

## A Web Based Learning System for Learning English on Mobile Devices

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### Abstract

This paper explains the development of a HTML5 based system for learning English as a second language for iPhone, iPad, Android devices, and other smart mobile devices. HTML5 and jQuery Javascript library was used to develop this system. The web based system was installed on a server which could be accessed by any PC or smart mobile phones and tablets that support JavaScript library. Thirty English lessons were developed for this system. University students at Assumption University tried out this system using their mobile devices for a period of 6 weeks. A survey questionnaire was used to evaluate the effectiveness, usability, and students' satisfaction of this system.

**Keywords:** English learning, web based learning, smart mobile devices, HTML5 and jQuery

### 1. Introduction

Learning and the lifelong pursue of knowledge has become one of the most essential activities in the current knowledge-based economy, which is characterized by information age, globalization, knowledge acquisition and transfer, and the information and communication technology revolution. Globalization requires new methods of knowledge acquisition and to convey new skills and tools [1].

The traditional learning context is experiencing radical changes and challenges. There are often occasions when people want to learn exactly what they are interested in or what they need to learn, without time and location boundaries. Learners are demanding for better and improved access and convenience at the lower costs and with the direct application of contents to their needs. Computer based learning and Computer Assisted Learning (CAL) have been effective in learning a number of subjects including languages especially the English language.

Mobile technology is introducing new approaches to learning due to the features that are defined by a number of characteristics. They support learning activities that need Just-in-Time (JiT) and true learning on demand. With the advances in smart mobile phones and tablet technology and the availability of WiFi and 3G networks, it is possible for owners of a mobile device to have instant access to lots of website to acquire knowledge in many areas. The purpose of this paper is to design and develop a web based system for learning English language, and then evaluating the effectiveness of the web based learning system. Though this web based system could be viewed on any computer, it would be optimized for the small screens of mobile devices.

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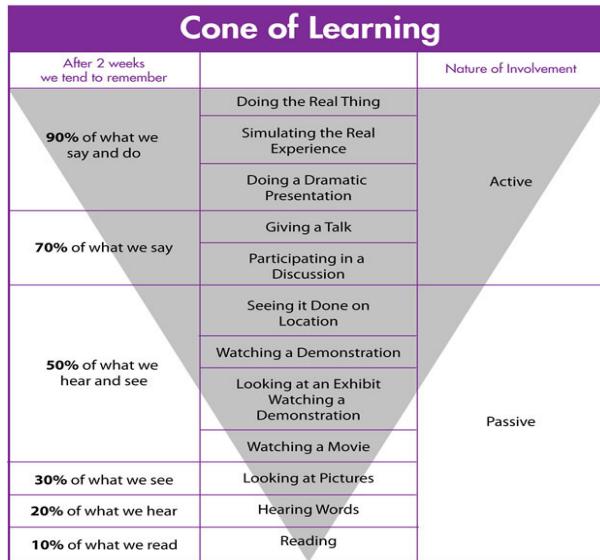
## 2. Literature Reviews

One of the first projects where mobile phones were used in language learning was developed by the Stanford Learning Lab in 2000 [2]. They basically developed Spanish language learning using both voice that could be played on mobile phones and emails to support the study material. They provided voice for vocabulary practice and pronunciation, word and phrase translation, and quizzes to their students. Their results indicated that voice vocabulary lessons and quizzes had great potential if provided in small chunks suitable for the small screen sizes of mobile devices.

Another project at a Japanese university utilized SMS to deliver English vocabulary and their meanings to their students [3]. They sent short lessons on separate and discrete chunks to their students' mobile devices 3 times a day. Each lesson introduced a couple of new words daily and the new words were recycled in subsequent lessons. Students were tested biweekly and compared to groups that received identical lessons by web and on paper. The results indicated that the SMS students learned over twice the number of vocabulary words as the web students, and that SMS students improved their scores by almost twice as much as students who had received their lessons on paper.

One more project in Japan utilized mobile phones that played short audio clips in English to help with pronunciation for English as a Second Language (ESL) students [4]. The results indicated that the learning content should be in short learning units or sessions. For instance, a unit on language vocabulary would best fit the capabilities of mobile devices for learning in a brief period, such as around 5 minutes. Another conclusion that was considered very useful was to provide customization of learning material for individual or group needs and learning experience.

Another important project was a Flash-Based Mobile Learning for Learning English as Second Language by the author for learning English on mobile phones with Flash player back in 2008 [5]. This project was the inspiration for the author to develop this research, a web based learning system for learning English on mobile devices.



