

Language learning applications for Sepedi: a user experience study

Ilana Wilken^{1,2*}, Elsabe Taljard¹ and Febe de Wet²

¹Department of African Languages, University of Pretoria, Pretoria, South Africa

²Human Language Technology Research Group, Meraka Institute, CSIR, Pretoria,
South Africa

Corresponding author email: iwilken@csir.co.za

Abstract: Being a multilingual country rich in culture and diversity, South Africa's residents use a variety of the 11 official languages for daily communication. Multilingual communication occurs especially in hospitals and clinics. People visiting healthcare facilities often struggle to locate a health professional that shares the same language or even a language which is similar to their own and thus intelligible to them. The research which is reported on here aimed to assist the University of Pretoria in its endeavour to address this situation by teaching students an additional language. This was done by providing three custom-designed, mobile-assisted Sepedi language learning applications to students from the Faculty of Health Sciences enrolled for the Sepedi language module, *Sepedi for Beginners*. The application was specifically designed to assist students with the acquisition of vocabulary related to health care. The students used the applications as supplementary tools and gave feedback through a questionnaire, to establish whether the students perceived the mobile applications to be useful as a supplement to the course material and whether they had a clear preference for a specific application. The results of this study show a positive response to the applications, including strong preferences expressed by the participants.

Introduction

Communication is the key to successful everyday interaction between people and in some situations communicating across language borders is necessary. In South Africa, communication in multiple languages occurs country-wide because of the huge variety of indigenous languages. Environments characterised by multilingual communication include hospitals and clinics. When non-English speaking people need medical attention in South Africa, it is often not possible to find a health professional that can communicate in a patient's

first language. The research undertaken for the purpose of this study attempts to assist with addressing this challenge.

There are 11 official languages in South Africa and medical professionals are expected to use the languages of the areas where they work to communicate with their patients (Van de Poel et al. 2013), but only a few professionals actually do (Drennan and Swartz 2002). Health professionals are often not fluent in their patients' first languages which, in turn, causes a serious communication barrier, especially in the rural communities of South Africa (Herselman 1996). This situation arises because medical students do not always study in the same areas where they grew up, so they have to learn another language to communicate with their patients, which is quite challenging (Van de Poel et al. 2013). Moreover, students sometimes have to complete their practical training in areas other than where they studied. This means that it is especially difficult for a student who, for example, grew up in the Tswana-speaking North-West province and studied at a university based in the Zulu-speaking KwaZulu Natal to work in the Xhosa-speaking Eastern Cape.

In South Africa's healthcare sector, there is a large diversity of languages spoken by health professionals and patients. As a result, a communication gap between the two parties arises because they do not share a common language. Bridging that gap is the biggest motivation behind teaching students in the health care sciences an additional language. The language barrier issue is addressed to some extent by universities through the inclusion of an additional language module – usually on a compulsory basis – in the curriculum. Some universities in South Africa, like the universities of Pretoria, Cape Town, KwaZulu-Natal, the Western Cape and the Stellenbosch University, teach health care science students at least one additional language, apart from English. The language modules are taught as part of the health care science course and do not solely focus on the acquisition of medical terminology in another language, but also on the communication between health professionals and patients. One of the sections of the Sepedi beginner's module at the University of Pretoria typically centres around acquiring basic communication skills in Sepedi, with the emphasis on everyday expressions and high-frequency vocabulary that is suitable for everyday situations (University of Pretoria 2016). By achieving the outcomes of the language module, students are empowered to construct their own conversations to convey information to patients, or even to retrieve information from patients. It is for the sole reason of assisting students to

communicate with their patients that this study only focusses on providing health care science students with a tool which could aid them to acquire basic Sepedi vocabulary related to their field of study.

This study falls within the realm of applied linguistics. A specific area of study within applied linguistics is language acquisition. Numerous theories exist on how people acquire an additional language. The focus of many of these theories is on how adults acquire an additional language compared to children, and whether adults can ever attain native-like proficiency levels in the target language. This study utilises a theory focusing on language subsystems.

Language learning traditionally happens in classrooms with lecturers teaching students, but this has changed somewhat over time. Devices like smartphones, tablets, laptops, etc., have in recent years become easier to access and use. The software (e.g. mobile applications) that these devices use has subsequently also become easier to develop and access. These applications not only offer users information or assistance on various subjects, but some also act as learning applications, focusing on subjects ranging from mathematics to language learning.

Applications can thus be seen as extensions of traditional methods used for learning in new and different environments, and when it comes to language learning applications, the applications allow learning not to be limited only to classrooms (Miangah 2012). Since mobile learning is “spontaneous, informal, personalized and ubiquitous”, busy students learn when they want to, simply by using portable devices (Miangah 2012, p. 309). The portability of mobile learning is a big advantage when learning vocabulary because students can learn at their own pace and in an environment in which they feel comfortable.

The aim of this study is twofold: first, to determine whether students in the health care sciences perceive mobile-assisted language learning (MALL) applications useful for acquiring Sepedi vocabulary for health care purposes; and secondly, to establish whether the students have a clear preference for a specific MALL application.

Theoretical background

Applied linguistics is defined by Cook (2003, p. 9) as “the academic discipline concerned with the relation of knowledge about language to decision making in the real world”. More specifically, it is an interdisciplinary field that focusses on investigating either educational or social problems relating to language that occur throughout the world (Cook 2003). As a result of its language diversity and the associated challenges, South Africa experiences both social and educational problems. Applied linguistics can be used as a means to solve these communication problems. However, the field of applied linguistics is too broad to try and solve just any language-related problem. Problems need to be sorted into specific areas of study within applied linguistics, as categorised by Cook (2003), namely:

- Language and education
- Language, work and law
- Language, information and effect

This study focusses on a section of South Africa’s communication problems in the area of language and education, as it includes, amongst others, additional language education as a specialisation field. Additional language education itself can be divided into two more areas, namely, second-language education and foreign language education. Second-language education refers to “when someone studies their society’s majority or official language which is not their home language” (Cook 2003, p. 7) and foreign language education refers to “when someone studies the language of another country” (Cook 2003, p. 7). The linguistic repertoires of South Africans cover a wide spectrum. Literature, as discussed by Banda (2000), has shown that a typical South African can speak at least two of the official languages, with black South Africans being able to speak up to three (sometimes more) of them. Many South Africans are therefore defined as being multilingual and have thus two or more languages in their language repertoire. Since South Africa has 11 official languages, it is often difficult to establish which language is defined as a second language. Also, if people do not hear a certain official language every day, they can find it so unfamiliar that they themselves might define it as foreign. It is for these reasons that the term additional language will be used to describe the studying of any language to avoid confusion about the type of additional language being referred to.

Additional language acquisition

Health professionals and patients in South Africa, in particular, are prone to communicative difficulties since they often do not share a common language. The relationships between them are then affected, as information sharing becomes problematic. When health care science students learn an additional language to communicate with patients, they use that skill to improve the relationship between them and their patients.

Age and language acquisition

One of the main themes discussed in the literature on additional language acquisition concerns the possibility of adults being able to learn an additional language up to a proficiency level close to that of a native speaker. (Marinova-Todd et al. 2000; Abello-Contesse 2009; Hellman 2011; Piehl 2011). Such a theme stems from the beliefs that younger children acquire a language faster and achieve better outcomes than older children or adults (Abello-Contesse 2009). One of the first claims made about these beliefs is called the critical period hypothesis. It argues that there is “an optimal period for language acquisition, ending at puberty” (Abello-Contesse 2009, p. 170) and that once that period has passed, a learner is less likely to achieve native-like proficiency in the target language (Marinova-Todd et al. 2000). Numerous findings have indicated that most adult additional language learners “do not attain the [proficiency] level of native speakers” (Hellman 2011, p. 163), but they still manage to acquire high levels of proficiency in an additional language, regardless of their age (Abello-Contesse 2009).

