

# Owóksape - An Online Language Learning Platform for Lakota

## Owóksape Development Team

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### Abstract

This paper presents Owóksape, an online language learning platform for the under-resourced language Lakota. The Lakota language (*Lakhótiyapi*), is a Siouan language native to the United States with fewer than 2000 fluent speakers. Owóksape was developed by The Language Conservancy to support revitalization efforts, including reaching younger generations and providing a tool to complement traditional teaching methods. This project grew out of various multimedia resources in order to combine their most effective aspects into a single, self-paced learning tool. This paper describes the motivation and development of the platform, its fundamental pieces, example usage data, and future considerations.

**Keywords:** Owóksape, Lakota, Lakhótiyapi, language-learning, under-resourced, The Language Conservancy, Siouan, revitalization, web app, mobile app

## 1. Introduction

### 1.1. Background

The Language Conservancy is a non-profit organization which, in collaboration with the Lakota Language Consortium, has produced numerous pedagogical materials for the Lakota language, including an audio series, traditional and speaking dictionaries, a grammar handbook, textbooks, dubbed cartoon series, a vocabulary-building mobile app, print story books, as well as an accompanying augmented reality app. Activity in the community includes summer institutes with language instruction and teacher training. In order to transition to a digital medium, an online learning platform was undertaken, combining aspects of the other pedagogical materials, and resulting in Owóksape, a self-paced digital learning environment (Lakota Language Consortium Inc, 2019).

This paper first discusses the linguistic and cultural features of the application and its pedagogy. The application features are then described in detail, followed by an overview of the software design. Finally, since Owóksape is an ongoing effort, the intention is to provide a description of the application's current state and end with a description of future improvements.

### 1.2. General Overview

Owóksape (literally “place of knowledge”) contains linear learning paths with exercise types that appeal to various learning styles. It is designed for self-study or to supplement classroom learning. The platform caters to multiple audiences including adult members of the Lakota community who didn't grow up with the language, children in tribal schools in and around the Lakota reservations, and learners of all ages across the U.S. and the world who take an interest in the Lakota language for cultural, linguistic or personal reasons. The platform targets modern web browsers, as well as Android and iOS devices.

## 2. Linguistic Features

Lakota has provided unique challenges and opportunities in documenting and subsequently creating comprehensive curricula for the language. As with other Siouan languages, Lakota was not written by its speakers prior to the end of the 19th century. Modern Lakota learners generally know English as their first language, so the focus of learning modules has been to bridge the gap between English and Lakota.

### 2.1. Corpus-based Documentation

Creation of Owóksape's curriculum revolves around analysis of existing corpora, such as the text collected in 1930 by Ella Deloria (Deloria, 1932), unpublished texts in various archives, as well as numerous recordings from native speakers collected by Jan Ullrich from 1992-2020. This approach started with the creation of a consistent phonemic orthography, compilation of a more than 31,000 entry English-Lakota dictionary with more than 53,000 example sentences, and the organization of grammatical analysis in the Lakota Grammar Handbook (Ullrich and Black Bear Jr., 2016).

The importance of this corpus-based approach is two-fold. The collection of texts and recorded stories serve as a lasting accurate reference of the language available to both scholars and lay people, whereas translational elicitation, which has been the prevailing method since the advent of Chomskyan linguistics, results in problematic data more often than not (Chelliah, 2018; Epps et al., 2017). And in the case of Lakota, collections of stories and utterances preserve cultural context and attest to consistencies in the language that become harder to measure as the population of speakers decreases.

### 2.2. Phonological Treatment

Speaking Lakota requires the pronunciation of aspirated and unaspirated stops, nasals, glottals, velar and uvular fricatives, and other sounds not easily differentiated by En-

glish speakers. The voices of fluent speakers are essential in providing accurate models for learners to emulate. Introduction of these sounds is done gradually with emphasis on practice in isolation and within words. Several exercises are designed to help learners distinguish between sounds. One such exercise presents the user with a word that is missing a phoneme. Among the phonemes *k*, *kh*, *kʰ*, and *k'* the user must select the one that corresponds to the word they hear pronounced by a fluent speaker. Lakota also uses a phonemic pitch accent. Many exercises train the user to distinguish accent placement through listening, typing and multiple choice activities, given differently stressed variations of a word. With accent placement being unpredictable, fluent speakers recognize accent placement, in particular, as a clear sign of experience in the language.

