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MLab: A Mobile Language Learning Lab System for Language Learners

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Abstract: This paper describes the design and development of a mobile language lab system called MLab. The MLab system aims to replace the traditional language lab—which typically has a restrictive layout and lacks interaction—with a more user-friendly, low-cost mobile language lab. The target users of MLab are language teachers and students, and the system offers them the freedom to move around and use their own devices at any time and in any place. The MLab system was developed using several web technologies and Application Programming Interface (API) to provide a fast and convenient method of accessing required content. To evaluate the MLab system, a pilot test was conducted with a class of 15 students and their teacher. The results showed high usability rates and generally positive attitudes toward using the system.

Keywords: Language Lab, Language Teaching, Mobile Lab, Web Technologies, MALL
Categories: H.5.2, K.3, K.3.1, L.3.0

1 Introduction

Language labs, which can be defined as audio or audiovisual equipment that is used to facilitate language teaching and learning, have been around since the 1950s and have undergone several stages of development. The early types of language labs consisted of a tape recorder and audiocassettes, which were used to teach students pronunciation and to develop their listening skills. This conventional lab was later upgraded to a *linguaphone lab*, in which each student was provided with a headset to enable him or her to listen to the audiotapes individually [Roby, 04; Salaberry, 01]. However, these labs soon became unpopular due unreliable technology and a lack of appropriate training to both teachers and students. Furthermore, these labs were linked with the behavioristic model, which rooted in the audiolingual approaches to language

teaching. Such approaches were compared to the innatist theories [Krahnke, 83] and soon became discredited.

By the late 1970s, another generation of language labs appeared along with the advent of personal computers. Computer labs began to gradually replace audio language labs, and they offered greater technological advancements and more learning and teaching options. Unlike the previous generation of language labs, which were devoted solely to listening and speaking skills, the new digital labs are able to facilitate the teaching of reading and writing. During the 1980s, the term CALL, which stands for computer-assisted language learning, became a buzzword in language teaching and learning, and there was a flurry of language learning software and CALL publications. A decade later, with the emergence of the Internet, most traditional computer labs were replaced by network- and multimedia-enabled systems with extended functionality, thereby allowing students to record, view, upload, and download multimedia (for a comprehensive overview of the history of labs, [see Roby, 04 and Remenyi, 07].

Many researchers have pointed out the impact of today's language labs on language teaching and learning. In regard to language students, these labs can be used effectively to assess their speech, enhance their pronunciation by providing several samples of voices and accents, facilitate their communication, enhance their listening skills, and improve their fluency by providing authentic learning materials. Another advantage of language labs is that they reduce shy students' anxiety by offering them some degree of privacy and assuring their anonymity through the use of booths and headsets.

Conversely, many researchers believe that language labs have their shortcomings. According to Bräuer [01], for instance, "the term labs nowadays also triggers memories about a place where students disappear behind technology, separated from each other, delving head first into the electronic environment and fighting a lone battle with linguistic requests from mysterious authorities" [p. 185, cited in Roby, 04]. In fact, Bräuer's view of language labs suggests a lack of interaction, which is a key element in second language (L2) acquisition.

According to Ellis [99, p. 1], interaction refers to "the social behavior that occurs when one person communicates with another." Interaction in the L2 classroom provides students with appropriate, comprehensible input while giving them opportunities to negotiate meaning, which, in turn, facilitates L2 learning [Long, 90]. The problem with the regular lab layout and booth size is that they are somewhat restrictive, thereby failing to provide adequate workspaces and the freedom to move around or work in groups. Figure 1 illustrates an example of the layout of a modern language lab, where the students sit inside isolated booths.

One major challenge regarding the use of today's language labs relates to teachers' and students' awareness and computer skills. Most teachers and students may not have the requisite computer skills and might soon become overwhelmed by the sophisticated functionality of today's digital lab systems. Thus, they should be provided with the appropriate training and technical support to reduce the apprehension that is usually associated with new technology. Recurrent technical problems are another shortcoming. The failure to operate the lab equipment efficiently due to hardware or software problems will inevitably cause delays and frustration for both students and instructors.

Figure 1: A picture of a modern language lab at King Saud University (KSU)

To overcome such problems in existing language labs, this paper will present a novel mobile lab system for language learning. This system, which is called MLab, is easy to use and relies on web technologies. MLab is also a cross-platform system, which means that it can operate on any mobile device with an Internet connection. In the following sections, we will first discuss the rationale behind building the MLab system. We will then explore related projects in the same domain and describe how our system will add to the previous work trying to bridge the gap between the advancements of new technologies and the functions of language labs . In the Proposed System section, we will present the MLab prototype, system functions, technologies, and components. This will be followed by a section on the preliminary evaluation of the MLab system, which was conducted on students in an English language class at KSU, as well as a discussion of the results that were obtained. The paper will then conclude with suggested future directions for our research.