A number of scholars succeed in explaining why adults indeed manage to acquire high levels of proficiency in an additional language. After analysing studies linking age to language acquisition, Marinova-Todd et al. (2000, p. 9) state that the “age differences [as referred to by the critical period hypothesis] reflect differences in the situation of learning rather than in the capacity to learn”. Also, adults acquiring high levels of proficiency in an additional language could be ascribed to their existing knowledge of any language other than the one they are currently learning (Abello-Contesse 2009). The existing knowledge can comprise anything from different ways of studying to where to find additional help if they need it. Lastly, adult additional language learners are also not necessarily bound to classrooms and are free to interact with people who speak the language they wish to learn. By interacting with native speakers on a peer-to-peer level, language learners experience a valuable and

effective way of learning (Nguyen and Kellogg 2010). The explanations given can possibly add to what psycholinguists believe, i.e. that the critical period only exists for first language acquisition and cannot be extended and applied to additional language acquisition (Marinova-Todd et al. 2000).

On many occasions, adults are required to learn an additional language for educational or employment purposes, as is the case with the health care science students involved in this study. Most of these students chose the field of health care sciences not because they had to, but because they wanted to become health professionals. The students also knew beforehand that they would possibly have to communicate with someone who does not speak their first language at some stage during their career. Given this information, it is safe to assume that certain students will strive to master an additional language to deliver a service to as many people as they possibly can. In this particular instance, the remark made by Abello-Contesse (2009) about the role played by existing knowledge in the acquisition of an additional language is of particular importance. Consider the fact that the majority of students involved in this study have Afrikaans and/or English as first languages, both of which are Indo-Germanic languages. When learning an African language, these students cannot draw on their existing knowledge of a language with which they are familiar. This is due to the fact that what is popularly known as African languages actually belong to the Bantu language family. The Bantu language family is characterised *inter alia* by an extremely complex morphological system and has very little in common with languages belonging to the Indo-Germanic languages. On the other hand, these students have the benefit of literally being surrounded by these languages in day-to-day life. They will be able to hear words being applied in sentences and experience how the language is used by everyday speakers. This is a resource for additional language acquisition that is to a large extent underutilised and underestimated.

Vocabulary acquisition

When learning a new language, students are required to make every effort to study the three language subsystems equally, namely grammar, phonology and vocabulary. They should do this regardless of whether or not they are exposed to the language in its natural form on a daily basis. However, of these subsystems, vocabulary is often neglected the most (by students and lecturers), even though it is seen as an essential step in mastering any language

(De Groot and Van Hell 2009; Zhang 2016). Students are largely left to their own devices when they have to acquire new vocabulary items. It has been argued that, should speakers know a handful of well-chosen basic vocabulary in the language they are learning, the chances of successfully communicating in that language are considerably larger than if they have mastered the language's grammar (De Groot and Van Hell 2009). This is supported by Wilkins' statement (in Chen and Li 2010, p. 342) "without grammar very little can be conveyed, and without vocabulary nothing can be conveyed".

When a student wants to master a language, the question asked quite often is: How much vocabulary does a language student really need to know? In an attempt to answer this question, Nation (2001) asks three additional questions:

- How many words are there in the language?
- How many words do native speakers know?
- How much vocabulary do you need to use in another language?

According to Nation (2001), it is an extremely ambitious goal to try and know all the words in the language you are learning when even the native speakers of that language do not know all the vocabulary. It is also difficult to decide what to count as a word and what not. However, Nation (2001) finds a solution by identifying four ways of counting words, namely tokens, types, lemmas and word families:

- Tokens: every word in a text or spoken form, including repeating words
- Types: every word in a text or spoken form, excluding repeating words
- Lemmas: the headword and some inflected and reduced forms
- Word families: the headword, its inflected forms and closely related derived forms

An easier undertaking when learning a language is to look at how many words native speakers know. However, "research on measuring vocabulary size has generally been poorly done" (Nation 2001, p. 8). After reviewing relevant studies, Nation (2001, p. 9) estimates "that for each year of their early life, native speakers add on average 1000 word families a year to their vocabulary" and states that it is a manageable goal for non-native speakers.

To answer the question of how much vocabulary a person has to know to use a language, Nation (2001, p. 9) states that it might be "useful in the long term" to know as much vocabulary as a native speaker. He further states that it is "not an essential short-term goal" (Nation 2001, p. 9) because even though studies show all words as being equal to a native

speaker, it is not true for learners as some words carry more weight than others in terms of their usefulness.

After taking all three questions and answers into consideration when learning a language, it is possible to determine students' proficiency levels through their vocabulary knowledge. Vocabulary knowledge is studied through two dimensions, namely size and organisation (Meara, in Nizonkiza and Van Dyk 2015). Throughout the years, the dimensions were also referred to by other terms, like vocabulary size and depth knowledge (Nizonkiza and Van Dyk 2015). Vocabulary size "refers to how many words one knows irrespective of how well they are known" (Nizonkiza and Van Dyk 2015, p. 150) and depth knowledge "refers to how well a word is known" (Nizonkiza and Van Dyk 2015, p. 150).

Nizonkiza and Van Dyk (2015) also state that scholars are in agreement that learners' vocabulary size is directly related to their language proficiency. Vocabulary tests can thus be used to determine a learner's level of proficiency. This, in turn, will also determine the vocabulary a learner still requires to use the language efficiently for specific purposes like, amongst others, watching television and reading a newspaper (Nizonkiza and Van Dyk 2015). For example, when a student has to read the business section of a newspaper, but knows no vocabulary related to economics, it means that the student requires vocabulary for this specific purpose to complete the task. This type of vocabulary is known as specialised vocabulary.

Specialised vocabularies are vocabularies with restricted topics (Nation 2001). A specialised vocabulary is of great use in specific domains where a learner only needs a certain number of words to effectively communicate about a specific topic. A prime example of communication in a specific domain is when health professionals communicate with patients about diagnoses or treatments. That is why this study makes use of the specialised vocabulary for health care sciences, and more specifically vocabulary related to the communication between health professionals and patients.

The vocabulary for the module which forms the focus of this study was sourced in a hands-on manner. Students and healthcare professionals were asked to provide the lecturers responsible for the curriculum design with typical phrases and vocabulary that they use on a daily basis in their communication with patients. Two thematic categories were established from this data; one with vocabulary shared by all healthcare professionals, and the second

with vocabulary specific to a particular profession. This approach ensured that students derive the maximum benefit from a relatively small but dedicated core vocabulary.

Multimedia annotations

A research area of vocabulary acquisition that is relevant to this study includes using multimedia for vocabulary acquisition, or rather multimedia vocabulary annotations. These annotations are used to assist language learning students in better comprehending what they are reading and learning (Lin and Yu 2016). Multimedia vocabulary annotations can be seen as “texts, pictures, films, animations, and sounds”, but pictures are used most frequently (Lin and Yu 2016, p. 2).

In a study done on multimedia annotations, Yeh and Wang (2003) found that text along with a still image of the vocabulary item has the biggest impact on vocabulary acquisition. However, in a similar study done by Lin and Yu (2016), they found that text with a still image and an example pronunciation of the vocabulary item was the most effective type of annotation for vocabulary acquisition. The audio used played a critical role in the students’ “retention of word meanings and their reduction of learning load” (Lin and Yu 2016, p. 11).

