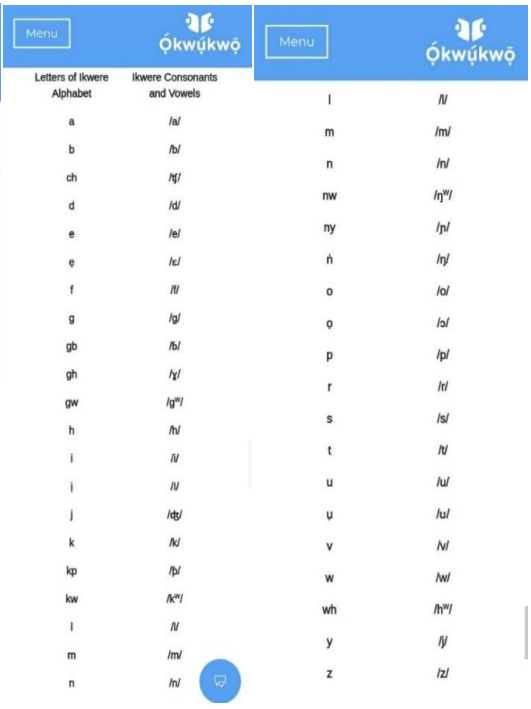


Fig. 5.8
Screen Shots showing correspondence between Ikwere sounds and letters

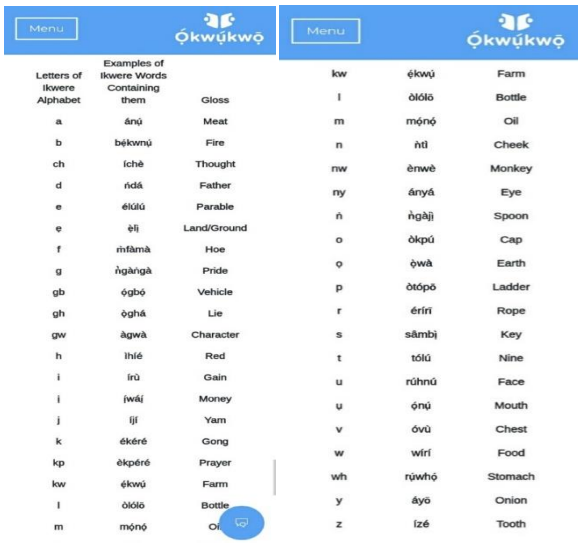


Fig. 5.9
Screenshots showing the letters of Ikwere alphabet and words in which the letters occur

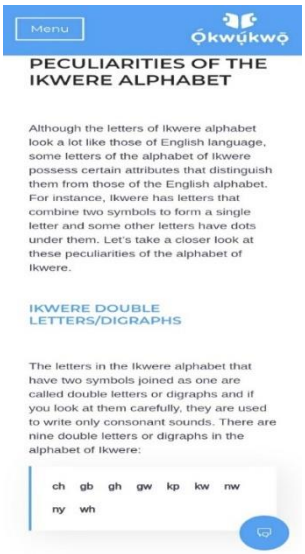


Fig. 5.10
Screenshot the Page Showcasing Ikwere Digraphs

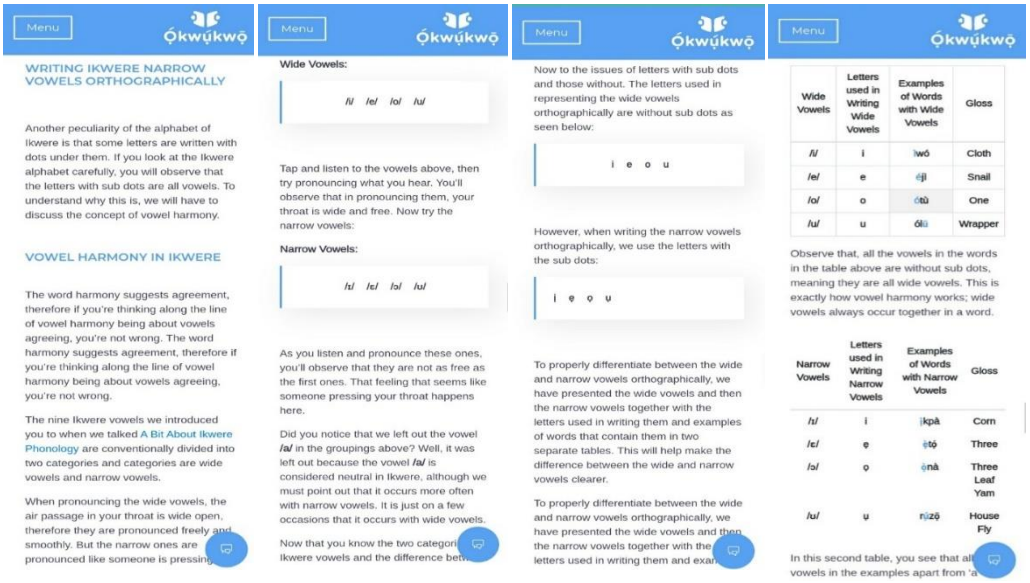


Fig. 5.11
Screenshots that Showcase how Ikwere Narrow Vowels are Written Orthographically