### 2.3. Learning Vocabulary

The introduction of vocabulary in Owóksape is done first in isolation and eventually in greater context. Teaching vocabulary in semantic groups helps learners solidify associations, therefore it is a primary focus of vocabulary exercise sections. Extra attention is also given to the introduction of verbs, providing the citation form of the verb first, with conjugated forms introduced only after a particular pattern of conjugation is taught in detail. Finally, students are gradually introduced to various types of agglutination.

### 2.4. Grammatical Treatment

There are many grammatical concepts in Lakota difficult for second language learners. Lakota is a head marking language, which means, among other things, that a verb alone can constitute a clause, and that most word categories can function as predicates. When optional noun phrases are present, they conform to a subject-object-verb word order. The language has no tense. Proper conjugation and use of verbs requires a deeper understanding of modes, person, and the numerous ways to mark aspect. While there are general rules for verb affixes, the position of affixes that express grammatical person or argument cannot always be easily predicted by novice learners, so many verb forms require memorization. This is in addition to word final vowel alternation (ablaut). Where memorization of vocabulary or exceptions is needed, those cases are explained and practiced in exercises designed to contrast those exceptions.

## 3. Cultural Features

Language is an integral component of any culture. In creating resources for language revitalization, recognizing the audience of these tools is an important aspect both in attracting and supporting users. The visual design of Owóksape seeks to serve the relevance of the oral history of Lakota, but also reflect modern Lakota people.

### 3.1. Character Design

Modern Lakota people drive cars, use cell phones and wear jeans and sneakers. At the same time, a rich connection to the land and spirituality remains present in everyday life in ways such as hairstyles and adornments. Producing characters that modern Lakota people can relate to involved consultation with numerous tribe members, as well as that of

historical and modern photographic references. The end goal is to allow Lakota learners to see themselves in the Lakota language curriculum.



Figure 1: Avatars designed for Lakota people

### 3.2. Iconography

Icons of Lakota culture are also integrated into the visual style of many aspects of the platform. Eagle feathers are presented to young men and women on important occasions of success like high school graduation or after a feat of bravery. The campfire, tipi, buffalo and other animals also all retain important meaning for modern Lakota people. The integration of these icons serve to again provide context for the language learned and connection to the learner's existing cultural context. These same icons are integrated into curricula relating to traditional dress, items and places of cultural importance, and naturally appear in modules based on texts of traditional stories.

## 4. Pedagogical Principles of Owóksape

The approach to teaching employed by Owóksape is based primarily in the research on language learning principles, rather than on theoretical concepts of constantly changing methodologies. Thus, Owóksape aims to provide a balanced approach to teaching fluency, accuracy and complexity. Grammatical structures are introduced primarily via guided induction (rather than via explanation) which is combined with input enhancement (such as noticing questions). Deductive activities are provided only in review of the individual previously practiced bottom-up activities. Another important approach is the attempt to use algorithmization specific to individual learners which provides them with balance in learning and practicing receptive skills (reading, listening), productive skills (speaking, writing), cultural awareness, as well as in learning vocabulary and structure. Additionally there are multiple reward and competition features aimed at keeping learners motivated. An important characteristic of Owóksape is that all of the learning content is based in authentic (and occasionally semi-authentic) language originating from connected speech recorded from native speakers, rather than in artificially created sentences and text.

### 4.1. Pattern Based Teaching

Methods and principles used in second language teaching vary across platforms and classrooms. While rote memorization of common conversations may aid a vacationing traveler, the goal of Owóksape is to provide a long-term

learning resource for dedicated Lakota learners. Learners gain both a conceptual understanding of the structure of the language and a scaffold of pattern recognition innate in fluent speaking and natural language acquisition (Hakuta, 2006). More advanced units continue to expand on previous patterns. For example, Unit 2 introduces the user to a basic question pattern using colors (e.g. *Sápa he?* ‘Is it black?’), then basic patterns of demonstratives are introduced in Unit 12 (e.g. *Hé šíná* ‘That blanket near you’), and with this in place, more subtle adverbs in Unit 126 (*Lakhóta etáŋ héł waŋwíčhalaka he?* ‘Did you see any Lakotas there?’).

