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# DEVELOPING AN EFFECTIVE MOBILE APP FOR IMPROVING ENGLISH SPEAKING SKILLS

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## Abstract

This study aims to create a mobile application that will facilitate learners' practice of the Test of English as a Foreign Language (TOEFL) speaking and improve their speaking skills. The study follows a design-based research (DBR) framework to delineate the phases and principles of developing the application. The TOEFL exam is a requirement for international students to apply to universities in the USA. However, challenges emerge even after international students are admitted to colleges. All lectures and discussions within classrooms are conducted in English, and students need to communicate and negotiate all daily issues with others by themselves. While there are a number of mobile apps in the market targeting English Speaking skills in general, only a small number of apps address TOEFL speaking specifically with their own limitations. The four steps of DBR-- Planning, Developing, Testing, and Redesigning-- were followed in designing the mobile application. This DBR framework proved to be a successful model for designing and developing the mobile application, which can be applied to other applications as well. The Visualize TOEFL Speaking mobile application demonstrated that its learning activities could support pedagogical goals. Students found the application engaging, useful, and interactive, and they reported that it helped them improve their English-speaking skills, particularly in the TOEFL speaking test and its sub-categories. Although the interface and functions of the mobile learning application need to be refined, it is a highly valuable tool.

***Keywords:*** *Mobile app development, English speaking skills, design-based research, TOEFL speaking, mobile app design principles.*

## 1. Introduction

In recent decades, e-learning has become increasingly important in our daily lives. Mobile learning, as a part of e-learning, is prevalent in informal education, but not so much in formal education, especially in higher education. Using an application to learn and practice English is convenient for learners, for they can study anytime and anywhere through their mobile devices. Moreover, instructors can evaluate learners' performance conveniently on such platforms. There are mobile apps in the market offering English speaking training; however, only three of them specifically address TOEFL-speaking, and all three have limitations, which will be explained in detail later in this paper. The purpose of this study is to design and develop a mobile application to facilitate learners' practice of TOEFL speaking and improve their speaking skills. Using a design-based research framework, this study will delineate the phases and principles of developing a mobile application.

## 2. Literature review

### 2.1. Strategies for teaching and learning English speaking

It is obvious that language is an important vehicle for communication. Language competencies usually include four key skills: speaking, listening, reading, and writing. Speaking is the most important skill in the four key language skills because speaking skills are a primary factor in measuring whether a student is proficient in a language (Gani, Fajrina, & Hanifa, 2015). Rora (2015) proposed five key components of speaking: grammar, vocabulary, comprehension, fluency, and pronunciation. Choosing appropriate strategies can help improve learners' performance, while inappropriate strategies may lead to misunderstanding the content (Allison & Rehm, 2011; Hengki, Jabu, & Salija, 2017). Effective teaching should be learner-centered, with ample opportunities for discussion and communication in English. The predominant concepts in constructivism, such as the learner-centered approach, collaborative learning,

and authentic problems, can guide the scaffolding of the active learning process (Christensen, 2008; Driscoll & Bruner, 2021; Ertmer & Newby, 2013). Another instructional design theory that can prove beneficial to language learning is cognitive load theory. Cognitive load refers to the amount of working memory resources used. There are three types of cognitive load: intrinsic, extraneous, and germane (Reedy, 2015; Sweller, 1988, 1994, 1999).

### 2.2. Review of mobile apps for TOEFL speaking

At the beginning of this project, we selected five existing mobile applications developed for TOEFL speaking skills to compare their features, functions, strengths, and weaknesses. The summary of the comparison will be at the conference. Among the five applications, only two, Magoosh and Xiaozhan, are dedicated to helping learners practice TOEFL speaking skills. However, Magoosh does not provide feedback from instructors, and Xiaozhan only serves Chinese students. Therefore, there is a need to develop a mobile application that can serve all learners of TOEFL speaking skills and, most importantly, provide them instructors' feedback and guidance.

### 2.3. Instructional design principles for mobile learning

In developing instructional design principles for mobile learning, it is important to consider the advantages and limitations that a mobile environment offers to learners. Grant (2019) proposed seven mobile design characteristics of a mobile learning environment: "learner is mobile, device is mobile, data services are persistent, content is mobile, tutor is accessible, physical and networked cultures and contexts impact learning or learner, and learner is engaged" (p. 370). "Learner is mobile" refers to the key learning characteristics offered to learners in mobile learning, namely, a high initiative and being self-paced and self-adaptive; "learner is engaged" describes how learners participate in a mobile learning environment, including in formal, informal, or semi-formal learning.