**Figure 1** The Cone of Experiences [6]

Most of the time, in a typical classroom setting, students are involved only passively in learning, i.e., in listening to the instructor, looking at the occasional overhead or slide, and reading when required the text book. Research shows that such passive involvement generally leads to a limited retention of knowledge by students, as indicated in the 'cone of experience' shown in Figure 1.

Active learning involves students directly and actively in the learning process itself. This means that instead of simply receiving information verbally and visually, students are receiving and participating and doing.

### **3. Research Methodology**

The purpose of this research was to design and develop a web based system for learning English language, and then evaluating the effectiveness of the web based learning system. The System Development Life Cycle (SDLC) methodology was used for development of the system, and a quick prototype model of the system was built. The web based system was developed using jQuery Javascript library and was optimized for viewing on small screens of mobile devices. Most researchers in language learning have mainly focused on a single medium, i.e. SMS (text) or MP3 (voice), to deliver the content to learners. In this research though a multimedia mode of delivery of the content to learners was developed, a combination of text, voice (MP3) and pictures. This researcher with the assistance from a professional ESL lecturer developed 30 mobile English lessons to be used by samples of students owning an iPhone/iPad or Android phone or tablet at Assumption University.

This research was a multi-disciplinary type of research consisting of 3 distinct components or phases. The first phase of this research was to design and develop a web based system for learning English using HTML5 and jQuery programming for mobile devices. This developed system was the engine or the operating system for mobile language learning. The second phase of this research was to try out this web based learning system developed in the previous phase in order to evaluate its usefulness and effectiveness in learning English as a second language. In this phase, sample volunteer students owning smart mobile devices were requested to try out the web based learning system. A survey questionnaire was prepared for the volunteers to answer to seek their views and observation of the lessons on their mobile devices after trying out the English lessons on their mobile devices. Participants in this research were interviewed informally to seek their opinions on the web based mobile learning system. The third and the last phase of this research was to analyze the data gathered in the second phase in order to explore the attitude of students towards learning English on their mobile devices and to evaluate the usefulness of the developed web based mobile English learning system. Both quantitative and qualitative methods forming a mixed type of research have been utilized to analyze the data. Based on the analysis of data, conclusions were made indicating the strengths and weaknesses of the developed system and recommendations on how to improve the system.

The main functionalities and characteristics of the developed web based system were as follows:

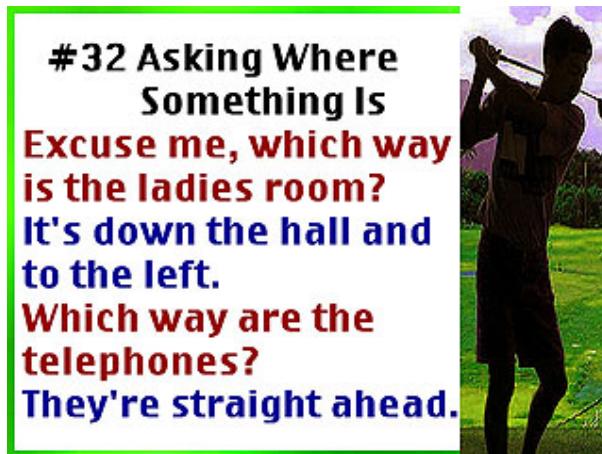
- Multimedia delivery of text, voice, and picture for learning English on smart mobile devices.
- HTML5 and jQuery programming based to allow full control of the mobile device and the lessons by the user.
- Engaging the learners in their learning the English language at their own pace, place, and on their free time (active learning).
- Allowing the learners to control the operation of the Learning System by their mobile device. The learners can play a passage as often as s/he likes to learn how native speakers pronounce words in passages.
- Providing the text of a passage/lesson so that while listening, the learners can also see and read the text on the screen on their mobile device. Students can also learn spelling, grammar, and rules for conversation by listening and reading simultaneously.

#### 4. Development of the System

Very similar to the Learning Management System (LMS) for the Internet based eLearning systems, the Mobile Learning Systems needs to contain 2 main components, namely the content (learning material) and the interface with the learner. Currently this system has no management features to be called Mobile Learning Management System. This prototype system, however, could be considered as an embryonic model for a fuller version with management of user activities. In this section the two components of the system are presented and discussed.