### 4.2. Spaced-Repetition Algorithm

A number of methods have been used by other platforms in order to maintain varied, but directed learning outside of a linear curriculum sequence. Review is available to learners with both the specificity of a chosen topical category or a global review encompassing all curricula the learner has been exposed to. The organization of this is done via the tracking of the user’s previous responses to exercise content segregated by the type of learning exposure (reading, writing, listening, or speaking). Previous correct or incorrect responses are weighed against the number of times the user has been exposed to that content, and the time since the most recent exposure, to create a score for that specific learning content. Each time the user completes an activity, that score is reevaluated and new, more difficult, or less often seen exercises rise to the top of the list. This ensures that as the user continues to review, they are getting pertinent exercises for their learning path and reinforcing core concepts again and again with ample time to reflect and reinforce the learned language (Ebbinghaus, 1885; Kramár et al., 2012).

### 4.3. Gamification

A varied approach to providing users with feedback on their progress and rewarding persistence is employed. Users may earn badges in three different ways: 1) for completing levels, 2) maintaining a streak of consecutive days of use, or 3) communicating with others in the forum. There is also a public and friend-based leaderboard for comparing a learner’s progress with others. The leaderboard shows the user’s accrued points. These points not only reflect the

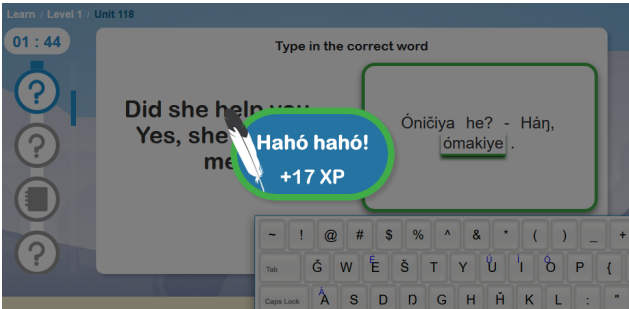


Figure 2: Pop-up rewarding user with points after answering a question correctly

user’s progress, but also the user’s aptitude, as fewer points

are awarded when an exercise is repeated after an incorrect response. Points are awarded and celebrated after each exercise with a screen proclaiming a varied set of congratulations in the language (*Taŋyáŋ ečhánuŋ!* ‘You did it correctly!’, *Áta khilí!* ‘Totally Awesome!’, *Wašté!* ‘Good!’ ...).

## 5. Application Features

### 5.1. Cards

Cards make up the fundamental linguistic data of Owóksape. Each one consists of classes of data known as *components*. Figure 3 shows the required data every card must have, as well as additional optional components that permit creation of more varied activities. On the right is a real example of card data for the Lakota word *thó*. Concern-

Card Data	
Required	Card ID
	Card Type (word, pattern)
	Lakota Text
	English Translation
	Lakota Audio
	Grammatical Gender
Optional	Alternate Lakota Text
	Alternate English Glosses
	Image
	Video
	Inflection

Example Card Data	
Card ID	3
Card Type	word
Lakota Text	thó
English Text	blue
Lakota Audio	blue.mp3
Grammatical Gender	none
Image	blue.png

Figure 3: Card data components (left) and an example of real card data (right)

ing card types, word cards are used for teaching and learning individual items of vocabulary, whereas pattern cards are intended for teaching and learning phrases and sentence structures. These card data are presented to the user in the form of instructions or quizzes, with different combinations of card components producing unique activity types.

### 5.2. Learning Paths

At the top of Owóksape’s hierarchy are learning paths. Each one is designed to be dedicated to a specific topic

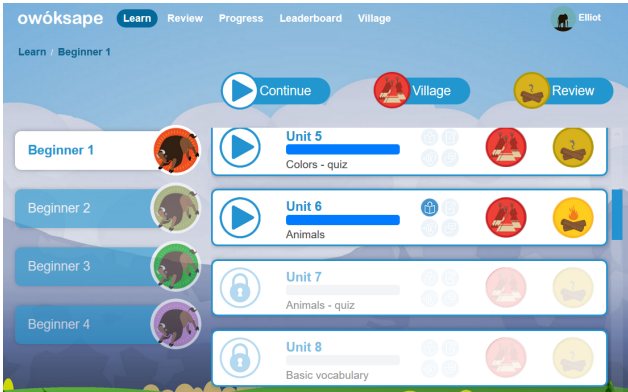


Figure 4: Learning path screen

or objective such as vocabulary, advanced grammar, fundamentals, etc. Each of these learning paths contains units organized into proficiency levels.