Even though the main focus of the current study is not vocabulary acquisition, but rather the user’s experience of the applications, the researcher decided to implement multimedia in the form of text, pictures and sounds. This was done to give the users of the applications an indication of what supplementary learning tools can offer in terms of vocabulary acquisition should they feel they are learning some vocabulary in the process of using the applications.

By acquiring an additional language, students in the health care sciences will be able to use a language for a specific purpose, such as communicating with patients. This will, in turn, improve the relationship between health professionals and patients in the South African health sector.

Mobile-assisted language learning

To explore mobile-assisted language learning (MALL), one has to first look at computer-assisted language learning (CALL). CALL can be defined as finding ways of using computers in language teaching and learning (Torut 2000). CALL is one of the earliest methods of using a computer to learn and is seen as an aid to language learning, used by teachers and students

both in and out of the classroom environment (Gündüz 2005). Given the definition of CALL, one can deduce that MALL is similar to CALL, but that mobile devices are used instead of computers.

MALL is classified as a specialisation of mobile learning (ML), which is also known as mLearning (Viberg and Grönlund 2012). Scholars seem to disagree about what *mobile* in mobile learning refers to – the mobility of technologies, the mobility of the learner or the mobility of the learning content (Kukulska-Hulme 2009). Three possible meanings of *mobile* were identified and three authors define mobile learning as follows:

- Quinn (2000) defines mobile learning by focussing on the technology, stating that it is “elearning through mobile computational devices”.
- Kim and Kwon’s (2012) definition focusses on the mobility of individual learners, saying that mobile learning helps learners to develop a “sense of individuality, community and ubiquitousness in learning”.
- Thornton and Houser (2005) focus on the mobility of the language learning content by referring to a study conducted about the usage of mobile phones in English education in Japan. In the study, they found that mobile devices can be used as effective tools when distributing language learning material to students.

These definitions modelled the definition of MALL for the purpose of this study. MALL is thus defined as using language learning content and handheld, portable devices as aids in language learning.

Methodology: application design and development

Before designing and developing the applications used in this study, a search on the Google Play Store for medical vocabulary applications in a South African language other than English was done. Only one application, *Mobile Translate MD*, was found. This application, however, has its roots in the form of a website called *Mobile Xhosa* (Moolla 2013), which was created in 2011.

Mobile Xhosa (Moolla 2013) is a website that was created and aimed at assisting students in the health care sciences who struggle to communicate with their Xhosa-speaking patients. The website can be accessed from desktop computers or smartphones and contains English phrase lists relating to the medical domain with Xhosa translations. The content of the

website is divided into different categories including history, examination, medication, etc., with each category containing a number of subcategories such as cardiovascular, prescribing, greetings, etc. In each subcategory, an English phrase list with its Xhosa translation is found. No illustrations of the phrases are given.

In 2013, four additional languages – Zulu, Afrikaans, French and Spanish – were added to the list of target languages, and the project was renamed *Mobile Translate MD*. The website content was subsequently copied into Android and Blackberry applications (Moolla 2014), with the added functionality of text-to-speech generated pronunciations of phrases for French and Spanish. However, no examples of how the Xhosa, Zulu or Afrikaans phrases should be pronounced are given, except for a few links to external websites that explain general pronunciation in terms of phonetics.

Because no medical vocabulary acquisition application suitable for Sepedi and/or this study could be found on the Google Play Store, a decision was taken to design and develop applications solely for the purpose of the study. These applications differ in many ways from the website and application mentioned above. The target language is Sepedi and the main focus is assisting students in the health care sciences with vocabulary acquisition. The lessons in the applications contain questions in English with matching pictures and three possible answers in Sepedi. Students are also able to listen to the pronunciation of a Sepedi word by a native speaker, and they have the opportunity to record their own pronunciation of the target word.

Application design

Three applications with similar basic functionalities were designed. Additional functionalities were incorporated into two of the three applications. This was done to offer students a variety of vocabulary learning tools (without presenting them with three completely different and unrelated applications) and to determine if they prefer one particular application design. The applications are referred to as *Silent* (vocabulary acquisition with text and pictures only), *Listen* (vocabulary acquisition with text, pictures and pre-recorded audio clips) and *Speak* (vocabulary acquisition with text, pictures, pre-recorded audio clips and record-and-playback).

Functional description of the applications

The functionalities of all three applications are summarised in Figure 1, followed by detailed descriptions of each application's functionalities. The functionalities are also described in Wilken et al. (2016). As is illustrated in the figure, the Listen and Speak applications are extensions of the Silent application. The Listen application has the Silent application's functionality PLUS example pronunciation of the target word. The Speak application incorporates both Silent and Listen's functionalities PLUS record-and-playback of the user's pronunciation.

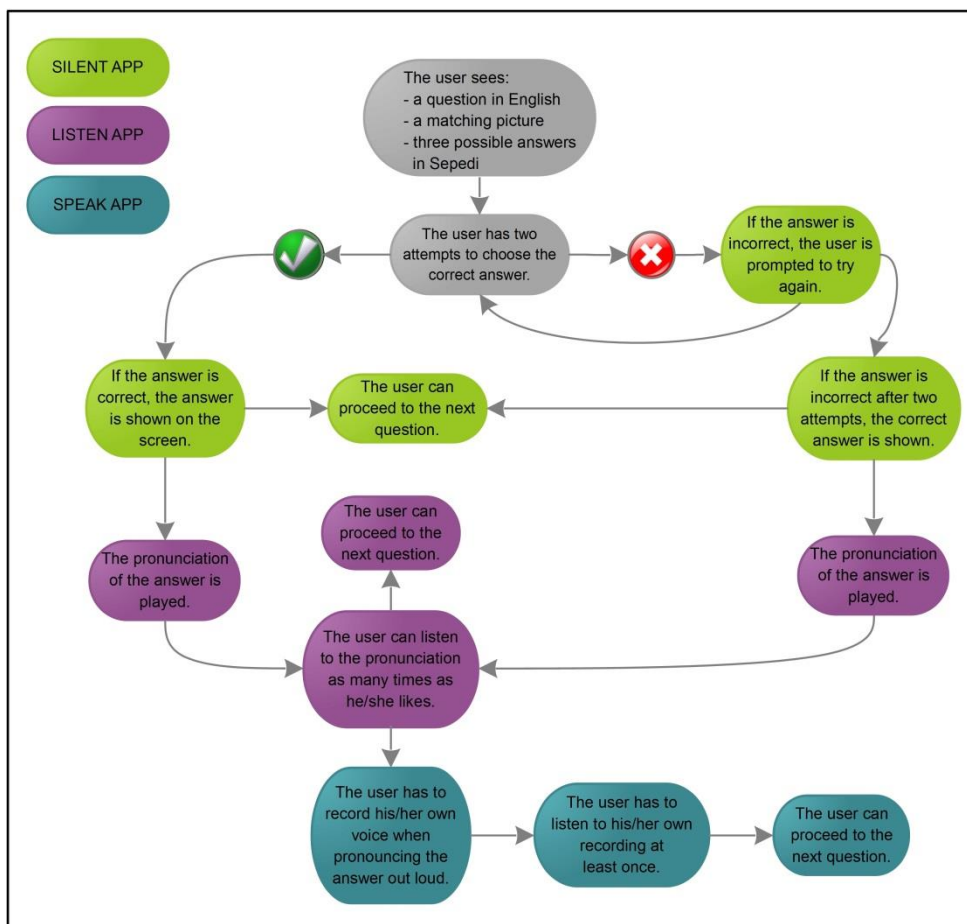


Figure 1: Graphical representation of the applications' functionalities

Silent application

Screenshots illustrating the Silent application are shown in Figure 2. Each lesson consists of a number of questions. Questions consist of an English word and are accompanied by a picture that matches the question and three Sepedi words, which are the possible answers.