The English lessons used for this research were originally developed by Mr. Frank Mausley who is an ESL lecturer in Chiangmai, Thailand, and formerly an English lecturer at Chiangmai University. The original English lessons were in PowerPoint slides presentation. The author received permission from Mr. Mausley to redevelop them for mobile devices. The contents of the lessons should be optimized for the small screens of mobile devices, usually between 3 to 7 inches. The contents should be grouped into small chunks of data. Each chunk then could be displayed on the screen of the mobile device. The content could be multimedia material; for this research the researcher is making use of text and pictures to display the contents as learning material and the voice of native speaker for listening purpose. As the developed Mobile English Learning System is intended to be used for learning English as a second language for the trial purpose, it would be useful to show the pictures of English nouns or actions for better understanding of the meaning of English words by showing their pictures.

The resolutions of most modern mobile devices are either 1280 x 720 pixels (720p) or 1920 x 1080 pixels (1080p/full-HD) spread along the width and height of the smart phone's screen. This researcher optimized the texts of all the English lessons for the resolution of 720p and 1080p/full-HD. Mobile devices with lower resolutions display the text with less clarity or sharpness, though still legible. The contrast and brightness could be controlled by the user through mobile device features. Figure 2 depicts how the content is optimized for a screen resolution of 1280 x 720 pixels.



**Figure 2** Screenshot of a slide of a lesson on a mobile device (Red: Male Voice, Blue: Female Voice)

The voices of two native speakers, one American gentleman (ESL lecturer who prepared the 30 English lessons) and a British lady (English lecturer), were recorded while reading the passages of the lessons in MP3 format. Unfortunately at this time various browsers such as Firefox, Chrome, Internet Explorer, Safari, etc. use different audio format for HTML5 [7]. The sound associated with the text is in MP3 format with a bit rate of 64 kilo bits per second (kbps). The higher the bit rate the better the quality of sound and also the larger the file size would be. The small delay (1 to 2

seconds) is acceptable for these lessons as it provides a couple of seconds to the learner to read and meditate upon the text on the screen. The researcher had to use Miro Audio/Video converter to convert all the MP3s to OGG and WebM formats so that all the lessons would be available to all smart phones and all the popular possible browsers available on the mobile devices. Using HTML5 and jQuery, the right sound format is selected automatically depending on what browser is used.

The lessons are prepared as sequence of 8 – 10 slides (images). Each slide contains the text as an image (jpg format). At the bottom of each slide 3 touch-sensitive buttons are displayed which are ‘Previous’, ‘Play’, and ‘Next’ as shown in Figure 3. The ‘Play’ button is toggled to ‘Pause’ when clicked.



**Figure 3** A slide of a lesson on a mobile phone with user interface

When Play button is touched, tabbed, or clicked the audio plays the right audio format using the following HTML5 code.

```
<img class='audiopic' src='images/1-1.jpg' alt='media/1-1.ogg' data-ogg='media/1-1.ogg' data-mpeg='media/1-1.mp3' data-webm='media/1-1.webm' />
```

This HTML5 code shows an image called 1-1.jpg with the 3 media (audio) file format as 1-1.ogg, 1-1.mp3, or 1-1.webm depending on what browser is used. The audio section codes of the HTML5 which are activated when ‘Play’ button is pressed is shown below:

```
<audio id='iplayer'>
  <source src='media/1-1.ogg' id='oggSource' type='audio/ogg' />
  <source src='media/1-1.mp3' id='mpegSource' type='audio/mpeg' />
  <source src='media/1-1.webm' id='webMSource' type='audio/webm' />
</audio>
```

The HTML5 for showing the 3 touch-sensitive buttons are shown below:

```
<div class="controls">
  <a class="button-controls" id='previous' href="#">Previous</a>
  <a class="button-controls" id='play' href="#">Play</a>
  <a class="button-controls" id='next' href="#">Next</a>
</div>
```

As almost all new smart phones are touch screen enabled, the interface with the user is also enabled by touching the function display on the screen, i.e. to play the audio for the current screen, to go backward or forward one screen at a time.

The learner should be able to select a lesson, be able to play a lesson slide by slide, and at the end of each slide, the learner should have a choice to repeat the same slide or be able to go forward to the next slide. At the end of a lesson (the last slide), the learner can decide to repeat the same lesson from the beginning all over again or simply quit the lesson and return back to the normal mode of operation of the mobile device.