The user progresses through levels by completing sequential units, finishing the current unit to unlock the next one. To finish a learning path the user must complete all the units in each proficiency level until all levels are completed.

### 5.2.1. Learning Speeds

In a settings menu, a user must select how much time per day they would like to commit to learning Lakota given four possible learning speeds shown in Figure 5. The four settings determine how long a user must use the app before they are rewarded for completing their daily study goal, notified by a pop-up.

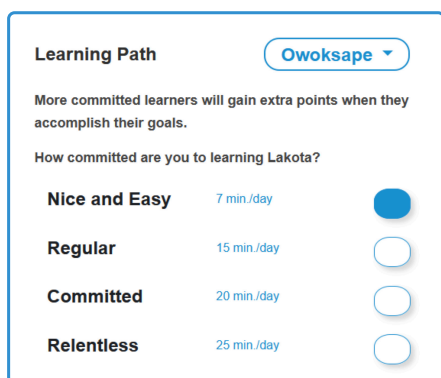


Figure 5: Learning speeds: target minutes per day of study selected by the user

### 5.3. Proficiency Levels

A learning path contains one or more levels, with the goal of producing content across the seven established Lakota proficiency levels. Each one is represented by a different icon to the left of the list of units (see Figure 4).

### 5.4. Units

Units are the main activity area for users. The learning page contains a list of units for the current level that the user must progress through sequentially. A unit consists of three major elements: a *learning session*, a *review session*, and a unit-specific forum called the *village* (see Figure 6). The learning session is accessed by pressing the unit's *play* icon, and contains interspersed lessons with associated exercise sessions, ending in a cumulative quiz session. The review session, entered via the *camp fire* icon, comprises unit-specific quiz activities that use the spaced-repetition approach described above.



Figure 6: Unit progress bar and four learning skill icons indicating percentage of skills the user has practiced in this unit.

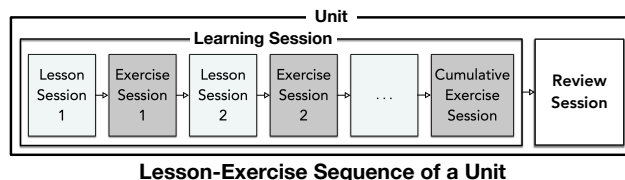


Figure 7: Unit design and user progression through the unit via multiple lesson-exercise session pairs, followed by a cumulative exercise session and finally a review quiz session

The progression of unit activities is shown in Figure 7. Completion of the learning session unlocks the review session, for which a predetermined number of activities must be completed before the following unit is unlocked. Once a unit is unlocked a user can always return to that unit. The village, represented by the tipi icon in Figure 6, presents the user with a forum specific to that unit where users can ask and respond to unit-specific questions.

### 5.4.1. Unit Progress

Certain data pertaining to a user's progress on a unit is displayed on the learning path screen as seen in Figure 6. A progress bar informs the user how much of the unit they have completed, while four small circular blue icons indicating the four different learning skills (reading, writing, listening, and speaking) inform the user of which and how much of each of the skills they have practiced based on the icon's opacity.

### 5.5. Lessons

Lessons are presentations and explanations of new concepts in the form of multimedia cards with text, images, audio and speech recordings. The concepts range from vocabulary and sentence structure to pronunciation and phoneme distinction. These lessons are carefully designed and unchanging. The order of concepts will always be the same.



Figure 8: Example lesson concerning the adjective inflections for the word *short*.

## 5.6. Exercises

To facilitate understanding and retention of the concepts introduced in the lessons, a series of exercises is presented after each set of 4 or 5 cards. Exercises test a user's knowledge of a word or pattern card by displaying one component of the card (the prompt) and requiring them to respond with another specified component of the card (the response).

Correct answers turn green and cause a pop-up to appear that rewards the user with points based on the type of exercise. If the user answers an exercise incorrectly, their answer turns red and a pop-up showing the correct answer appears giving the user time to read and listen to the correct response. That question will then reappear after the other cards in the lesson are quizzed, and will continue to reappear until they respond correctly, or reach a predetermined number of failed attempts. This is done in order to maintain flow and reduce discouragement, with the understanding that all of the concepts will reappear in the review sessions and more advanced units. After every response, the selected cards are colored green or red to indicate to the user that their response was either correct or incorrect, respectively.