2 Project motivation

Over the past decade, mobile technologies have been receiving extensive attention within the field of language teaching and learning. This is evidenced by the increasing number of publications that discuss their potential as an educational tool [see Kukulska-Hulme and Traxler, 05; Traxler, 07; Ally, 09; Yang et al., 05].

According to Khanna and Singh [11], mobile devices are acknowledged as a delivery channel with immense potential for sustainable learning and that offers better accessibility and practicability. Although mobile technologies include tablets, MP3 players, iPods, and personal digital assistants (PDAs), mobile phones are gaining momentum and are attracting increasing attention from researchers [see Gilgen, 04; Koole, 09; Stockwell, 10; Yamada et al., 01; Mehta, 13; among many others]. Many researchers argue that the popularity of mobile phones is attributed to several factors, one of which is the relatively low cost of these devices [Pea and Maldonado, 06; Crowe, 07; Shin et al., 07]. This indicates that there is no need for teachers or institutions to provide students with sophisticated, high-priced equipment or installations to enable the integration of mobile-assisted language learning (MALL) into their teaching environment.

Another unique feature of mobile phones is that they can be linked to what Koole [09: p. 36] refers to as “the psychological comfort.” She suggests that “highly

portable, intuitive, and transparent devices can reduce cognitive load and increase task completion rates because the learner can concentrate on the tasks rather than the tools." This feature can reduce learners' anxiety and enhance their levels of comfort and motivation. In addition, Peters [07] suggests that mobile phones can enable ubiquitous learning in both formal and informal settings by reducing students' reliance on particular work and study settings. This anytime, anyplace feature cannot be found in traditional language or computer labs. In terms of interactivity, compared to MP3s or iPods, most modern mobile phones incorporate email and short message service (SMS) capabilities. Such features provide both students and teachers with opportunities to interact easily. Browsing functionality is another advantage that allows students to access updated or specific information when needed.

According to Yang et al. [05: p. 20], the ubiquitous and multifunctional nature of today's smartphones go beyond traditional oral communication. The new technology provides users with the ability to access the Internet to search for information, exchange email messages or SMS, read or listen to books online, create and share multimedia, and even shop online. Therefore, based on the abovementioned points, the objectives of this project are twofold:

1) To benefit from the smartphones, which most students have at their disposal to use as a mobile language learning lab, and
2) To develop a low-cost, cross-platform, user-friendly mobile language learning lab system that uses Web technologies and APIs to provide the essential functionality required by any language lab.

3 Related work

In this section, we shed light on previous research and techniques, focusing on mobile language learning. The reviewed literature describes several projects that escalated from simple to more advanced systems. Thus, we begin by exploring projects that used simple mobile technologies, such as SMS; we then present several ad hoc MALL applications that served particular language learning needs; and, finally, we discuss MALL systems that employed social networks along with mobile language labs.

3.1 Short message service system

One of the most popular techniques used in MALL systems is the Short Message Service SMS. This feature allows students to receive numerous new English words daily, which, in turn, helps to enhance their vocabulary and grammar. Various studies, such as those conducted by Cavus and Ibrahim [09], Kennedy and Levy [08], and Alemi et al. [12] have proven the effectiveness of using SMS in English learning and have demonstrated that students prefer the use of mobile phones in the learning cycle.

Cavus and Ibrahim [09] designed a system that stored both students' numbers and a file consisting of a list of new English vocabulary words. The system sends 16 messages daily over an eight-hour period in the morning, and the students can read the messages at their convenience. The evaluation of the system revealed that the students enjoyed the new method of learning English vocabulary and viewed it as useful.

Similarly, Kennedy and Levy [08] reported their experience in sending one vocabulary-, grammar-, or course-related message over a seven-week period to 76 Italian beginner students of English. The students appreciated the use of mobile phones and the way in which the experience encouraged them to learn outside of the classroom setting. Conversely, Alemi et al. [12] compared the use of SMS and the dictionary for learning English vocabulary. Forty-five freshman students were studied for 16 weeks. Of these students, 28 used SMS and the remainder used a dictionary. The post-test results indicated that the use of SMS had a more significant effect on students' vocabulary retention than the use of the dictionary. This illustrates that the use of SMS helped students to retain vocabulary in their long-term memory.

3.2 MALL applications

During our research, we found several MALL projects that were designed to fulfill the specific learning needs of language students. For instance, Pemberton et al. [10] reported their experience in designing and developing a website and Android mobile application called CloudBank. The CloudBank project targets international students at the University of Brighton to help them understand the local language and culture of the United Kingdom in an easy and collaborative way. The project followed the rapid application development approach, which is based on learners' input. The main features of the system are that it enables the students to collect and capture culture-related content and upload this to the system's repository. Thereafter, the information can be synchronized via RSS feeds that are integrated with a website or that send alerts to subscribed mobile phones, enabling other students to discuss and share their knowledge.