Adding a matching word to the English question is a form of audio-visual teaching (Cook 2013), which provides the student with the meaning of the target word visually as well as in a language they know. One of the three Sepedi words is the correct answer. Users are allowed two attempts to choose the correct answer. Should the user answer correctly, the answer is shown on the device's screen and he/she can continue to the next question. If the user answers incorrectly on the first attempt, he/she is prompted to try again through a message displayed in the screen. If the user still fails to answer correctly after two attempts, a message indicates this, and the user is allowed to proceed to the next question. The figure shows, from left to right, the question screen (left), an indication that the chosen answer is correct (middle) and an indication that the chosen answer is incorrect and a prompt for the user to try again (right).

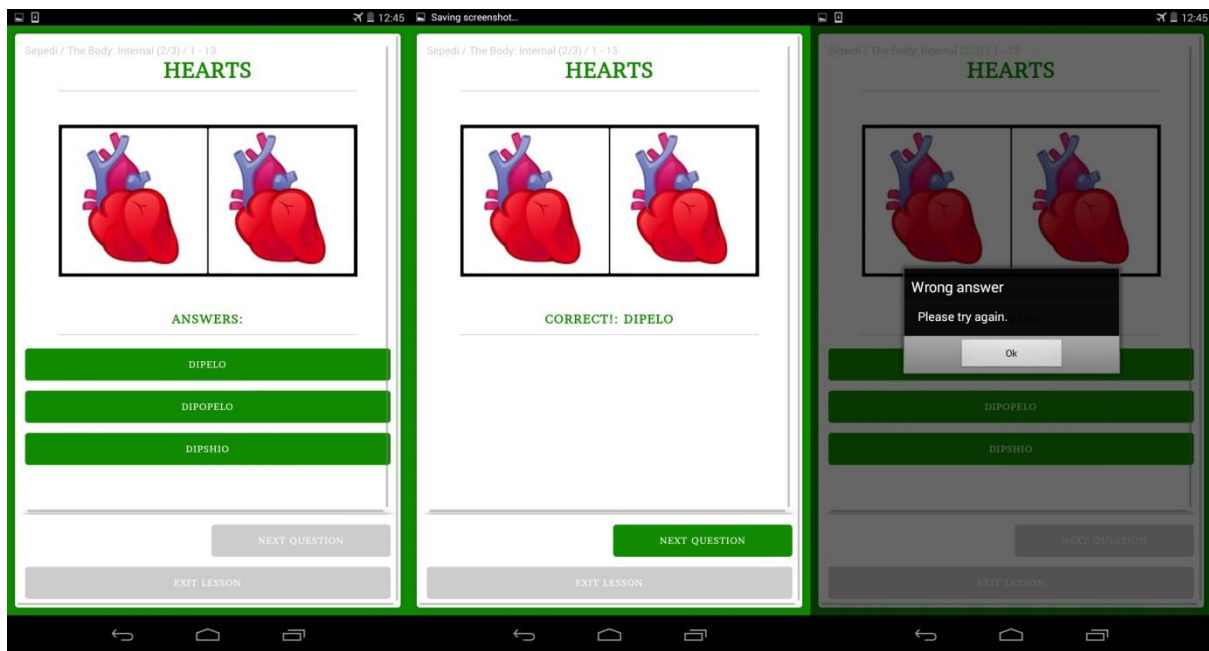


Figure 2: Screenshots of the *Silent* application

Listen application

Figure 3 shows three different screenshots of the *Listen* application. The *Listen* application has the same functionalities as the *Silent* application, but with the added feature that an audio version of the answer is played when the correct answer is displayed on the screen. Users are allowed to listen to the pronunciation as many times as they like before moving on to the next question. When a user has not chosen the correct answer after two

attempts, a message to that effect is displayed on the screen and the audio corresponding to the correct answer is played. The user can then also listen to the pronunciation as many times as he/she likes before proceeding with the lesson. The illustration shows from left to right the question screen (left) and a screen indicating that the chosen answer is correct (middle). A PLAY button is made available for the user to listen to the correct pronunciation of the answer again. A screen indicating that the chosen answer is incorrect and a prompt for the user to try again is shown in the screenshot on the right.

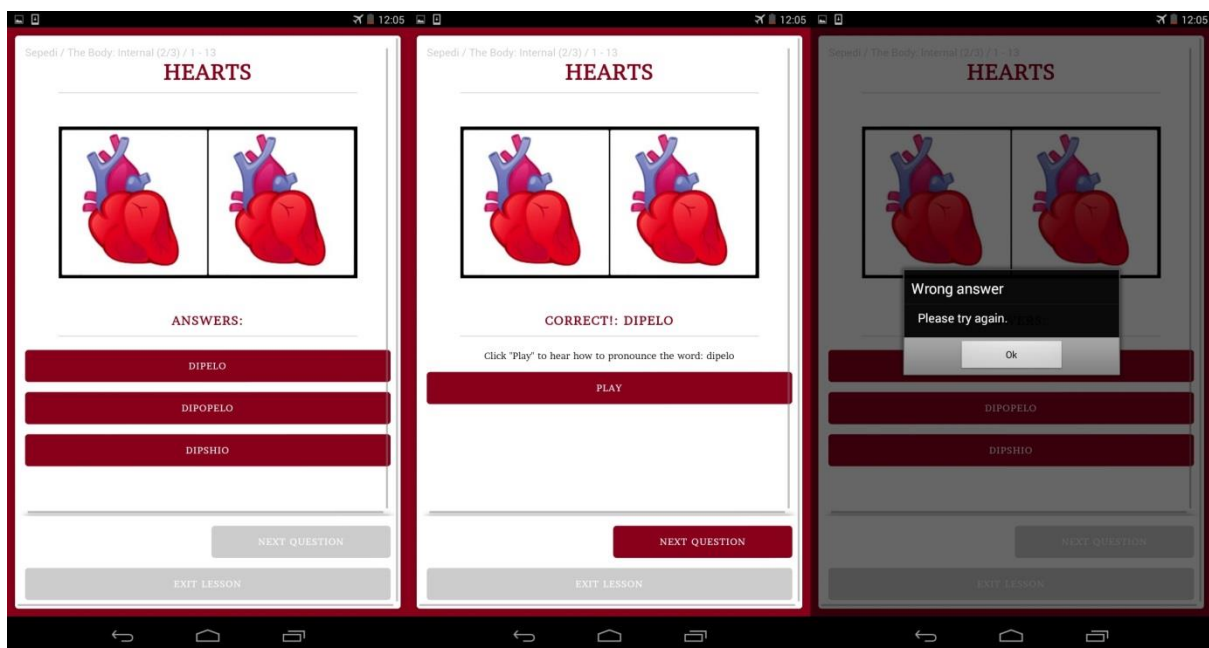


Figure 3: Screenshots of the Listen application

Speak application

Screenshots of the Speak application are shown in Figure 4. The Speak application incorporates the functionalities of both the Silent and Listen applications. After listening to the target pronunciation, users have to record their pronunciation of the answer and listen to it at least once, before they can move on to the next question. When users have answered incorrectly after two attempts, the audio version of the answer is played. They then have to record their own pronunciation of the answer and listen to it before proceeding with the lesson. The screenshots in Figure 4 are, in a clockwise direction, the question screen (top left) followed by an indication that the chosen answer is correct (top right). A PLAY button is made available for the user to listen to the correct pronunciation of the answer again. The

user also has to use the RECORD button to record his/her pronunciation. The next screenshot (bottom right) is an indication that the user has successfully recorded his/her pronunciation. The user now has to use the PLAY RECORDING button to listen to his/her recording before being allowed to continue to the next question. The last screenshot (bottom left) corresponds to the case where the chosen answer is incorrect and a prompt for the user to try again is given.