The prototype system was developed using jQuery Javascript library package under Windows 7 Operating System and HTML5. jQuery is an open source software which is a multi-browser JavaScript library designed to simplify the client-side scripting of HTML. For this project the researcher downloaded and installed 2 jQuery libraries namely jquery.js and player.js, and also a cascading style sheet (CSS3) called style.css from the jQuery site (jquery.com). The developed System for Learning English as a Second Language was in HTML5 file format which can be played on any computer, including PC, Macintosh, Linux systems or any smart mobile devices with browsers that support HTML5. By limiting each lesson to 8-10 slides, the lesson could be short enough to learn in less than 5 minutes. The lessons could be played on most mobile devices. Figure 3 displays a slide of a lesson on a mobile device.

## **5. Trying Out The System**

In order to conduct this research the author placed 30 lessons on a server belonging to the Graduate School of elearning at Assumption University Suvarnabhumi Campus. The url of a sample lesson could be accessed at <http://ews.elearning.au.edu/h5>

It is also possible to save the English lesson and the jQuery libraries on mobile device storage and run the lessons without a need of WiFi or 3G to access the website. However, for this experiment, participants were requested to access the lessons through the website when they are online.

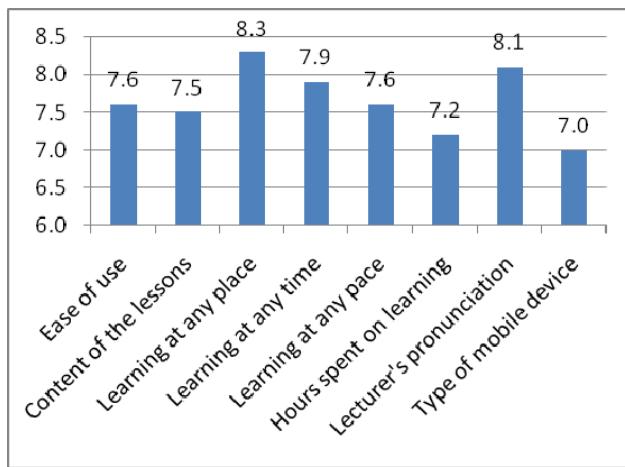
Information about this research and free mobile English learning was posted at most floors on the IT Center where many students visit daily to do their computer related assignments or access the Internet. The only requirement for the students to access and use the lessons was to answer to a survey questionnaire after using the system for between 4 to 6 weeks of using the system.

During the 6 weeks of availability of the lessons on the server, a total of more than 20,000 accesses to the 30 lessons were recorded. The exact numbers of students accessing the lessons were not known as some students might have accessed each lesson for many times. At the end of 6 weeks though, just 288 students replied to the online questionnaire. Many students might have ignored or forgotten to reply to the online questionnaire after trial of the lessons, as it is the norm almost on any online survey. Those replied the questionnaire represented the population of university students. They were from various schools in the university from freshmen to seniors with various degrees of English proficiency. There were 151 males and 137 females who completed the survey, majority of whom from the Martin De Tours School of Economics and Management followed by the School of Arts. There were 203 Thai students, 41 Chinese, followed by Burmese, Vietnamese, and some students from Indian subcontinent.

The type of mobile devices used by students to tryout the mobile English learning experiment is as follows:

- iPhone: 87
- Android based phones: 95
- Blackberry: 19
- iPad: 43
- Android based tablets: 36
- Others: 8

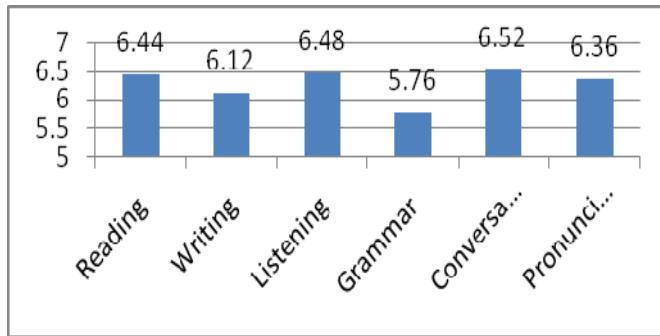
One of the question in the survey asked participants to rank (1 to 10) the importance of the eight factors in learning English using mobile devices. Figure 4 depicts the rankings.



**Figure 4** Ranking of factors for mobile English learning

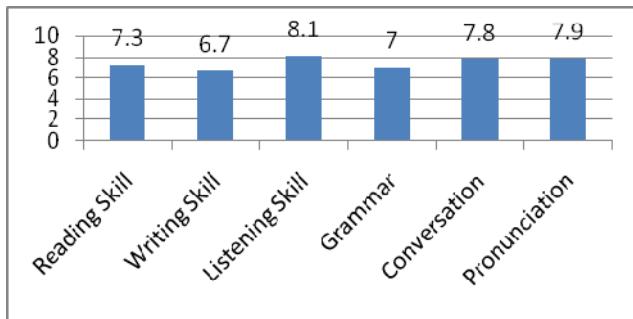
As shown in Figure 4, learning at any place, lecturer's pronunciation, and learning at any time are the factors that are most important for mobile English learning. Ease of use and learning at any pace are also two other factors.