Huang and Sun [10], researchers at the National Kaohsiung Normal University in Taiwan, designed and developed an English listening exercise system that allows students to participate in English listening exercises at any time. The system consists of two subsystems: the first is a website for multimedia materials that is responsible for uploading and managing audio and video listening materials, and the second is a mobile multimedia English listening exercise subsystem that allows the students to play and complete exercises related to English listening materials. The system also offers numerous many services, such as the provision of online listening materials, which students can download to their mobile phones and then play while they are offline. It also allows the students to organize their listening materials and discuss them with their classmates via a Q&A messaging board. Regarding system content, the listening materials are divided into five levels—very easy, easy, normal, hard, and very hard—to help the students to choose the most suitable material.

Demouy et al. [11] from the Open University in the United Kingdom designed the Interactive Oral Assessment (IOA) project, which aims to evaluate the Talkback application provided by Learnosity (http://www.learnosity.com/). Talkback is a specialized tool that aims to improve listening and speaking skills; users can interact with Talkback voice response through a telephone call, iPhone application, or Skype. For the iPhone application, which is called OU Voice, the student needs to log in to the application using his or her university account to view the activities. Most of the activities take the form of audio questions, to which the student can respond orally. The answer is recorded so that the student can listen to his or her answer, and this is followed by the correct sample answer, thereby enabling him or her to know whether

his or her answer was appropriate. The project was evaluated by 60 students from a beginners' French course and 11 students from an English for Academic Purposes course for the duration of six weeks. For data collection, the authors used a weekly online questionnaire, interviews, and the recorded feedback from the TalkBack application after each activity, forum, and email. Most of the students reported that the application was flexible, easy to access, and helped to boost their confidence in speaking.

Yang et al. [13] from EF Labs designed and developed an iOS application called Engage that helps Chinese students to practice real-time English speaking exercises. They used a user-centered design approach in the early stages of development because it is suitable for interactive product design. The design stage was divided into two phases. During the first—the internal test phase—the students were invited to test the system with paper prototypes in the first iteration and then to test it with usable prototypes on the iPhone. Face-to-face interviews were then conducted to gather their feedback. The second phase—the use of the external test—aimed to test the released version in the app store. The students were asked to test the application on their iPhones by logging in to the system and booking a new speaking class. The main functionalities of the system included that it allowed the students to book a role-play class according to the available times. It also enabled them to download the daily topics to listen to along with synchronized text sentences and to view the associated translation for these sentences. In addition, the teacher could evaluate a student's progress by giving him or her a grade of A, B, or C and by providing suitable comments on the feedback view page. Finally, an online survey was used to explore the students' opinions regarding the use of the application.

A year earlier Tamilarasi and Shanmugapriya [12] had reported their experience in developing a mobile adaptive test (MAT) system prototype for the third generation of Android-based mobile devices. The system was developed to assist English language learners with their academic studies. The major advantages of the MAT system were the automatic estimation of questions' difficulty; the use of rich and personalized multimedia options, rather than the use of classical multiple-choice questions; and the accurate measurement of students' performance. The system consisted of a number of activities. The first activity is the authentication layer, whereby the learner needs to log in to the system using his or her username, which is stored in the database. The second activity is the adaptive test questions sequencing, in which the learner chooses a test option and then begins with the first question. The next question depends on the user's performance in the first question and so on. The MAT system was tested with three groups of learners who specialized in computer applications. The results reflected positive feedback in addition to better performance and a more comprehensive understanding of the content, compared to the traditional testing systems used in classrooms.

3.3 Social networks

The use of social networks linked to mobile phones for English language learning has gradually increased. According to a number of studies, such as those conducted by Borau et al. [09] and Kim et al. [11], Twitter was classified as one of the most efficient and motivational tools for English reading, writing, and communication. Borau et al. [09] used Twitter in a study of 98 students who were enrolled in an

English course for native speakers of Chinese. The aim of the research was to evaluate the efficiency of exchanging informal messages, as well as its impact on the communicative and cultural competence of language learners. The questionnaire result illustrates that Twitter was an efficient tool for fostering communicative and cultural competence. Kim et al. [11] also used Twitter in a study comprising nine college students enrolled in an English as a Second Language course. The focus of the study was to increase the students' motivation to write in English.

The data analysis shows that the students focused on content rather than grammar while tweeting. The researchers concluded that the students' writing motivation increased. Many students use Facebook to exchange materials and engage in group discussions. Kabilan et al. [10] and Al-Shehri [11] investigated college students' use of Facebook as an English-learning tool. The students used Facebook to exchange video and audio English materials, as well as to communicate and have discussions using the English language. The results show that most students appreciated Facebook and found it a useful and meaningful learning environment.