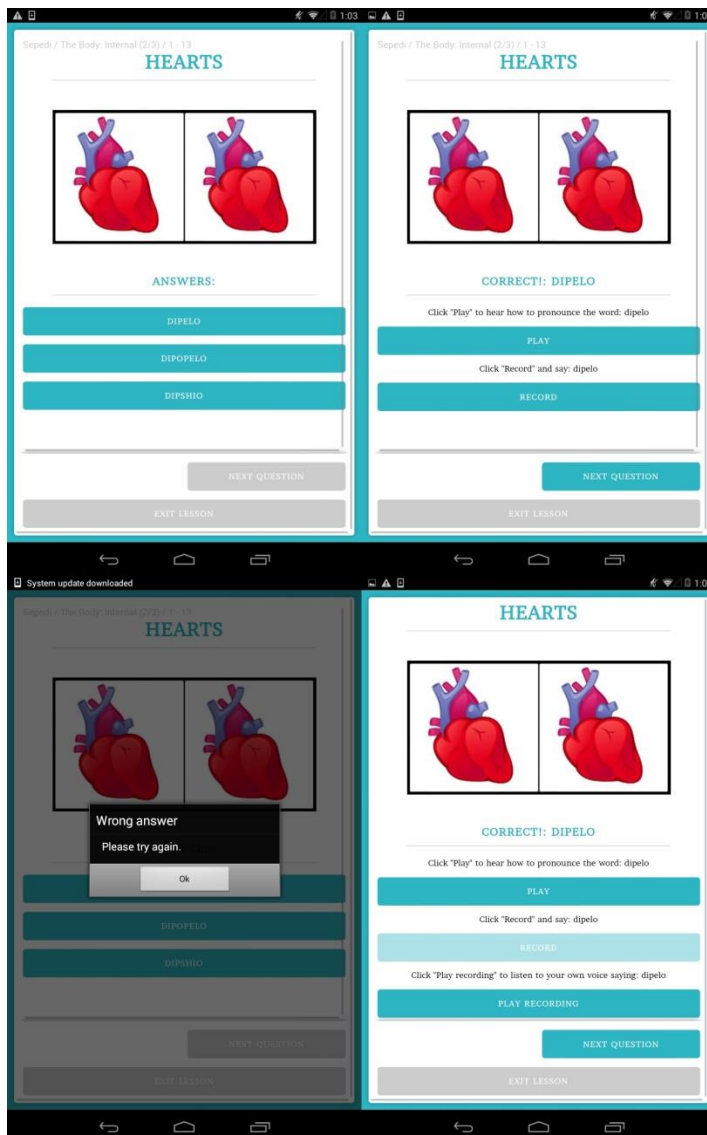


Figure 4: Screenshots illustrating the *Speak* application

Application development

The three mobile applications were designed and developed to conduct the user experience

study. The applications were developed in collaboration with Geckotech, a development house. The applications were designed for mobile devices running the Android operating system (version 4 and later). The devices used in the study were 7 inch Asus Google Nexus 7 tablets.

Content management system

A content management system (CMS) is an online platform that is used to upload the content in the form of lessons for distribution across a number of devices. The CMS was developed and hosted by Geckotech.

The functionality of the CMS is illustrated in Figure 5. On the CMS, an administrator can create modules (for example Sepedi), and in these modules lessons and questions can be created. Each module can have many lessons, and each lesson can have many questions.

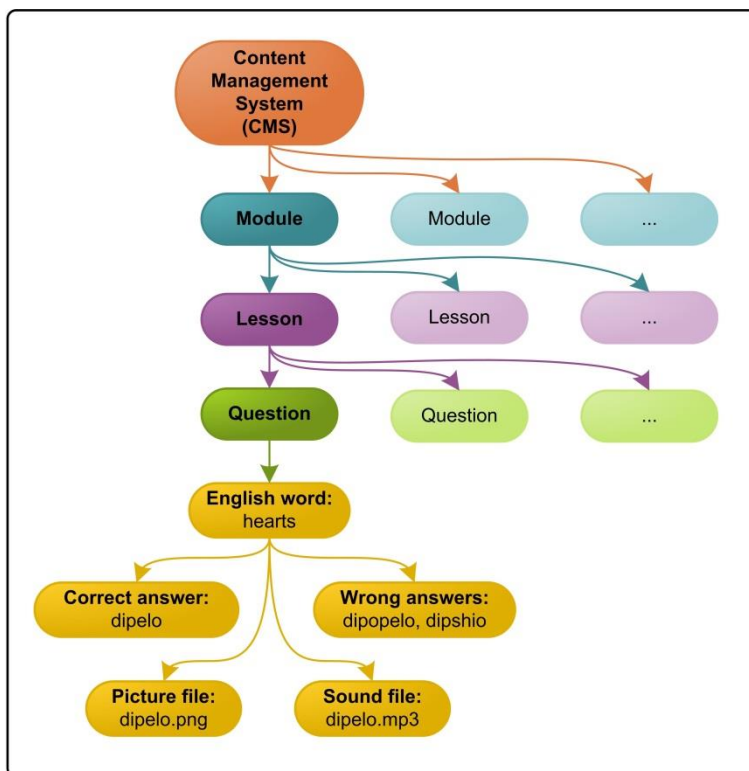


Figure 5: An overview of the CMS

Figure 6 shows how a module with lessons and questions is created, as well as what is needed for each field. As illustrated, the module name (*Sepedi110*) and a description of the module (*Sepedi for beginners*) are required to create a module. The information needed to create a

lesson is the lesson name (*Health*) and a description of the lesson (*Vocabulary related to health*). Questions require the question in English, the correct Sepedi answer, three possible Sepedi answers (of which one must be the correct answer) separated by two commas, an audio file (in .mp3 format) and a picture file (in .png format). The example in Figure 6 corresponds to the English word *pain*.

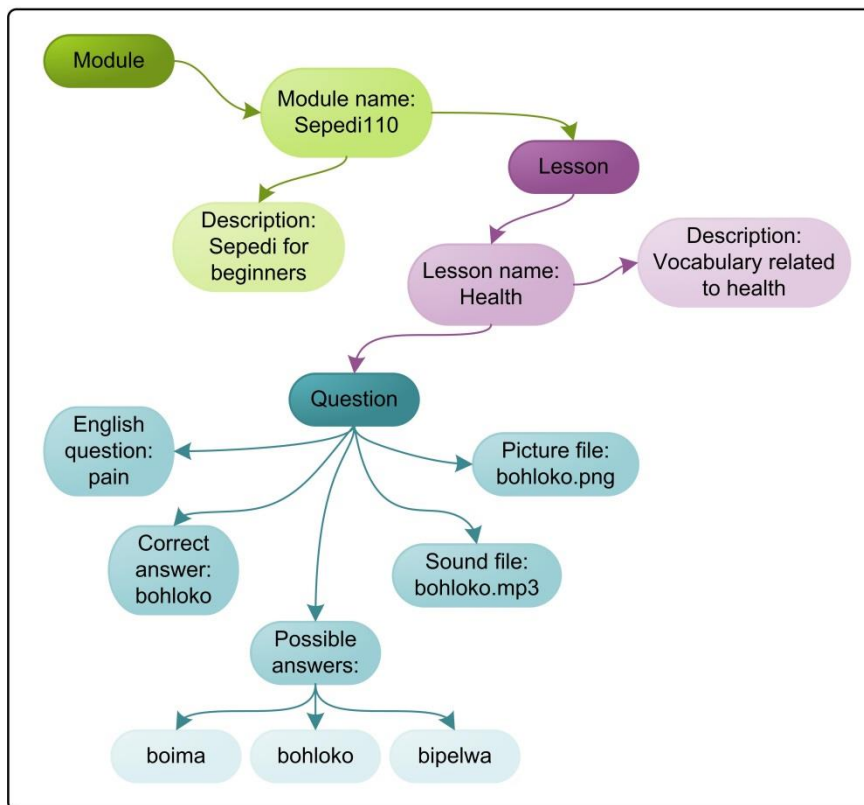


Figure 6: A module with lessons and questions

The content used in the applications is modifiable and lessons can be added, removed and edited as necessary. In addition, it is possible to change the target language of the applications, simply by adding content in another language. The content, in whichever language, is added to the applications by following the process illustrated in Figure 7. Following the steps illustrated in the figure results in fully functional applications that can be applied in a user experience study.