### 5.6.1. Exercise Types Overview

The following are the types of exercises that a user can encounter depending on the unit and type of information presented. Each type of exercise satisfies certain learning skills: reading, listening, writing, and speaking. The listen-

Valid Prompt/Response Pairs by Exercise Type												
Multiple-Choice, True/False												
Match-The-Pairs												
Typing, Fill-in-Blanks												
Anagram												
I-L	A-L	E-L	L-L	A-I	L-E	L-I	A-E	E-A	L-A	A-A	I-A	

Legend: A: Lakota Audio, E: English text, I: Image, L: Lakota text

Figure 9: Exercise types and their valid types of prompt/response pairs for word cards.

ing skill is divided further into comprehension and phonemic awareness; and within the writing skill a distinction is made between active and passive spelling, where active writing exercises require the user to actively supply the letters or words from their memory, whereas with passive spelling the letters or words are provided to the user and they just have to place them in the correct places to render the word or sentence correct.

Different prompt-response pairs are valid depending on both the type of exercise and whether the prompt card is a word or a pattern. For example, a speaking exercise cannot require the user to type or select something; and a pattern card can be difficult to represent unambiguously with an image.

### 5.6.2. True/False

True/False activities are the simplest type of exercise and involve two types of questions. The user may be asked whether the prompt card is equivalent to the response card,

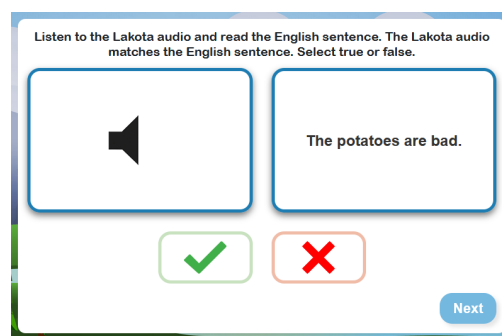


Figure 10: Example of a True/False exercise.

or whether the response card correctly answers the prompt card's question.

### 5.6.3. Multiple Choice

Multiple choice exercises have a single prompt card with up to four options, one of which being the correct answer. For example, in Figure 11 the user listens to the audio prompt of a word card and must select the response among three options that correctly identifies the stressed syllable.

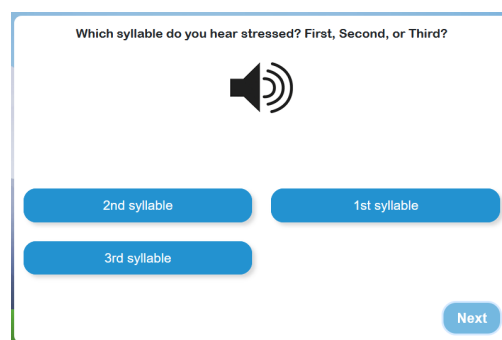


Figure 11: Example multiple-choice exercise.

### 5.6.4. Match-the-Pairs

Match-the-pairs exercises consist of a group of prompt cards all displaying the same card component and corresponding response cards displaying a different card component. The possible pairs are displayed in Figure 9. The user

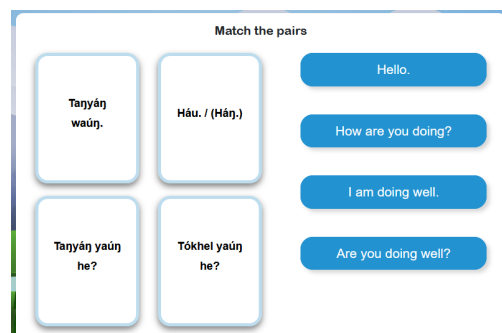


Figure 12: Example match-the-pairs exercise.

must first select a prompt card and then select the matching



response card. After each attempt to create a pair, a pop-up either rewards the user with points if answered correctly, or displays the correct answer with the ability to listen to the audio version. The user continues making pairs until all prompt cards have been attempted, receiving points after each attempted pair.

### 5.6.5. Anagram

Anagram activities mark the beginning of the productive exercises with the learner being asked to produce accurate spellings with a constrained letter set. These activities prompt the user with either English text, Lakota audio, or an image, and a jumbled set of letters corresponding to the equivalent Lakota text. The user must drag and drop the letters to put them in the correct order. If any letter is in the wrong place, no points are rewarded.