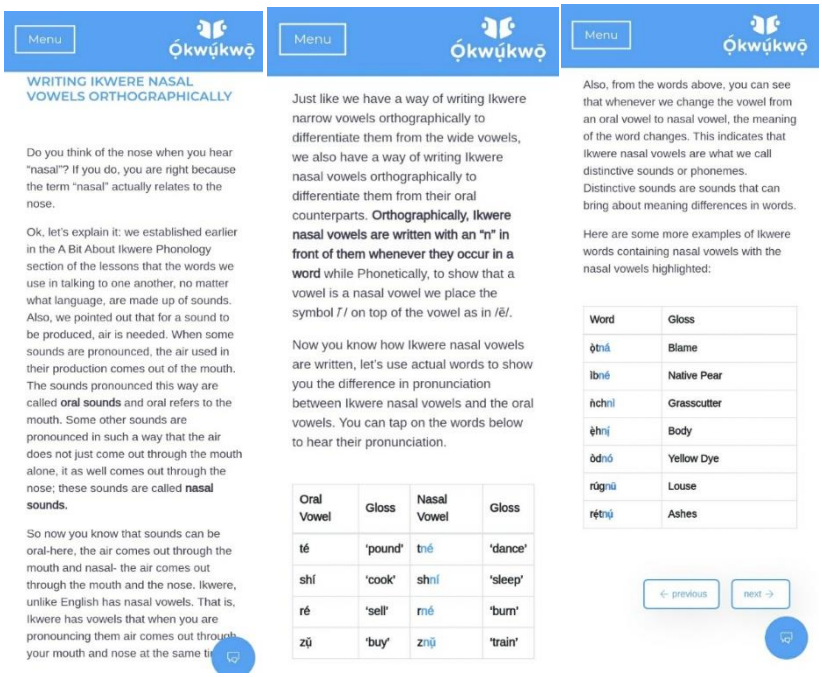


Fig. 5.12
Screenshots of the Page that Teaches How Ikwere Nasal Vowels are Written Orthographically

As seen in Fig. 5.7, this section of the app encompasses lessons on the orthography of Ikwere. The section starts out by justifying the decision to briefly discuss the sound system of the language, as said discussion was done to set the background. It then proceeds to acquaint the learner with the concept of orthography and presents the 37 letters of Ikwere alphabet. With sounds embedded in the letters, learners can click/tap on them and listen to how they are pronounced. This makes memorizing the letters of the Ikwere alphabet easier.

After presenting the letters of the Ikwere alphabet, this section as shown in Fig. 5.8 showcases how the letters correspond to the phonemes of the language. To situate the discussion in the actuality of the language, this section goes on to present the 37 letters of Ikwere alphabet side-by-side Ikwere words in which they occur as seen in Fig. 5.9.

Given that disparities exist between the English and Ikwere alphabets, a lesson that highlights the particularities of the writing system of Ikwere was included in this section of the app. The peculiarities noted are: Ikwere double letters or digraphs, writing Ikwere narrow vowels orthographically, writing Ikwere nasal vowels orthographically and writing Ikwere compound and complex words. These can be seen in Figs. 5.10, 5.11 and 5.12.

The subsection captured in Fig. 5.10, clarifies why some Ikwere letters combine two symbols (digraphs). It then goes ahead to present all nine Ikwere digraphs to the learner.

The subsection noted in Fig. 5.11, homes in on the wide and narrow vowel dichotomy of Ikwere and how it impacts the alphabet. There is a distinct dissimilarity between the letters that are used to write wide vowels and those used to write narrow vowels and this distinction is noted here. The sound difference between both vowel types is also emphasized and sufficient examples are employed to bolster the discussion.

In the subsection shown in Fig. 5.12, it is noted that Ikwere has inherently nasalized vowels which are phonemic and are accounted for in the orthography of the language. Although these nasal vowels do not have distinct letters in the alphabet that are used to represent them orthographically, a spelling rule is used to denote their occurrence in the writing system. This subsection explores the nasal vowels by showing how they are represented orthographically and spotlights the sound difference between them and their oral equivalent.

5.1.4 Orthographical Representation of Tone

Although tone is a phonological phenomenon, the lessons here focused more on how tone impacts orthography. The learner is made to understand why there are usually short strokes/markings (tone marks) on certain letters when we spell in Ikwere and the importance of those short strokes are highlighted. Below are screenshots of this section of the application.