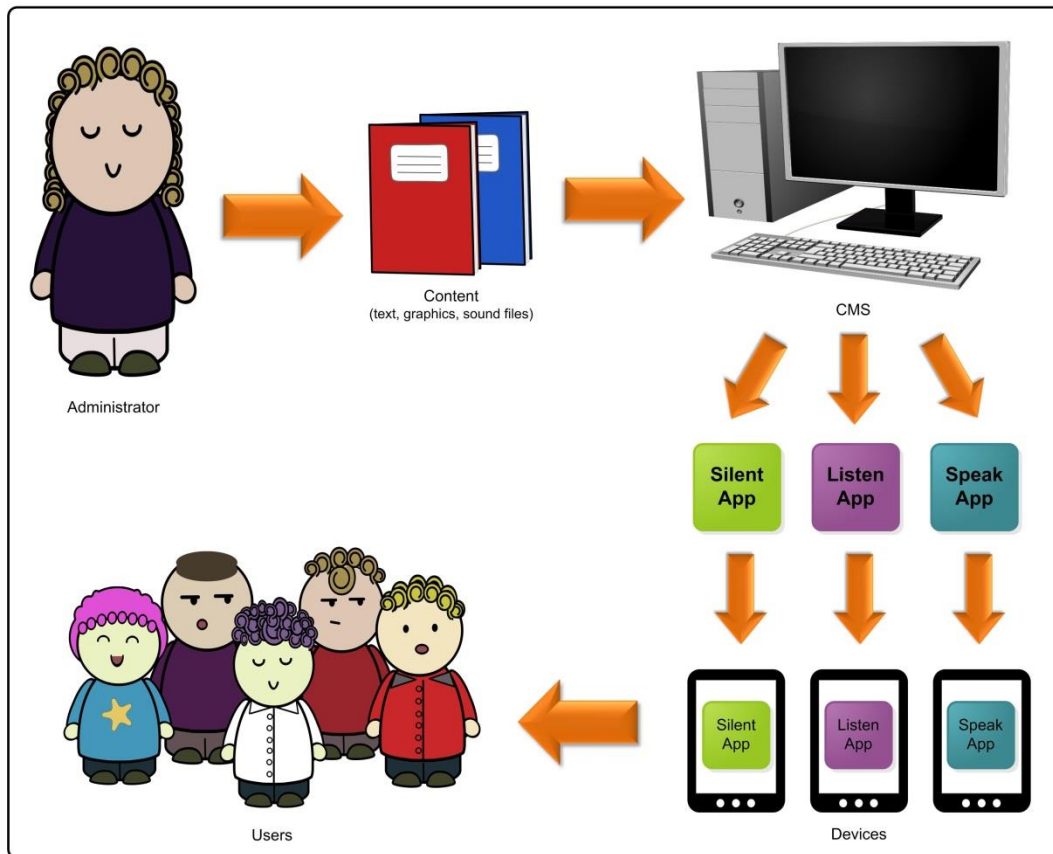


Figure 7: An overview of the application preparation process

Content

The content that was used in the applications consisted of a vocabulary list, recordings of pronunciations of the words in the vocabulary list and matching pictures. The content was used to create lessons and the lessons were uploaded manually to the CMS.

Vocabulary

The vocabulary was taken from the vocabulary list in the study guide of the Sepedi 110 module. The list was originally divided into subsections relevant to the different disciplines within the health care sciences, like dietetics, radiology, nursing, etc. However, since there is a sizeable overlap in the vocabulary utilised for the different disciplines, no such differentiation was catered for. After having removed all duplicates, the content was organised into new categories: The Body: External, The Body: Internal, Objects and People, Nutrition and Health. The new categories were chosen so that during the intervention, all the students could participate in and complete lessons relevant to their own studies. The

categories also exposed them to other Sepedi words they might come across during their encounters with Sepedi speaking patients.

The English and Sepedi vocabulary list consisted of 336 words for each language, 317 unique words for English and 333 unique words for Sepedi. The total number of words differs for each category as is shown in Table 1. The totals range, for example, from 36 words in the category The Body: Internal to 91 words in the category Objects and People.

Table 1: Number of words per category

Category	Number of words
Health	42
Nutrition	81
Objects and People	91
The Body: External	86
The Body: Internal	36

Sound recordings

Audio versions of the target utterances were produced by a female Sepedi speaker. The recordings were done in a quiet room using Adobe Audition 1.5 with a sample rate of 44.1 kHz. The words were recorded in batches of 15 words over a period of four days. The fourth day was used to re-record words that were not recorded in a satisfactory manner during the first three days. The same program was then used to edit the audio files to remove any noise and to segment the long audio files into single word audio files. The files were normalised to ensure the same average volume throughout. The original format of the audio files was .wav, but it had to be changed to .mp3 to be compatible with the CMS.

Pictures

Appropriate pictures were identified in the Shutterstock catalogue. Pictures were carefully selected to match the content that was used in the applications. The pictures were then purchased by the Council for Scientific and Industrial Research (CSIR).

All the pictures were resized to 100kb or less and converted to .png format if needed. Some pictures were also duplicated to create pictures for the plural form of words and/or cropped and partially coloured. The pictures were edited using Fotor and PhotoScape photo editing software that is freely downloadable from the Internet. Examples of the changes made to

some pictures can be seen in Figures 8, 9 and 10.



Figure 8: A cropped and partially coloured picture to indicate a word in the singular form



Figure 9: A duplicated picture to indicate a word in the plural form



Figure 10: An edited picture. An indicator was added to highlight a certain area on the picture

Lesson design

Each category was divided into several lessons so that users could complete lessons timeously and to keep them engaged. Table 2 indicates the number of lessons per category, as well as the number of words per lesson. The researcher decided that the maximum number of lessons per category should not be more than six. This, in turn, kept the maximum number of words per lesson to no more than 17.

Table 2: Number of lessons per category and number of words per lesson

Category	Number of lessons	Number of words per lesson
Health	3 lessons	1. 14 words 2. 14 words 3. 14 words
Nutrition	5 lessons	1. 17 words 2. 16 words 3. 16 words 4. 16 words 5. 16 words
Objects and People	6 lessons	1. 16 words 2. 15 words 3. 15 words 4. 15 words 5. 15 words
The Body: External	6 lessons	1. 16 words 2. 14 words 3. 14 words 4. 14 words 5. 14 words 6. 14 words
The Body: Internal	3 lessons	1. 13 words 2. 13 words 3. 10 words

The intervention

The intervention involved the usage of the applications by target users over a period of time, including a written pre- and post-test. After using the applications for nine weeks, the users

completed a questionnaire in which they rated their experience with the applications and gave feedback on the intervention and the applications in general.

