

## DEVELOPING AUGMENTED REALITY ON ENGLISH PHONETICS MODEL

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### **Abstract**

The basis of developing English phonetic model to English literature students is giving concrete example of how sound produced in the vocal track. Due to distance learning environment that demand students to be independent learning, Augmented Reality technology is chosen manifesting 3D object to aim the goal of students mastering English phonetics. The research methodology is research development. The development is begun by identifying lesson objective and measuring to which extend the application intends to make. It is decided that the Augmented Reality is in form of mobile application with several menus such as tutorial, the vocal track, and exercise. The application contains the sounds of thirty-four vocal and consonant combines. Besides, it demonstrates how to pronounce single sounds or phoneme, it also serves examples in words. The development has three stages that are planning, making, and evaluation. The novelty of this research is shifting the 3D still image model into interactive 3D augmented reality model. The result is self-learning application that in form of moving 3D and expected to help students learning the English sound more precisely.

Keywords: Augmented Reality, Phoneme, Phonetic, and vocal track

### **1 INTRODUCTION**

The need for students to understand the articulation organ to produce correct phoneme sounds in English drives the development of AR (augmented reality) phonetic articulation in the English sound system. Universitas Terbuka students enrolled in the English literature study program with a translation interest have the obligation to study independently. Due to these circumstances, students face numerous challenges in accurately learning the sounds of the language. This competence, however, is difficult to achieve correct English sound because lecturers and students do not meet in person and there is no form of verbal practice. Meanwhile, the ability to recognize articulations and understand vowels and consonants in English is important because a phoneme's sound can change the meaning.

When learning English spoken language, a problem with delayed meetings between students and teachers gave rise to the idea of using augmented reality. Augmented Reality (AR) is defined as a real-time direct or indirect view of a physical real-world environment that has been enhanced/augmented by the addition of virtual computer-generated data to it (Carmigniani & Furht, 2011). AR is also become good choice for educational media. Applications for augmented reality (AR) have already been used to develop literature and poetry as well as successfully teach science, biology, and math (Scrivner et al., 2017).

Our research focuses on the creation of augmented reality in the English phonetic model. Our research aims to determine the suitability of augmented reality (AR) as a teaching tool in

independent learning. This paper includes the following sections: I) exploring AR learning in English phonetic and phoneme, ii) gathering feedback from experts to match the lesson object, iii) describing example and voice over, and iv) planning future evaluation, technology, and instruction.

The development of AR is anticipated to result in the organ that generates the sound system appearing in three dimensions. It is anticipated that students will develop a more detailed understanding of the components involved in sound production. This AR is meant to supplement the English Translation Study Program's BING4214 - Introduction to Linguistics module.

## **2 METHODOLOGY**

This paper is composed by content analysis of the AR application that English Literature program study of Universitas Terbuka has been doing. The AR itself is research development program that begin with need analysis that figure out which lesson is difficult to learn if there is no simulation. Then the research begins to develop its material by hiring experts and composed the content. After that, there are many revisions to perfect the result.

The educational benefits of augmented reality (AR) are closely related to how it is created, put into practice, and incorporated into formal and informal learning environments rather than being solely based on the use of technologies (Wu et al., 2013). So, in making this application, researchers hire vendors who are experts in making 3D while the research team focuses on creating content so that students can practice it properly. Actually, there are several forms of AR application such as mobile based, wearable device, computer based, computer and projector (Parmaxi & Demetriou, 2020). The application of Phonetic AR in this research is as a mobile based application.

The data of consonant and vocal phonemes are taken from IPA (International phonetic alphabetic) of English. The vocal consists of monophthong and diphthong then will be categorize by each manner of articulation and how it will be voiced or voiceless. Meanwhile consonant will be categorized by its place of articulation, manner of articulation and the airflow.

## **3 FINDINGS AND DISCUSSION**

The finding and discussion will discover how the AR is being developed from the planning to become an application that can be used to self-learning.