### 2.4. Design based research

The design-based research (DBR) methodology was used to guide the design and development process of this project (Design-Based Research Collective, 2003). "Design experiments" is the foundation of design-based research proposed by Ann Brown (1992) and Allan Collins (1992), which is defined as a method of conducting formative research based on principles of previous research to test and improve educational design. In this design and research methodology, researchers and practitioners collaborate in a real environment intended to improve educational practice through systematic and iterative tests through analysis, design, development, implementation, and refinement of design principles or theories (Wang & Hannafin, 2005). As an example of DBR applied in an artifact development, Makoe and Shandu (2018) purposed four-phased DBR to develop a mobile app for teaching and learning vocabulary. First, the researchers conducted a literature review and analyzed the practical problem. Second, they developed a solution based on existing vocabulary teaching and learning principles. Third, they focused on evaluating and testing the solution in practice. According to the characteristics of DBR, this phase included iterative cycles of testing. Finally, the researchers refine the design principles based on the reflection of testing. Based on the literature review, this study proposes to develop a mobile application for TOEFL speaking using the four-phased DBR methodology similar to that was used in Makoe and Shandu's (2018) project. In the process, we develop design theories/principles and define them based on the combination of designing and researching processes.

## 3. Development processes

### 3.1. Planning

In the planning phase, we first analyzed the target learners' and instructor's needs, and the learning contents. We identified the areas that English learners need help most in improving speaking English and functions or components that learners prefer to include in the mobile app. We went to the English Language Program classrooms at a large public university in Southern California and recruited 30 international students who volunteered to take a pre-survey and informal interviews. After the analysis of learners' needs and content, we defined our Instructional Goal to be: international students will be able to improve their TOEFL speaking skills through a self-paced mobile learning course, which includes watching tutorial videos, practicing speaking and uploading their voice. There are four learning objectives. After the three lessons, on a given topic of speaking question, learners will be able to: 1) Organize and utilize their own life experiences or stories to prepare for the speaking topics, 2) Build up key expressions and apply to the speaking tasks, 3) Compose the content structure while staying on the topic within 15 seconds, and 4) Interpret the response lucidly and fluently within 45 seconds.

### 3.2. Developing

As shown in the DBR phases figure, we developed an English speaking application through initial theory building, content development based on the theories, coding, and an application development.

**3.2.1. Initial theory building.** The mobile app was designed under the guidance of Cognitive Load Theory and Constructivism Theory, considering Grant's (2019) mobile design characteristics of a mobile learning environment, which allows learners to study at their own self-pace, and teachers scaffold students' learning based on their previous knowledge to respond to a real-world question.

**3.2.2. Content development.** In order to validate the content of each lesson, we worked with an English professor who has been teaching college English for over 15 years as our subject matter expert. The professor was involved in reviewing the lessons and recorded all the three demo lessons, because none of the designers are native speakers. The tutorial videos in this app are recorded using Camtasia. Lesson 1 introduced three aspects of TOEFL speaking tasks including content, testing time and grading rubric. Lesson 2 covered the independent speaking task. The categories of four TOEFL speaking tasks are introduced, one of them being the concept of independent speaking task, and how to compose the response under this category were explained in this lesson. This lesson also included some examples for learners to easily start practicing. Lesson 3 reviewed the content of independent speaking tasks, as well as suggesting the useful structures, expressions and related topics for students' daily practice.

**3.2.3. Prototype development.** Before programming the application, we designed the storyboard and prototype, then applied the instructional design principles in designing the prototype (Baek & Guo, 2019).