Research study participants

Undergraduate students from certain schools in the Faculty of Health Sciences at the University of Pretoria are required to complete an African language module during either their first or third year of study. They have a choice between Sepedi and Zulu. Students in the health care sciences enrolled for the Sepedi 110 module were chosen as possible participants for the study. Eighty students were enrolled for the Sepedi 110 module in the second semester of 2015. The students were informed about the planned intervention and all planned activities were explained to them. The students were given an opportunity to decide whether or not they would like to participate, after which 36 students volunteered to participate in the study.

Survey instrument

The survey instrument used in the study was a questionnaire involving all three applications. The questionnaire included both qualitative and quantitative questions and was used to determine how the students experienced the applications. The questionnaire consisted of four main sections, namely, *General*, *Silent* application, *Listen* application and *Speak* application. Each section, as discussed below, aimed to collect specific information about certain parts of the applications and the intervention.

A Likert scale with a score between one and five was used to measure the answers received from the quantitative questions in the questionnaire. The Likert scale was chosen to measure the students' attitudes towards the applications, with a scale ranging from strong disagreement to strong agreement.

General

This section of the questionnaire included questions on:

- the users' general impression of the intervention;
- whether or not the applications were easy to use;
- what they liked most and least about the applications;

- what they would add to or remove from the applications;
- what they thought about the pictures; and
- whether they thought they acquired any vocabulary from using the applications.

There were five important questions in this section directly related to the research questions for the study:

- Did you learn any Sepedi from the applications?
 - If you did, which application, in particular, helped with this?
- Would you use the applications if they formed part of the Sepedi 110 module?
- If you would, which application(s) in particular? You may choose more than one.
- Would you recommend the applications to other students learning Sepedi?
 - If you would, which application(s) in particular?
- Which application did you prefer using? Indicate your preference with one score between 1 and 5.
- If the applications were made available on the Google Play Store, would you
 - Download them?
 - Pay for them?

Silent application

Because the `Silent` application formed the basis of all the applications, the questions in this section of the questionnaire focused on the layout and user friendliness of the application. One question, in particular, focused on what skills the users thought they gained by using this application.

Listen application

In this section of the questionnaire, the focus of the questions was on the quality of the sound files used, whether or not the users liked to hear the pronunciation of a word, if they liked having the option to listen to the sound file more than once and what skills they thought they gained by using this application.

Speak application

The focus of this section of the questionnaire was on whether or not the users liked to practise speaking and listening to the recording of their pronunciation, and if they found it useful or not. This section also included a question on what skills the users thought they gained by using this application, as well as whether or not they would like the application to provide feedback on their pronunciation of the words.

Response rate and data collection

In total, 36 of the 80 students enrolled for the Sepedi 110 module volunteered to participate in the study. Lectures for the Sepedi 110 module were scheduled once a week on a Thursday afternoon from 15:30 to 17:30. The lecturer of the module permitted the researcher to interact with the students every week for the last 30 minutes of the lecture. In these 30 minutes, the students used the applications at random and completed as many lessons as possible.

A total of five sessions with the students took place over nine weeks.ⁱ At the end of the intervention, 20 students had used each application at least once and completed a questionnaire on their experience with the applications throughout the intervention.

Results: the intervention

The results from the questionnaire were categorised into four main sections: General, Silent application, Listen application and Speak application.

Results: general questions

This section's questions focused on the applications and the intervention in general. The students' impression of the applications was largely positive. In total, 40% of the students said they liked the intervention very much and 45% felt extremely positive about the applications. Overall, 80% thought the applications were very easy to use and 42% liked the pictures very much.

Most students answered "nothing" when asked what they would add to the applications. However, some students did make a few suggestions, like adding a small tutorial at the beginning of the applications, enlarging the font on the applications and adding sentences to

the lessons. The majority of the students again answered “nothing” when asked what they would change or remove from the applications. However, some students did suggest changing the time it takes for the application to record a user. This is because some words take less/more time to pronounce than others, thus causing the user either to wait or to rush through the recording.

Figure 11 indicates the responses to a question asking if the students would recommend the applications to other students learning Sepedi. The majority (68%) of the students answered they definitely would, with only 11% answering that they possibly would. The students were also asked to indicate which application, in particular, they would recommend to other students. The Listen application was nominated as the favourite with 50% compared to 25% each for the Silent and Speak applications.

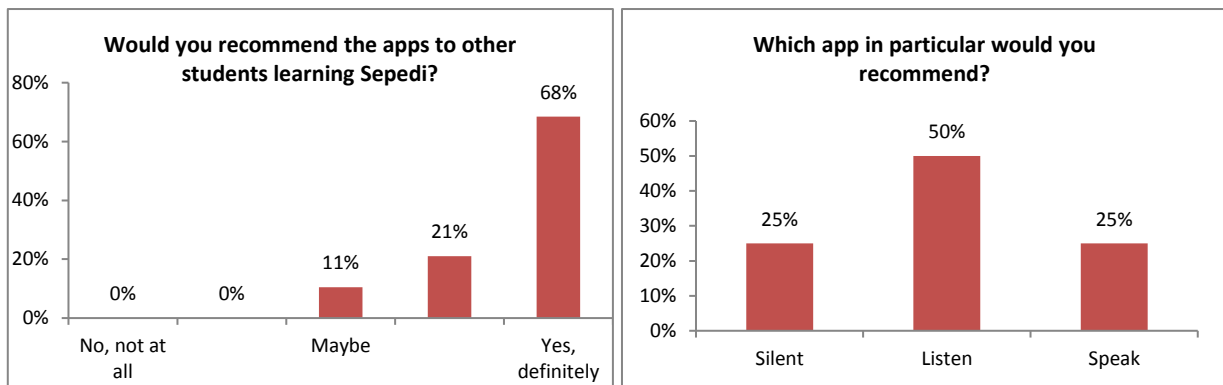


Figure 11: Feedback on a question

Figure 12 shows that 58% of the students would use the applications a lot if they formed part of the Sepedi 110 module, 58% of them answered that they would use the applications, with only 16% answering that they possibly would. The students also indicated which application, in particular, they would prefer using in the module. Once again the Listen application came out as the favourite with 39% compared to 29% for the Silent application and 32% for the Speak application.

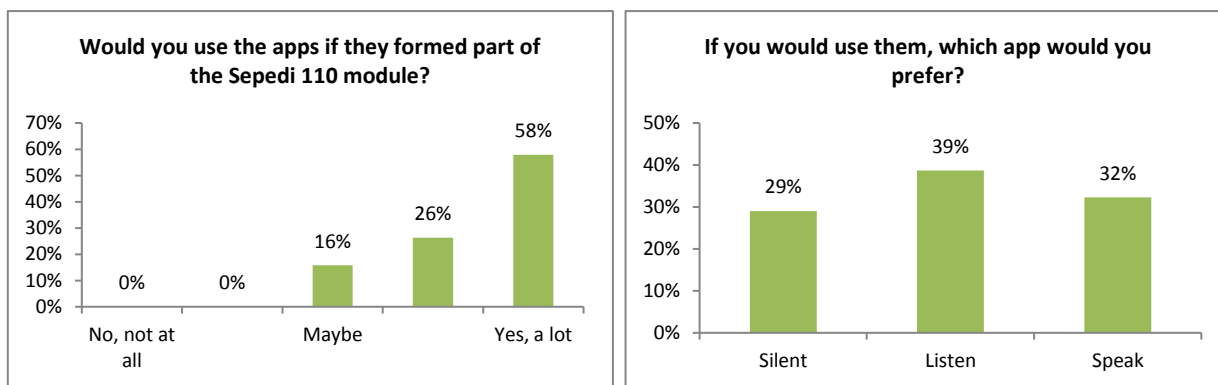


Figure 12: Feedback on a question

In Figure 13, it is shown that only 10% of the students were of the opinion they learned a lot of Sepedi by using the applications, but 50% thought that they learned a little bit of Sepedi from using the applications. The students who felt they learned some Sepedi then had to choose which application helped them the most. The `Listen` application received 50% of the votes, with the `Silent` and `Speak` applications receiving 15% and 35%, respectively.