### 5.6.6. Fill-in-the-Blanks

Fill-in-the-Blanks exercises present the user with a word or phrase with a missing phoneme or word important to the pattern at hand. Instructions guide the learner in their task, from selecting the correct phoneme based on audio to selecting the missing word in the phrase.

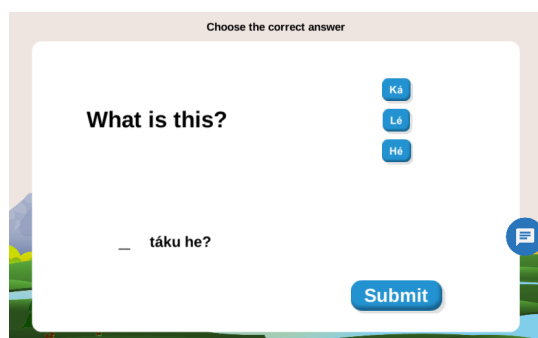


Figure 13: Example Fill-in-the-Blanks exercise.

### 5.6.7. Building Blocks

Building sentences is a leap in Lakota production. Building blocks exercises are a key first step in this pursuit. These exercises provide a varied prompt asking for a response in the form of rearranging words in the correct order to produce a coherent Lakota sentence.

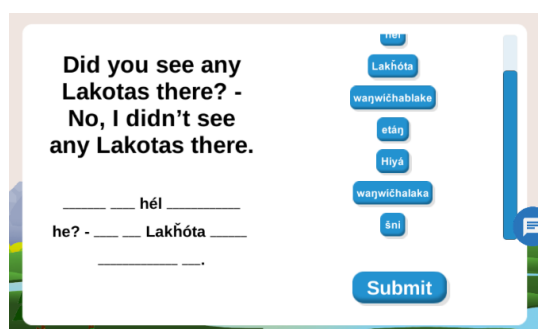


Figure 14: Example building blocks exercise.

### 5.6.8. Typing

As with other pedagogical tools, the computer keyboard and the ability to write with confidence are key components in language fluency in the modern world. The Lakota keyboard layouts for desktop and mobile devices were designed with ease of use and versatility in mind. The integration of the keyboard serves both as an exercise in Lakota typing and as a means to promote the production of full words and sentences from Lakota learners. Since this kind of production suggests a level of advancement in the learner, these exercises are limited to base curricula and later reintroduced as the learner proves excellency in vocabulary and concepts through easier exercises.

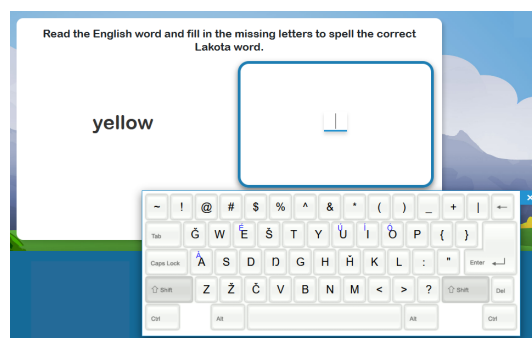


Figure 15: Example typing exercise.

### 5.6.9. Speaking

While fluency of speaking is still difficult to computationally judge in an environment with limited data and effective tools optimized for more common languages, the importance of eliciting speech from learners remains paramount. During the initial testing and release of Owóksape, existing speaking exercise features were left out for reasons of convenience and complexity, continued work on this aspect of the curriculum is promising. Learners will soon be able to listen to native speech and mimic it with some minor feedback based on pitch and syllable accuracy with greater cost efficient features on the horizon.

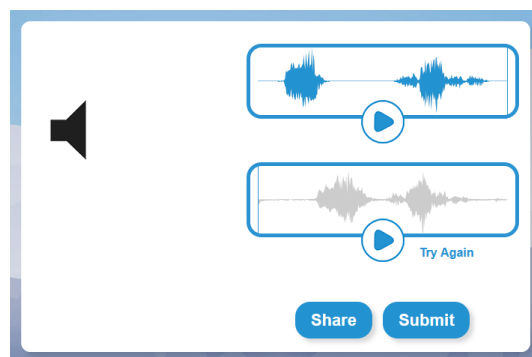


Figure 16: Example speaking exercise.