3.4 Mobile language labs

Developers have recently begun to design mobile language labs to support their existing CALL labs. One of the recent projects is the ReLANpro mobile app, which is available for students who have Apple or Android mobile devices. The application allows students to take classes or complete audio exercises using their smartphones or tablets, which creates an experience that is similar to that of being in the language lab at their school or university. The instructors upload their own exercises to the system's cloud server, from which students can download them at any time. The system also allows the students to listen to the instructors' directions and record their own answers. The cloud server, which is provided by ReLANpro, is also available for already-existing lessons. Although ReLANpro is available free of cost for students and teachers, the school/university needs to enter into a license agreement with ReLANpro (see http://www.relanpro.net/?page_id=317). The SANSSpace mobile app is another application that helps instructors to design, manage, and deliver multimedia content for students to access from their own devices. The SANSSpace mobile app is only available on iTunes and can be downloaded for free exclusively by individuals who are enrolled in or teaching a language course at an institution that has licensed the SANSSpace Virtual Language Learning Environment (see http://www.sansinc.com/products/sansspace.php).

According to the XCLASS Tablet (Android Edition) website, XCLASS is a mobile system that is tailor-made for multimedia classroom management. It connects teachers with students in a mobile classroom using tablets in a Wi-Fi environment; this provides students with the freedom to move around with their learning devices in the classroom while the teachers monitor, control, and manage the classroom activities (see http://www.suntechgroup.com/it/xclass_tablet.html). Finally, the Schoolshape language lab refers to cloud-based language lab software that allows instructors to develop and deliver tasks to their students. Using their own devices, the students are able to complete the tasks in class or at home. Registration is required to use the system (see http://schoolshape.com/language-lab).

According to the previous research, we can observe that most of the studies focused on the use of mobile phones outside of the classroom as a tool for language

practice—for example, the CloudBank application, which enabled the students to interact outside the classroom without their teacher's intervention. We also observed that most of the designed systems consisted of one or (at most) two features—for instance, vocabulary learning or speaking practice—as in the OU Voice application.

With regard to the studies that employed social networks in language learning, we noticed that these networks were used as a supplementary tool for language learning and not as a separate system, as social networks focus solely on interactivity without managing learning materials. Conversely, there is an apparent lack of projects that aim to replace traditional language labs through the employment of mobile technologies. All available systems seem to be upgrades of previously designed software that requires institutional registration or licensing (see Section 3.4).

The system we are proposing will be an initial step toward converting traditional language labs into mobile ones using web-based technologies. This will help students to watch, listen, and read language; complete related exercises in an easy and convenient way; and access most of the language lab features using their own mobile phones. In the following section, we present our proposed system, its components, and its functions, the foundations of which are the previously mentioned work, and we will provide new functions that have not been presented before.

4 System design

The main goal of this project was to design and develop a mobile language learning lab system that allows the students to access most of the traditional language lab features on their own mobile phones. The system is designed to be accessible through desktop computers and several types of mobile devices. This section describes the system's features and technologies, as well as its prototype and components.

The approach we used in the development is based on user-centered design (UCD). According to ISO 13407 (http://www.w3.org/WAI/redesign/ucd), UCD refers to "an approach to interactive system development that focuses specifically on making systems usable. It is a multi-disciplinary activity." Figure 2 illustrates the UCD cycle we followed. We started by collecting the language teachers' needs and requirements and then designing the system prototype. Thereafter, the system was implemented as a mobile web application, following which it was evaluated based on the viewpoints of the target users.

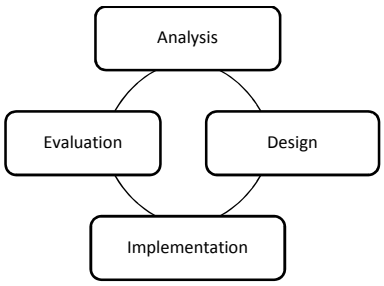

Figure 2: UCD cycle

Based on the UCD approach, we designed the main features of our system in order to do the following:

- Allow the teacher and the student to log in to the system using their usernames and course code.
- Allow the teacher to upload a .CSV file that consists of students' IDs and to set a course code
- Allow the teacher to post/delete YouTube videos on the videos materials page
- Allow the teacher to record his or her voice and upload it to the system
- Allow the teacher to upload/delete several audio file formats for audio materials
- Allow the teacher to upload/delete several text files for text materials
- Allow the teacher to design interactive exercises
- Allow the teacher to post announcements
- Allow the student to view the learning materials (videos, audios, and texts)
- Allow the student to perform and practice exercises

The system was developed using several web technologies, such as HTML5, CSS, and JavaScript for the interface and interaction and PHP for the business logic. The system is also mobile-friendly, which means it is accessible using any mobile phone browser. The reason for choosing a mobile web application is the variety and accessibility that mobile web applications provide on multiple platforms [Kroski, 08]. Moreover, the simplicity and maintenance of mobile web programming plays an important role in choosing a mobile web application [Firtman, 10].