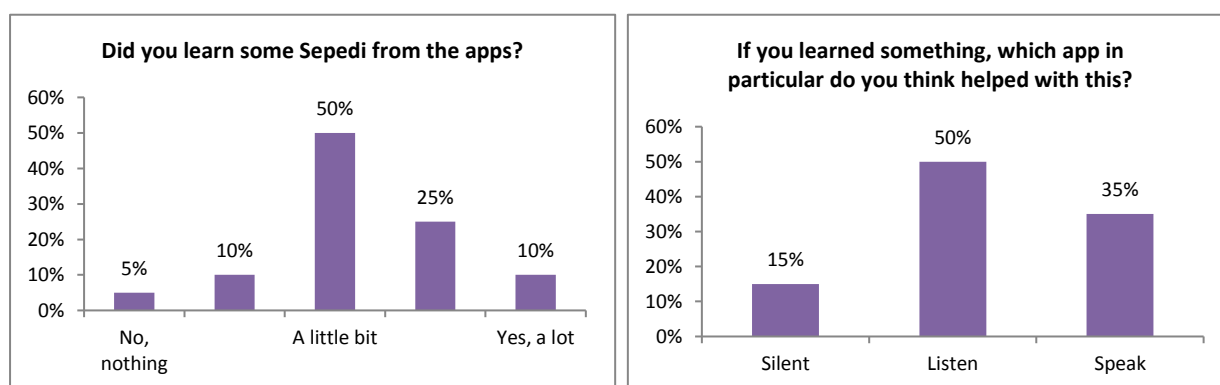


Figure 13: Feedback on a question

Results: Silent application

Because the `Listen` and `Speak` applications are extensions of the `Silent` application, a question on the user friendliness of the applications in general was added to this section. In terms of the layout of the applications, 60% of the students chose the 'very user-friendly' option. They felt that the `Silent` application helped them with their Sepedi skills and 36% of the students selected vocabulary as the skill they thought benefited them most using the application.

Results: Listen application

When asked if they liked hearing the correct pronunciation of the word immediately after getting an answer correct, 70% of the students said they liked it very much. The students also had the option to listen to the pronunciation as many times as they liked, and 65% said they liked that very much, too. The students also gave positive feedback on the quality of the audio files used in the applications, with 60% of the students rating the quality as excellent. The students felt that the `Listen` application helped them with their Sepedi skills, with 29% of the students selecting pronunciation as the skill they thought benefited them most from using the application.

Results: Speak application

The students did not have strong positive or negative opinions of the `Speak` application. The results show that 30% of the students liked being able to practise speaking, but 30% also found it tolerable. In total, 10% of the students found it less than tolerable, with 5% not liking it at all. Even though most of the students did not like speaking to the application, 25% found speaking their answers very useful and 70% found it either tolerable or between tolerable and very useful. The majority (70%) of the students would like it very much if the application could give them feedback on their pronunciation. They did not, however, really like to listen to their own pronunciation. Forty percent found it tolerable with only 20% liking it very much. Nevertheless, 70% of the students think the `Speak` application can assist with improving their pronunciation. The students felt that the `Speak` application helped them with their Sepedi skills, with 31% of the students selecting speaking as the skill they thought had benefited the most from using the application.

Preference

The last question of the questionnaire asked the students to indicate which application they preferred to use. Figure 14 indicates the students' preferences. The students had to rate the applications between 1 and 3, with 1 being the most preferred. The majority of the students rated all the applications as requested, but a few students rated all the applications as either their first choice or only rated one application. These students' actions did not disqualify them from the study and their results were still included, because ratings were still provided. It can

be argued that these students imagined using the three applications in different scenarios, where each application would be most suitable for a specific scenario. Or, the students simply had a strong preference to one application and did not want to rate the other two applications.

The figure shows that 39% of the students rated the `Listen` application as their first preference. The `Silent` application was second with 35% and the `Speak` application was third with 26%.

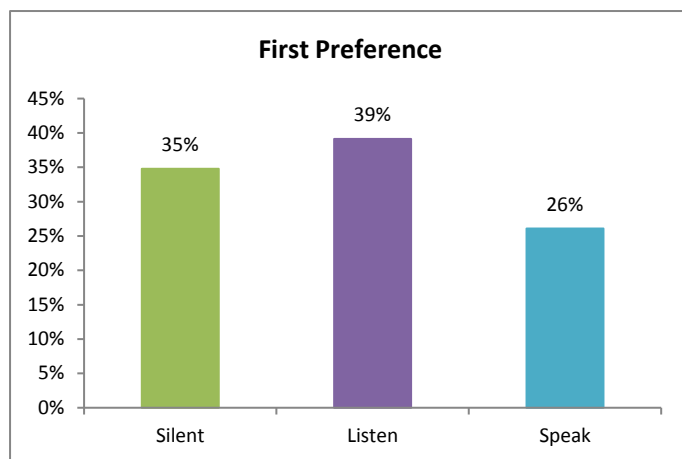


Figure 14: Results: First preference

Conclusion

This study investigates the user experience of students who used mobile applications as supplementary tools for Sepedi vocabulary acquisition. The results and feedback received from the questionnaires indicate that the students enjoyed the applications and that they perceived them to be useful as a supplementary tool for learning Sepedi. The students also indicated that the `Listen` application was their firm favourite and that they would prefer to use it if the applications were to form part of the Sepedi 110 module. They would also recommend the `Listen` application to other students learning Sepedi in the health care sciences.

The students who participated in the study were overall positive about the intervention with the applications. This observation confirms that the potential for using mobile applications as supplementary tools in vocabulary acquisition does indeed exist, and can be recommended and even improved to make it more user-friendly.

Future Work

The applications used for this study were technologically very basic. This option was chosen to collect honest feedback from students about using applications for language learning without the performance of the technology influencing their opinions.

In the questionnaire, the students indicated that they liked listening to the pronunciation of the words after getting an answer right when using the Listen and Speak applications. The students also indicated that they would like the Speak application to provide them with feedback on their own pronunciation of the words. Based on this, future research would include the following:

- Replacing the pre-recorded audio in the Listen and Speak applications with text-to-speech (TTS) generated sound files.
- Incorporating automatic speech recognition (ASR) into the Speak application to give immediate feedback to the students regarding their pronunciation of Sepedi words.
- Repeating this study with a test group and control group to determine the true effect the applications have on the students' vocabulary acquisition. The use of the applications can be divided into two interventions, one for each group. A retention test can also be written after the interventions to determine to what degree the students retain newly acquired vocabulary items.
- Expanding the content used in the applications to include sentences and basic grammar rules, which would allow the students to use the vocabulary they learn in a meaningful context.
- Ensuring that the interventions take place for a full semester, once again increasing the possible impact of the applications on the students' vocabulary acquisition.

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ⁱ The original design of the study made provision for 14 contact dates. However, this was influenced by various circumstances beyond the researcher's control, the most important of which was the Fees Must Fall movement. Because of this, only five contact sessions with the students over a period of nine weeks were possible.