## 5.7. Review

Review sessions are an integral part of Owóksape, exposing the learner to words and patterns they have previously

learned in a way that increases retention. A predetermined number of review activities is required at the end of each unit before the next unit is unlocked. There are two types of review sessions, a unit-specific review that tests only the concepts introduced in that unit, and a global review that tests all the cards a user has seen across all units.

The review activities are generated using the aforementioned spaced-repetition algorithm that pulls cards from four sorted lists corresponding to the four different learning skills. The *repetition\_value* is computed for each card and equates to the importance of presenting the card to the user again. The smaller the value, the more important it is to quiz the user on it. Thus, the list is sorted numerically in ascending order. The lists are filled or updated every time a card is presented to the user, either in the form of an exercise or a review activity. Where the card gets placed in a given list is determined by its *repetition\_value*, which comes from two calculations: Eq. (1), computes the average score of the last four activities concerning the specific card and the learning skill associated with that list, and Eq. (2), computes the final value that determines its place in the list.

$$\bar{x}_n = \frac{\sum_{i=n-3}^n \bar{x}_i}{4} \quad (1)$$

where  $\bar{x}_n$  and  $\bar{x}_i$  are the average points awarded for the last four activities and for the  $i^{th}$  activity, respectively, related to the current card.

$$repetition\_value = A \cdot \bar{x}_n + B \cdot d + C \cdot n \quad (2)$$

where *repetition\_value* refers to an integer that determines where in the review card list the card will be placed.  $A$ ,  $B$  and  $C$  are coefficients that allow for fine adjustment of the parameters in order to optimize the algorithm's efficacy based on user data and statistics.  $\bar{x}_n$  is the same as in Eq. (1).  $d$  is the time stamp of when the card was last reviewed. The larger the value, the more recently the user was exposed to the card and the less likely it will reappear. Lastly,  $n$  is the number of times the card has been presented.

The higher the number, the more practice with it the user has had and therefore the less likely it will be to reappear. The review activities contain a subset of the exercise types found in the quizzes in the learning session. However, instead of being predetermined, the review uses an algorithm to select the activity types, as well as the cards for each activity, in order to create four activities every time the front-end requests more.

This algorithm has three main features: 1) a table of activity types with associated prompt-response pairs and percentages is used to probabilistically select the activity type details, 2) the cards are selected from the user's review card lists to ensure they receive more attention (spaced-repetition), and 3) the combination of activity data and cards selected is used to generate the data for the four activities.

Figure 17 shows the activity types. This table, with its percentages, provides an efficient method of reducing the number of review activities while still testing an effective set of learning skills.

Activity Types for Word Cards					
#	%	Learning Skill	Prompt Type	Response Type	Activity Types
1	25%	Reading	Lakota text	Image, English text	Multiple Choice, Match-The-Pairs
2	25%		English text, Image	Lakota text	
3	50%	Listening	Lakota audio	English text	
4	15%		Lakota audio	Lakota text	Fill-in-the-Blanks
5	2%				Anagram
6	15%				Typing
7	1%	Listening / Writing	English text	Lakota text	Anagram
8	15%	Writing			Typing
9	1%				

Note: "%" signifies percentage of cards presented via exercise of this type

Figure 17: The different activity types within the review session. Percentages are used to probabilistically select the activity type, resulting in an overall percentage of cards in the user's review card list that will be quizzed using that activity type.

## 6. Software Overview

Owóksape consists of a web server, a web frontend, and mobile user interfaces. Together these three parts form a whole that provides wide access to the app, as well as an administrator interface for managing language content.

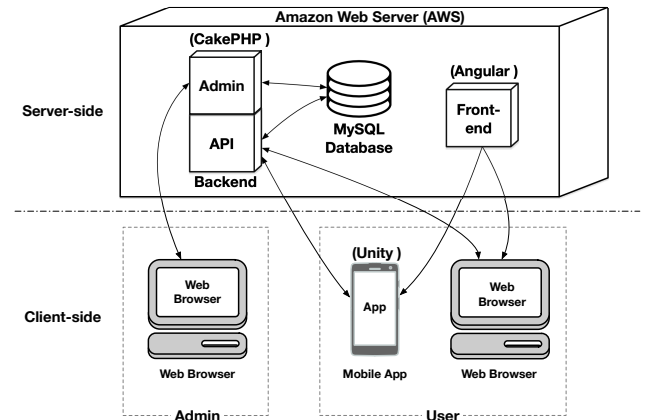


Figure 18: High-level overview of Owóksape's software architecture. Items in parentheses indicate the software development environment.