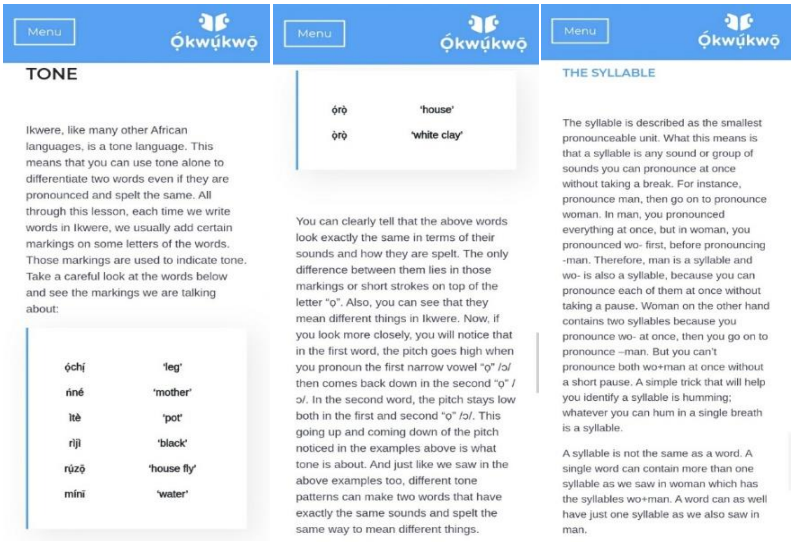


*Fig. 5.**13***

***Screenshots of the Opening Lessons** on Tone & Syllable in Ikwere*

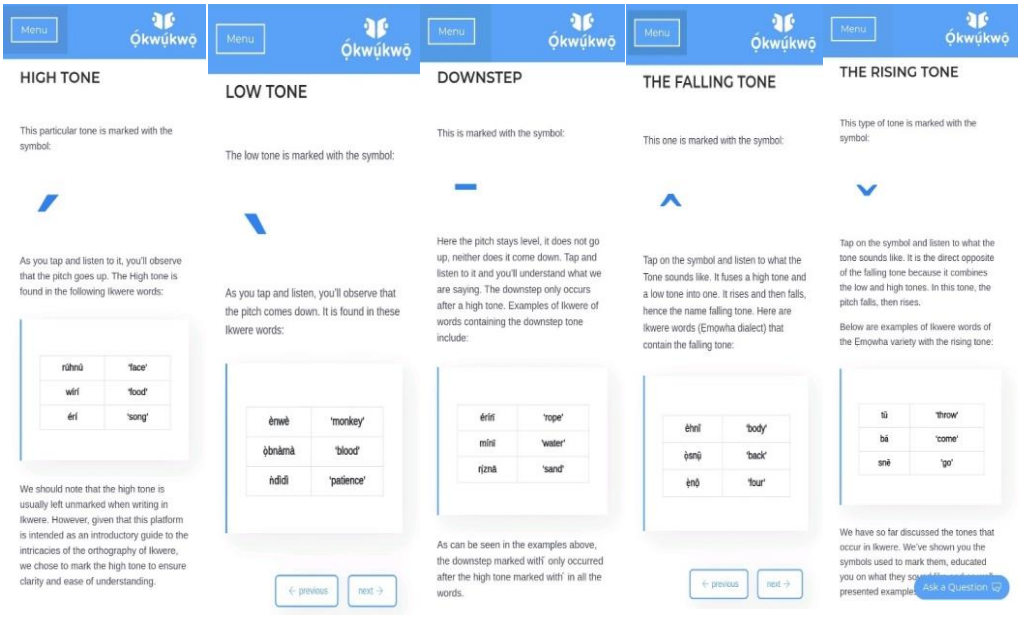


Fig. 5.13

Screenshots of orthographical description of High, Low, Downstep, Falling and Rising Tones

The subsections of this section on tone examines the different types of tone that occur in Ikwere and how they are marked orthographically. Examples are given to show the occurrence of the tone types in actual words.

As can be seen in Fig. 5.13, the learner is shown how the high tone, low tone, downstep, falling tone, and rising tones are marked orthographically in Ikwere. The lesson goes on to give examples of words that contain the tones. Upon tapping/clicking on the tone marks in the app, the learner hears what the pitch variation of that tone sounds like. This helps to entrench the lesson.

Tone is a pivotal prosodic feature in Ikwere, hence, its visibility in the orthography of the language. This is underscored by the fact that it can be the only distinguishing factor in a pair of words that are absolutely identical at the segmental level and also orthographically. The lessons on the platform are brought to a close with a note highlighting the importance of tone in Ikwere.

6. Conclusion

This study was conceptualized with the aim to expand the techniques adopted in teaching Ikwere, particularly, Ikwere phonology and orthography to the digital frontier. With a core focus on designing and developing a computer assisted language learning platform suited for the teaching and reinforcement of the sound and writing systems of Ikwere, the study achieved its aim by creating the **Ọ̀kwụ̀kwọ̄** progressive web application. Based on the achievements made by the study, some salient conclusions have been drawn.

The study adjudges as invaluable, the need to engender strategic partnerships between language professionals and software specialists in Nigeria. A relationship of this type will be pivotal to the advancement of Digital Linguistics locally. The pedagogy of indigenous languages has to be digitized, and only through partnerships of this nature can it be achieved.

Additionally, with this study's actualization of the development of a virtual platform that teaches Ikwere phonology and orthography, the study makes obvious the fact that software technology-mediated channels can be vastly adopted in the teaching of indigenous languages.

Finally, although the scope of this present work is delimited to the phonology and orthography of Ikwere, the study has presented a framework that can be widely utilized in digitizing the pedagogy of the entirety of Ikwere grammar and the grammars of other indigenous languages.

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