**m-IDP 1: Provide learner-centered mobile learning activities to allow learning anytime and anywhere**.

**m-IDP 2: Include mobile learning platforms to facilitate collaborations between learners**.

**m-IDP 3: Provide multimedia to engage learners**.

**m-IDP 4: Instructors provide instant feedback through mobile devices**.

**m-IDP 5: Provide variable learning context to help learners solve authentic, real-world problems.**

*Figure 1. Screenshots of Main Pages in the Prototype.*


| Home Page | Lesson Page | Recording Page | About Us Page |
|---|---|---|---|

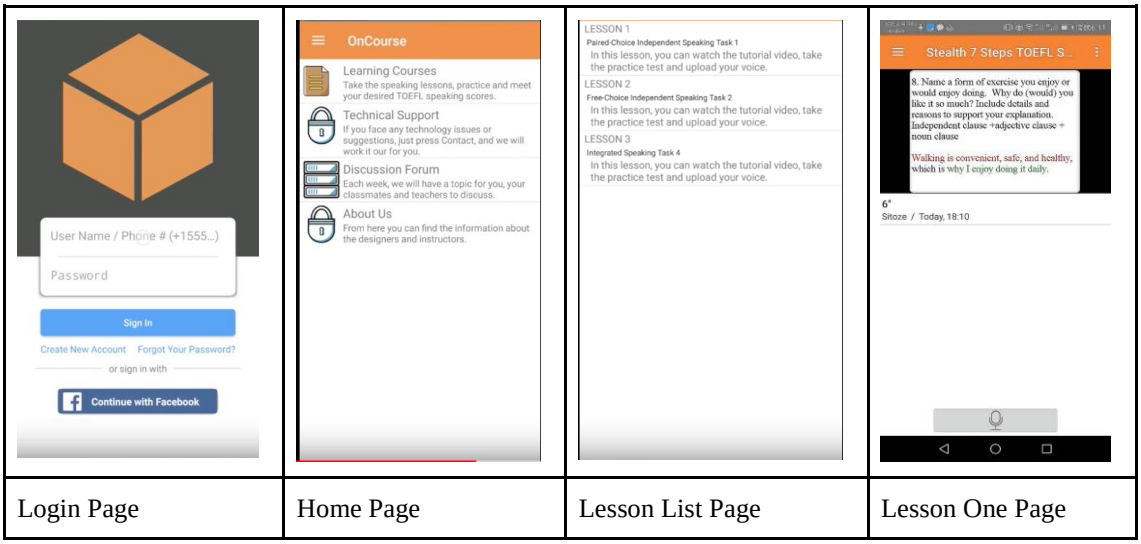
**m-IDP 6: Application design should be revised iteratively based on the evaluation**. The subject matter expert (an English professor) and users (international students) were invited to provide feedback on the storyboard and prototype, which guided the direction of the mobile application development. Similar to any other instructional material, the application should be tested and redesigned until its usefulness and effectiveness reach a certain level of user satisfaction.

**m-IDP 7: Design the UI to fit mobile screens.** In our application, we used the UI arrangement to accommodate the Android system, which provided a collection of both the View and ViewGroup subclasses that offered users common input controls (buttons or text fields) and various layout models (a linear or relative layout). For instance, the buttons and text fields were convenient to use. Furthermore, a linear and relative layout was attractive for users.

**3.2.4. Coding development.** Because of the time and funding constraints, we chose to develop the application for Android as a first step due to the relative ease of publishing an app to the Android market. A technology expert was involved in building this mobile application. The mobile app was developed using Java language and created in Android studio. Amazon Web Services (AWS) is used as a server to host the application. Also, we used the User Interface (UI) arrangement in order to accommodate Android systems, all user interface elements in an Android app were built using View and ViewGroup objects.

**3.2.5. Application development.** The design and development was an iterative process. The app has been revised several times, and we will be continuing revising until it meets learners' needs and functionally performs well. We decided to build the application for Android devices as a first step due to the relative ease of publishing applications in the Android market and owing to time and funding constraints. A technology expert was involved in the building. It was developed using Java and created in Android studio. Amazon Web Services (AWS) was used as a server to host the application. We also used the UI arrangement to accommodate the Android system, and all UI elements in the application were built using View and ViewGroup objects.

*Figure 2. Screenshots of the First Version of the Main Pages.*




| Login Page | Home Page | Lesson List Page | Lesson One Page |
|---|---|---|---|

*The last two phases: Testing & Redesign will be published in another venue.

## 4. Discussions and implications

In this study, we designed and developed a mobile application for TOEFL speaking by following the process of DBR, we applied the initial principles in designing the prototype. The DBR framework we implemented was proven to be a successful model in designing and developing the mobile application and can be used for other applications as well. The mobile application demonstrated that the learning activities in the Visualize TOEFL Speaking mobile application could support pedagogical goals. Students noted that the application allowed them to engage with the content and interact with the instructor and that it was useful in improving their English-speaking skills. Learning through the tutorial videos helped them improve the TOEFL speaking test and its sub-categories (Clark, Strudler, & Grove, 2015). Though its interface and functions need to be polished, the mobile learning application proved to be highly valuable.

## 5. Limitations and conclusions

Despite the benefits it offered, this study had some limitations. First, owing to time constraints, we developed the mobile application to focus only on TOEFL speaking. Also, only three sample speaking lessons were included in it (TOEFL Speaking Test Introduction, Independent Speaking Task, and review Independent Speaking Task with more useful structures and expressions). Further, due to time and funding constraints, only an Android version was designed and developed. Finally, this study only recruited 30 participants to test the mobile application and recorded their voice for the pre-test, which made the sample relatively small. We will conduct follow-up surveys and interviews at a later stage. The future direction of the project primarily includes two aspects. On the one hand, future studies could refine and apply the eight mobile learning design principles proposed for this project in other mobile learning courses, such as in

teaching English (listening, reading, and writing), mathematics, linguistics, science, and so on. On the other hand, our design team will continue adding more TOEFL speaking lessons to the application. Additionally, TOEFL reading, listening, and writing lessons will be developed in the future.

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