### 6.1. Web Server

The server design decisions of Owóksape were made based on two important goals. The first goal was that the app should lend itself well to a rapid development process. With this in mind, the CakePHP framework was chosen. CakePHP utilizes the Model-View-Controller (MVC) architecture, a common software design pattern found in many web server frameworks. Rapid development is achieved through various command-line function calls allowing the rapid creation of template components. The second goal was for the app to easily scale as the user base grows. To address this, the web server is situated in the

Amazon Web Services (AWS) cloud. Thus, infrastructure and resource allocation that would otherwise be dependent on in-house hardware and network administrators is instead managed in simpler and safer terms through the AWS administration panel.

### 6.1.1. Application Programming Interface

The Application Programming Interface (API) is written primarily in PHP using the CakePHP framework. This API is used by both the web and mobile applications to obtain data related to users and learning modules. The API interfaces with a MySQL database using CakePHP's built-in Object-relational mapping (ORM) functionality, allowing conversion between the database and object-oriented data structures in PHP.

### 6.1.2. Admin Interface

Within the web server CakePHP framework is an admin interface enabling the team to create, upload and manage language components, lessons, exercises, images, audio, video, etc. This provides a user-friendly environment for maintaining the MySQL database that stores all information concerning language learning content. Cards containing language data, metadata and references to media can be created and edited individually, or uploaded in bulk from a spreadsheet.

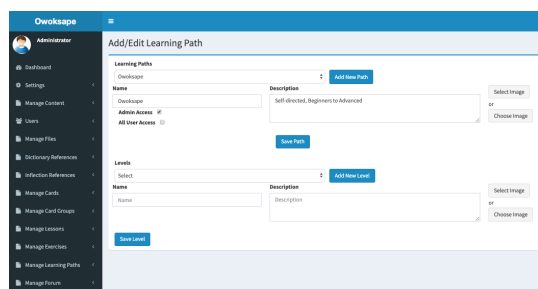


Figure 19: Administrator interface to the web server and database allowing management of language and app data.

## 6.2. User Platforms

The user applications consist of a web interface for modern desktop browsers and a mobile interface for Android and iOS devices. The web app uses the open-source Typescript-based Angular web application framework, which was selected for various reasons: it has a large community, is open-source, promotes quick development, and is designed for single-page dynamic websites.

The mobile apps are developed using Unity, a cross-platform engine that allows for development of the Android and iOS platforms using a single Integrated Development Environment (IDE). It takes a C# Unity application and outputs a versions for Android and iOS.

## 7. Future of Owóksape

As Owóksape's user base continues to grow, the development team at The Language Conservancy continues to provide support and develop new features. Near-term additions to the app include a teacher portal, new learning paths, one

for vocabulary and another dedicated to the Lakota Grammar Handbook (Ullrich and Black Bear Jr., 2016), and custom review sessions.

### 7.1. Teacher Portal

Owóksape has provided a complimentary learning environment to classrooms. However, what is missing is the ability for Lakota teachers to create customized paths that reflect what they are teaching in their classrooms, as well as the ability to oversee the progress of their students within the app. Teachers will be able to create tracks by selecting and ordering existing units within Owóksape via a teacher administrator interface.

### 7.2. New Learning Paths

Currently, Owóksape offers a single learning path that is based on the Lakota Audio Series (Lakota Language Consortium, 2014). Soon a new track dedicated to building vocabulary, and another dedicated to the 600-page Lakota Grammar Handbook will be added. Another likely path is the merging of the Lakota dictionary with Owóksape's database, turning the app into a dictionary, with simpler and more reliable unit construction by users and teachers (Lakota Language Consortium Inc, 2018). There is also a plan to offer activities using longer narratives and texts recorded from fluent speakers.

### 7.3. Supporting Other Languages

While the original goal of Owóksape was to target the Lakota language, its success has predicted viability in extending its support to other under-resourced languages. This effort largely involves replacing the underlying database and ensuring the software uses general terms instead of specifying specific languages.

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