We also used Web APIs in our system, and this offered us an excellent opportunity to reuse a number of existing services and software on the web without having to code them from scratch [Panziera et al., 12]. The major functionalities in our system depend on a number of APIs. The APIs that were used were the HTML5 getUserMedia() API for audio materials and the MediaFire Cloud Storage API for text materials. We chose the MediaFire API because it allows the teacher to upload text content of up to 12 GB for free.

The YouTube API was also used; it offers a share option with an embedded feature that shows the same video on different sites using the <iframe> tag (https://support.google.com/youtube/answer/171780). This feature allows the teacher to easily post YouTube videos.

4.1 System prototype and components

After identifying the requirements, we developed the system prototype using the Justinmind Prototyper 6.2.0 software (http://www.justinmind.com/). As shown in Figure 3, the Justinmind software allows the developer to design a dynamic prototype for web or mobile applications. The software offers an iOS application that allows the developer to log in to his or her account and then preview all the designed applications. We tested the prototype version with the language teacher to identify

and address problems at an early stage of our design process and then fix and apply the required changes.

Figure 3: System prototype using Justinmind software

Our system, which serves both English language teachers and students, consists of two views: (1) the teacher's view, which allows the teacher to manage the students' accounts, learning content, and exercises, and (2) the student's view, which shows the learning materials and provides exercises.

Figure 4 illustrates the main interfaces of the MLab system (the log-in interface, main interface, and learning materials interface). The design of the interface is simple and follows the design recommendations for mobile web applications provided by the W3C.

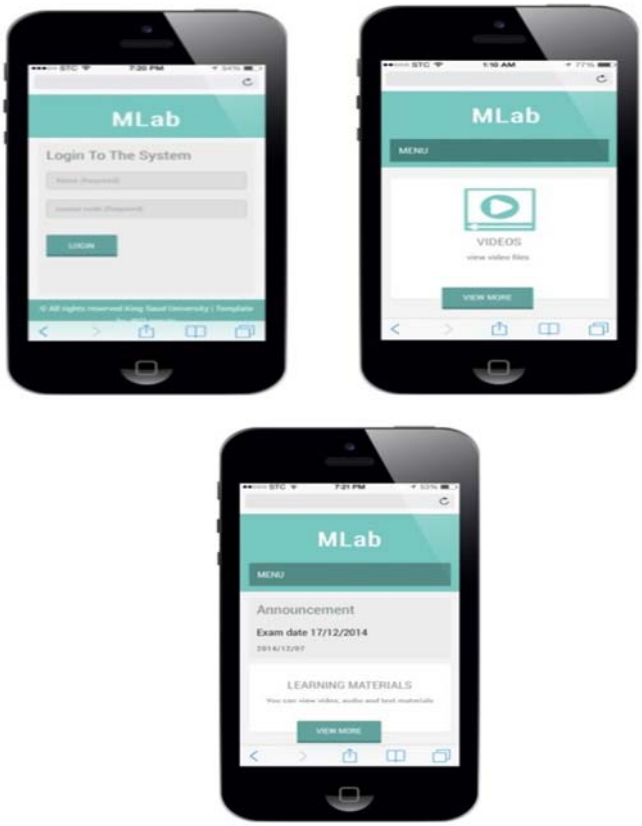

Figure 4: Main interfaces in MLab

Figure 5 presents MLab's detailed system architecture. Both the teacher and the students log in to the system using the same interface. After checking the existence of the accounts in the users' account DB, each user will be directed to the appropriate interface. For the teacher, the manage system interface will be displayed; he or she can then add/delete/view the learning materials, exercises, and announcements. For video materials, video URLs will be stored in the videos DB. Audio materials will use the getUserMedia() API to record the audio and then store it in the audios DB. It will also interact directly with the audios DB to save the uploaded audio files. All the uploaded text materials will be stored in the MediaFire cloud storage using the MediaFire API. The teacher can design exercises for the students, and the system will store the questions and multiple-choice responses in the exercises DB. In addition, the teacher's written announcements will be stored in the announcements DB.

For the student view, the system will retrieve the stored contents—namely learning materials, exercises, and announcements—to allow the student to interact with the system. Next, an explanation of three of the major components in MLab architecture is presented.

Firstly, a students' account DB. The system allows the teacher to create accounts for students by uploading a .CSV file that consists of the students' ID numbers. These numbers will be stored in the user account database, and then the system will redirect the teacher to set a course number. Thereafter, each student can log in to the system using his or her student ID and course number.