### 3.1 Pre-developing Process on Augmented Reality

Before deciding to create AR, we already decided that it should aid lessons that are challenging to comprehend through reading alone. To clearly explain how the vocal tract produces sounds at the level of the smallest unit of sounds, a 3D simulation is required. According to that strategy, it was decided to include phonetic and phoneme topics in this development.

#### 3.1.1 Exploring AR learning in English Phonetic and Phoneme

There are two ways to convey meaning when learning a language: spoken and written. Spoken language is formed by a series of sounds that combine to form meaning. Phonology is the study of sound production in linguistics. Phonology is derived from the words "phone" (sound) and "logy" or "logos" (knowledge). Therefore, phonology is the science that deals with sound. Phonetics and phonemics are the units studied in phonology. Phonetics studies how sound is produced, whereas phonemics studies sound systems (Wiratno, 2013).

Phonetics is the study of how sound is produced in the human vocal organs, including how articulation produces a sound (McMahon, 2002). There are two types of phonetic articulation of sounds: consonants and vowels. Each sound is distinguished by three variables: laryngeal activity, point of articulation, and articulation method. The image below depicts an organ that generates sound.

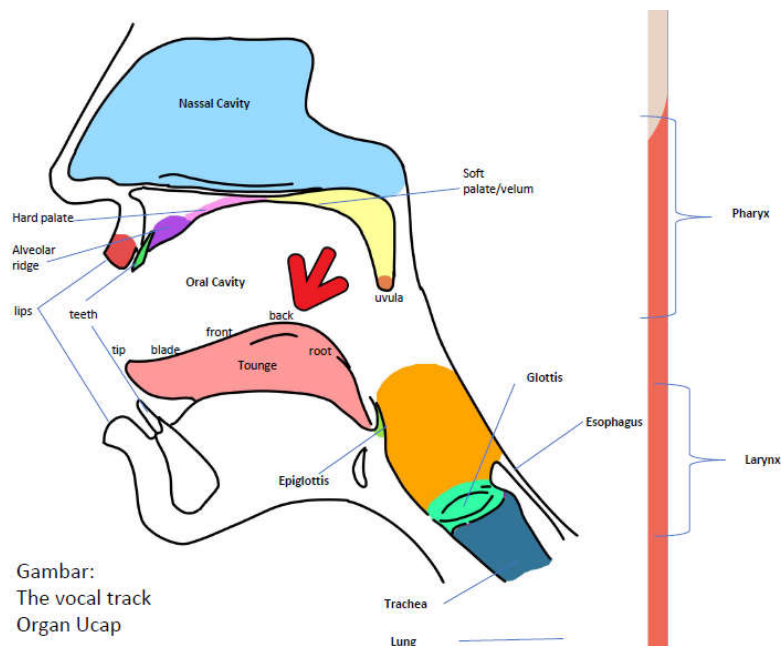


Figure 1. vocal track

The sound is produced by air expelled from the lungs (lungs), which travels to the larynx and then to the vocal cords. Air is formed into specific sounds at the vocal cords. The shape of the position of other organs such as the lower articulatory such as the tongue, lips, and lower teeth which move to the upper part such as the upper lip, upper teeth, and palate then determines the formation. A velum, a soft palate without bones at the back of the oral cavity, opens and closes the passage from the pharynx to the nasal cavity (Yavas, 2011). The ability to distinguish meanings in English depends on an understanding of the various sounds. For instance, compared to the sounds [k] and [t], the English phoneme [k] and [c] do not significantly affect meaning (Mcmahon, 2002). The ability to distinguish meanings in English depends on an understanding of the various sounds. For instance, compared to the sounds [k] and [t], the English phoneme [k] and [c] do not significantly affect meaning (Mcmahon, 2002).

### **3.1 Expert feedback for Lesson objective integrated on Augmented Reality**

The research team conducted a forum discussion group with two experts to develop the AR. We gather feedback on the application blueprint and the best lesson activity that will enable students to learn about the subject on introduction of linguistics.

The application's design is generally sound. There are some things to keep in mind, though, in order to enhance its usability. From experts, we make some points to be installed on the application. They are:

1. An introductory menu could be the first menu. An introduction to phonetics and phonology can be seen on this menu. The terms phonemes, allophones, phonemics, and phonetics must also be explained. The terms segmental and suprasegmental must also be explained.
2. The next menu can display the structure of speech instruments or articulators so that students can recognize and have basic knowledge of speech tools to produce consonant sounds and vowel sounds.
3. The menu about consonants is the following one. It is also necessary to clarify the idea of consonant voicing (voiced vs. voiceless). It is necessary to define consonants generally in this situation. The consonant submenu of the manner of articulation and the consonant description in terms of the place of articulation can both be found under this menu. The definition of each place of articulation and manner of articulation needs to be explained in each of these submenus, and sound examples are shown with the IPA symbol. To help

students learn to mimic the sound, it would be preferable to also provide an example of the sound.

4. The fourth menu is about vowel sounds. The concept of vowel sounds must be explained in this menu. The high and low of the tongue, as well as which part of the tongue is active in producing the vowel sound, can be used to explain vowel sounds. In this case, it is necessary to explain the vowel sound categories based on their high and low frequencies, as well as their location, namely front, middle, and back. As a result, especially in English, it is necessary to display quadrilateral vowels with vowel sounds. The vowel sound menu, like the consonant sound menu, must include all vowel sounds in English, including diphthongs, and be accompanied by examples in words written with IPA symbols.
5. Equally important is the menu of pronunciation exercises or the practice of transcribing sounds using IPA symbols. This exercise needs to be reproduced so that students are familiar with science symbols in English. For example, students can be given a game to transcribe words by choosing the consonant or vowel symbols in the word.
6. Finally, it may be necessary to display the latest science symbol table so that students become more familiar with science symbols for consonants and vowels in English, especially.

Based on learning objective of linguistic subject, students are demanded to apply basic concepts and theories of English linguistics to answer linguistic phenomena problems (*Capaian Pembelajaran ESAI – ESAI Indonesia*, n.d.). Bachelor students are advice to take the linguistic knowledge, in this term in phonetic and phonemes, on basic level. Therefore, the menu that the researcher established will focus on the vocal track, consonant, vocal, and exercise. Those valued as sufficient to achieve lesson goal.

### **3.2 Display of Menu, Example, and Voiceover**

The application is given name PHONETICS; consonant and vowel. The Application has several menus. They are tutorial, phonemes and AR scan, exercise, and Vocal track. Tutorial means to be the guidelines on using the application. Phonemes and AR scan contain vocal and consonant in English sound. It also has the scan function to detect the phonemes to be in 3D form. The exercise menu is a display that includes words, phonetic symbol, and sounds. The vocal track menu is the menu that shows a 2D picture with name label of the human voice organ. Figure 2 shows the display of application. From left to right are login display, phonemes, AR scan, and Vocal Track