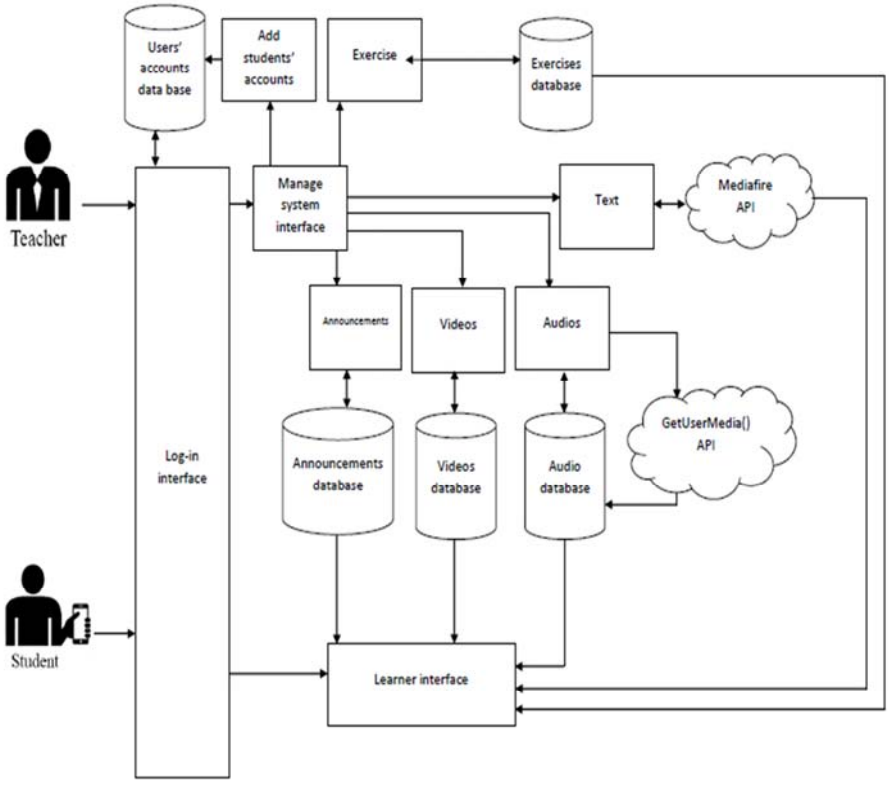

Figure 5: MLab System architecture

Secondly, learning materials. MLab allows the teacher to add video, audio, and text materials, and Figure 6 shows the interface for doing so. The learning materials were categorized and implemented according to the teacher's needs. For video materials, the system allows the teacher to add YouTube videos using the <iframe> tag provided in the sharing options. The teacher can specify the video name, video description, and the desired YouTube <iframe> tag URL. Thereafter, the information will be stored in the videos database and retrieved from the view video materials page.

The audio materials are divided into two parts: (1) the upload audio material, which allows the teacher to upload several audio formats and then store files in the audio database, and (2) the record audio material, which allows the teacher to record his or her own voice and upload it to the audio material. The record option uses the

getUserMedia() API provided by HTML5. The getUserMedia() API requests access to local multimedia devices, such as cameras and microphones, from the browser (see http://w3c.github.io/mediacapture-main/getusermedia.html). After it is recorded, the audio will be converted to an MP3 file and uploaded to the server using AJAX.

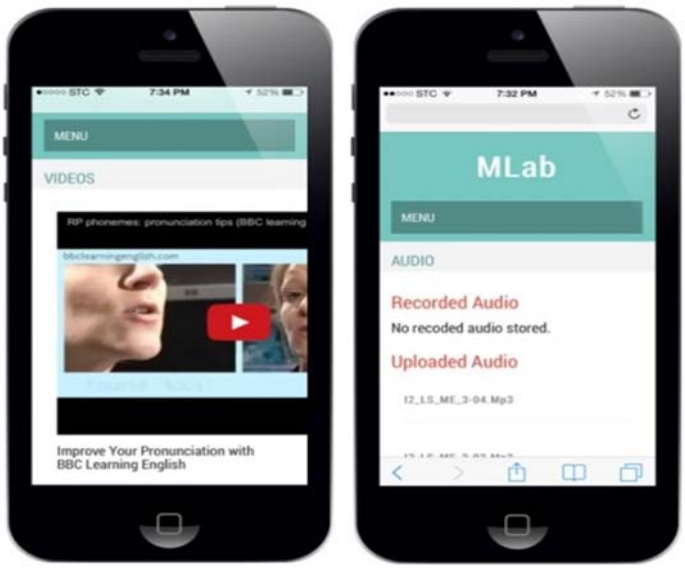

Figure 6: Video and Audio materials

For text materials, our system used the MediaFire API (http://www.mediafire.com/developers/core_api/1.2/getting_started/#api_basics). MediaFire is a cloud storage service that offers flexible management for several types of content. The API allows the user to upload, delete, and retrieve content from his or her MediaFire account. The teacher can upload text materials in any format, including .pdf, .docx, and .jpeg.

Thirdly, exercises. One of the most useful features of our system is the exercise feature. By managing the exercises, the teacher is able to design interactive exercises that consist of questions and multiple-choice answers. The teacher writes the question; specifies the correct answer in the right answer field; and then writes one, two, or three wrong answers. The questions and answers are then stored in the exercises database.

The student can practice the exercises; however, after submitting the answers, his or her result will be displayed directly at the top of the page, as shown in Figure 7.