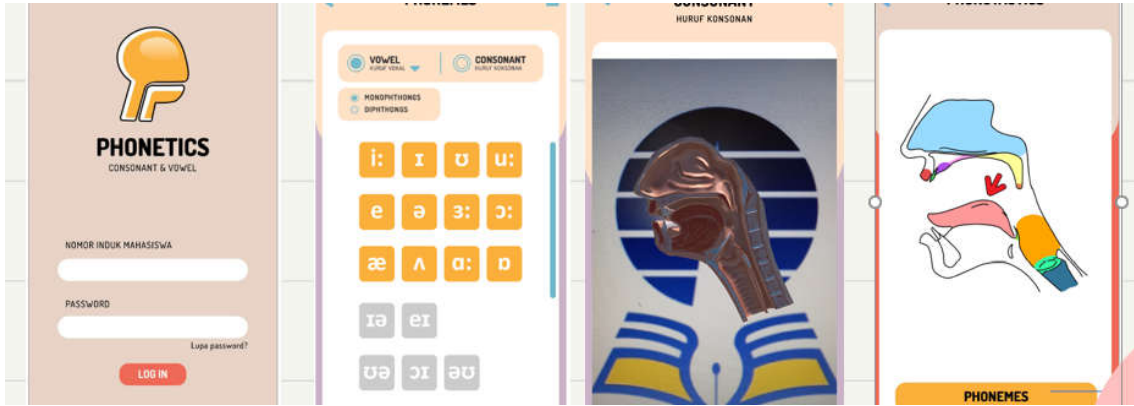


Figure 2. Menu display on AR Phonetic

Students must enter their student ID number and password to log in. They can read the tutorial and a brief description of the application after that. The phonemes menu will then be presented to the students. Consonant and vocal are available on the phoneme menu. This application includes features for 33 phonemes. The student must then select one of the phonemes after that. Then the AR scan will show up. To display a 3D image, it will detect a specific code (in this case, the UT symbol). A 2D figure of the vocal track is also available to help students learn.

Exercise was also used to complete the application. The exercise consists of a word, a phonetic symbol, and a sound. This application's voiceover is performed by a native speaker. The British standard on Oxford dictionary guidelines is used for the sound reference. Table 1 shows an example of how the exercise is created.

Table 1. The example of exercise

| No. | vowel | word  | sounds  |
|-----|-------|-------|---------|
| 1   | i:    | peal  | /pi:l/  |
| 2   | ɪ     | Sit   | /sɪt/   |
| 3   | ʊ     | foot  | /fʊt/   |
| 4   | u:    | goose | /gu:s/  |
| 5   | e     | dress | /dres/  |
| 6   | ə     | above | /ə'bʌv/ |
| 7   | ɜ:    | nurse | /nɜ:s/  |

|    |    |        |            |
|----|----|--------|------------|
| 8  | ɔ: | bought | /bɔ:t/     |
| 9  | æ  | bag    | /bæg/      |
| 10 | ʌ  | young  | /jʌŋ/      |
| 11 | ɑ: | spa    | /spɑ:/     |
| 12 | ɒ  | boss   | /bɒs/      |
| 13 | aɪ | ice    | /aɪs/      |
| 14 | aʊ | mouth  | /maʊθ/     |
| 15 | ɔɪ | voice  | /vɔɪs/     |
| 16 | əʊ | bone   | /bəʊn/     |
| 17 | eə | square | /skweə(r)/ |
| 18 | ɪə | here   | /hɪə(r)/   |
| 19 | ʊe | cure   | /kjʊə(r)/  |
| 20 | eɪ | train  | /treɪn/    |

### 3.3 Following Evaluation, Technology, and Instruction

Future evaluation planning is required because the use of AR applications in phonetic and phoneme learning is still relatively new. The plan is to integrate this application into the tutorials and modules for introductory general linguistics courses. We will conduct an evaluation in one usage semester by soliciting feedback from students who have used the application, particularly regarding its usability and effectiveness in fostering learning.

As an early product in the English literature study program, AR will have advantages and risks that need to be considered. The benefit of using AR is that it can be used anywhere and with self-service. The user's dependence on an internet connection, however, presents a limitation because not all students are adept at using the application and have a reliable internet connection. Because of how quickly the internet and technology infrastructure are evolving, difficulty is not a valid excuse for not fostering innovation.

As a stand - alone product, this augmented reality app's instructions ought to be easy to understand. When practicing English phoneme pronunciation, students use this application both as a visual aid and as a useful tool or virtual simulation of human substitutes. Future modifications to these instructions must be made to the tutorial or the module.

## 4 CONCLUSION

The development of AR phonetic to learn how to produce the correct sound in English pronunciation is a form of learning aid application that is very appropriate for independent students. Making AR begins with identifying learning objectives, inviting experts, making teaching materials, developing AR, and preparing evaluation designs after AR is ready to be used for the public. The advantage of using AR is that this application can support independent learning, provides a 3D simulation form and is also equipped with pronunciation exercises narrated by native speakers.

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