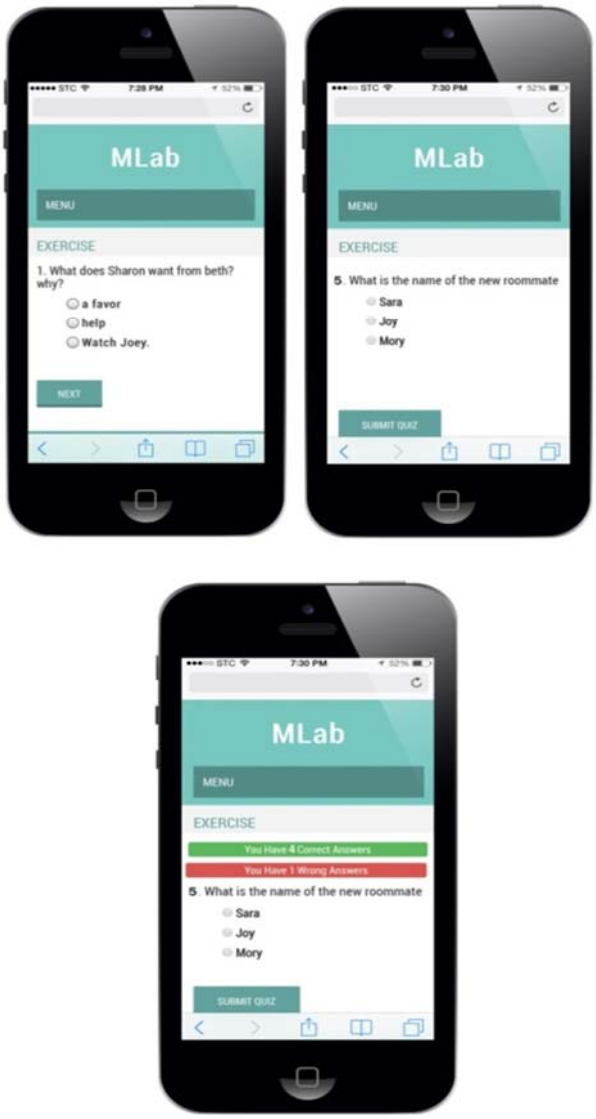

Figure 7: Exercise interfaces

5 System evaluation

We developed a holistic test case scenario to measure both system functionality and user acceptance. Table 1 illustrates the teacher test case scenario, starting with the log-in function, and then uploading the students' IDs file, uploading and deleting the

learning materials (videos, audios, and text), designing an exercise, and posting an announcement. Each task is coded with pass or fail.

Task number	Steps
1	Enter a valid username and course number; press log in
2	Upload students' IDs file
3	Set a course code
4	Upload video material
5	View video material
6	Delete video material
7	Upload audio material
8	record audio material
9	view audio material
10	delete audio material
11	upload text material
12	view text material
13	delete text material
14	insert question
15	view question
16	delete question
17	post an announcement
18	update password
19	log out

Table 1: Teacher test case scenario

For the students, we developed a test case scenario to evaluate the functionalities of the student view. Table 2 presents the student test case scenario; the students log in to the system, view the provided learning material, and perform the uploaded exercise. Each task is coded with pass or fail.

To assess the performance of our proposed system, we evaluated the system based on the views of 15 freshmen students majoring in English language and translation at KSU. They were all females aged between 19 and 21 years. Three times per week, they all attended listening and speaking class, which was taught by the same instructor. According to the instructor, the students' level of English was novice, and their use of English was limited to the classroom and language labs.

Task number	Steps
1	Enter a valid username and course number , Press log in
2	View video material
3	View audio material
4	View text material
5	perform exercise
6	log out

Table 2: Students test case scenario

The instrument used in this study was the system usability scale (SUS), which is a reliable and industrial-standard questionnaire that consists of 10 questions with 5 Likert response options ranging from strongly agree to strongly disagree. The SUS enables the evaluation of several kinds of services, such as mobile and web applications [Jordan et al., 96].

The first evaluation session was with the language teacher at the college language lab. We asked her to log in to the system using the provided username and course number. The teacher then uploaded the students' IDs and set the course number to allow the students to log in to the system for the next evaluation session. Regarding the management of learning materials, the teacher uploaded two audio materials for the students. On the exercises page, the teacher designed one multiple-choice question related to the audio material. We then asked her to fill out the SUS questionnaire. During the second session, we asked the students to take out their own mobile phones and to wear their headphones. They then entered the system URL and logged in to the system using their IDs and course number. Thereafter, the teacher asked the students to listen to the provided audio materials and then solve the question on the exercises page. The students were then asked to fill out the SUS questionnaire. We also asked the students about the experiment and whether they preferred to use the system or the traditional lab; most of the students stated that they enjoyed the use of the system, and they expressed a desire to use it in the future.

The analysis of the SUS questionnaire revealed a generally positive attitude toward using the system. The results from both the teacher and the students indicated high usability rates. Figure 8 shows that almost 80% of the students' responses indicated a preference for using the application frequently. Regarding the system's complexity, 66% of the participants did not view the application as complex, and 60% of them agreed that the application is easy to use, even for the inexperienced user. They also agreed that there is no need for a technical support person to assist them while they use it. More than half of the students agreed that the system functionalities are well integrated and that the system seems consistent. The majority of the participants (68.25%) found the application convenient and showed high confidence in their ability to use it.

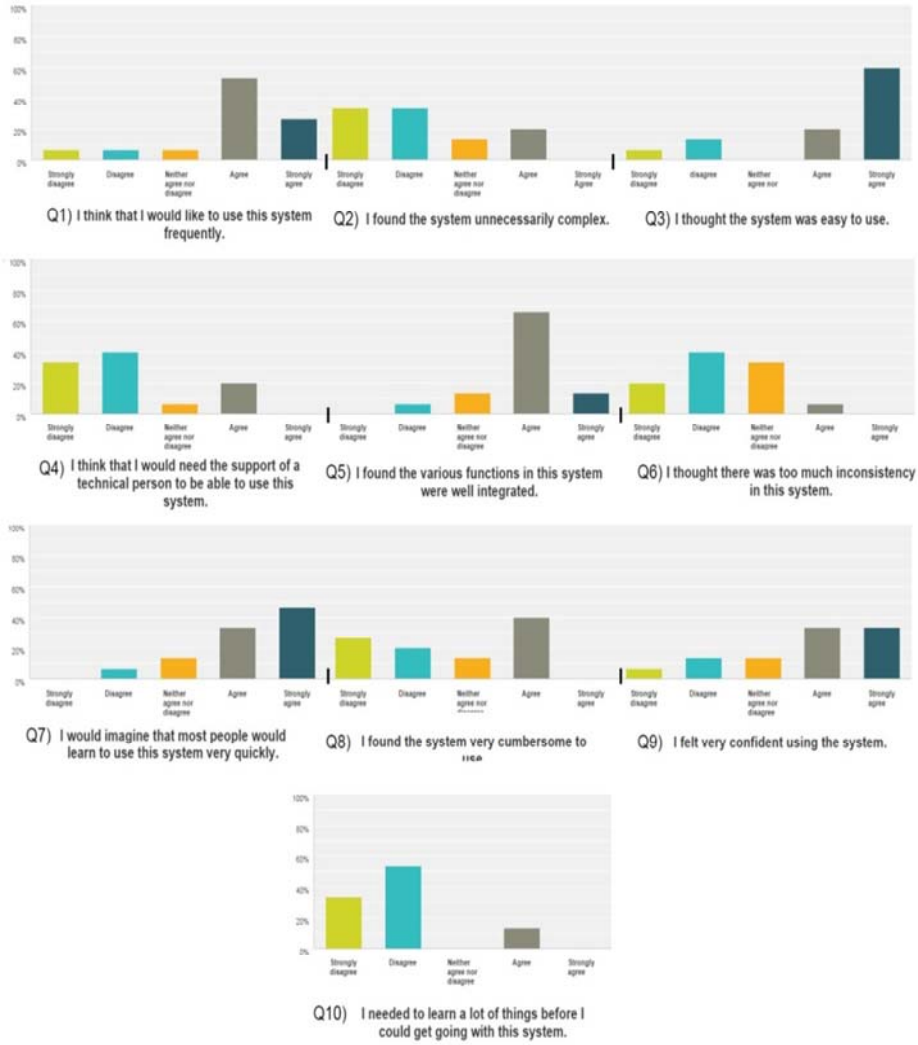

Figure 8: The result of SUS survey

6 Conclusion

This paper presented the design and development of a mobile language lab system called MLab. The target users of MLab are language teachers and students, and the system offers them the freedom to move around and use their own devices at any time and in any place. The MLab system was developed using several web technologies and APIs to provide a fast and convenient method of accessing desired content. To evaluate the MLab system, a pilot test was conducted with a class of 15 students and

their teacher. The results showed high usability rates and generally positive attitudes toward using the system. One unique feature of our system is that it can be used for any language; it is not restricted to any single language, because it depends on the learning materials that are uploaded. However, the system has several limitations, one of which is the security issues associated with the use of some APIs, which may prevent access via users' devices. Another issue relates to the sustainability of the APIs, which might affect the operation of the system.

Regarding future work, the system can be enhanced to support not only language courses but also interpretation modules. Such features will allow students to read or hear a text and then record and send their oral interpretations directly to their teachers who then collect them. In addition, the system's interactivity needs to be enhanced through the implementation of more group-based tasks, thereby facilitating students' efforts to upload and share files via the system. Furthermore, the system needs to be thoroughly evaluated from the pedagogical perspective to determine whether it will facilitate language learning. Finally, once the system has been completed, we will release it as an open-source MALL system from which the community will be able to derive benefit.

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