Another question in the survey asked the participants to rank (1 to 10) their English proficiency skills before using the mobile lessons. Figure 5 shows the responses of the participants. This is just a self-perception of students about their English ability in areas of 'Reading Skill', 'Writing Skill', 'Listening Skill', 'Grammar', 'Conversation', and 'Pronunciation'. Though this self-perception of students about their own English proficiency might not be academically accurate, still it provided some information on impact of the web based learning system on their English skills and proficiency after using and trying out the lessons on their mobile devices.



**Figure 5** Ranking of English proficiency skills before trying out

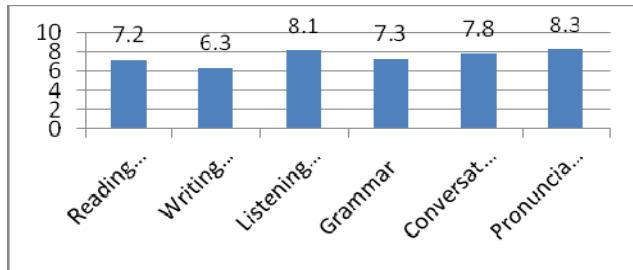
Students were then asked to rank their knowledge of English skills after using and trying out the lessons for at least 4 weeks. Figure 6 shows the response of the participants. This Figure 6 should be compared with figure 5 to assess how the students perceived their English have improved over the course of trying out the web based English lessons on their mobile device.



**Figure 6** Ranking of English proficiency skills after trying out

When figure 5 is compared with figure 6, participants felt improvements in all 6 levels of the English proficiency skills. The most improvement is in pronunciation and listening skills.

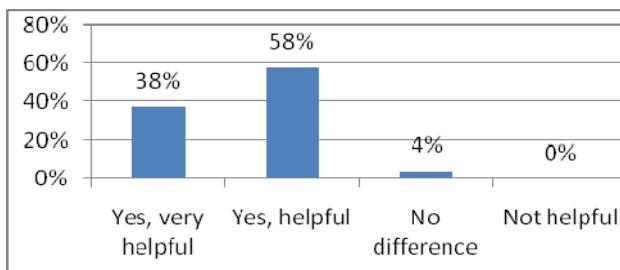
In the survey participants were asked to rank (1-10) the impact of mobile learning on their English proficiency skills. Figure 7 depicts their responses.



**Figure 7** The impact of mobile English learning on participants

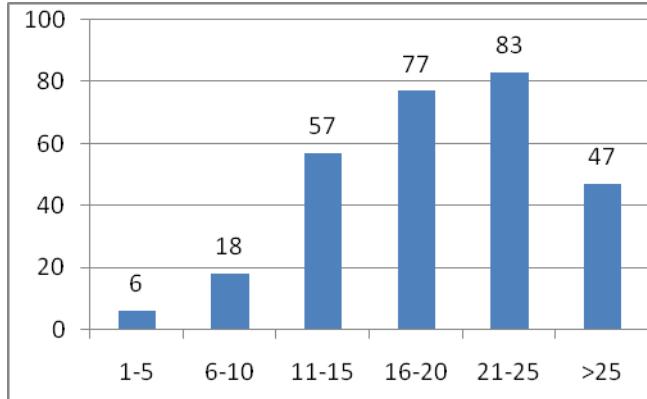
As shown in figure 7, participants felt the most impact of mobile English learning has been on their pronunciation followed by listening skills and conversation. This is in agreement with the conclusion made when comparing figures 5 and 6 as stated earlier. Students perceived that there have been impacts in all levels of their English proficiency of English language.

One important feature of the web-based mobile learning system is its multimedia capability, i.e. users can read the text on their mobile devices screens while listening to the same text spoken by a native speaker. This researcher wanted to explore if this feature was useful to participants. One of the questions in the survey asked participants if this feature of being able to read the text while listening was helpful to them. Figure 8 depicts their replies. Majority of students perceived that was helpful or very helpful to have this multimedia feature in learning English on their mobile devices.



**Figure 8** Multimedia feature helpful?

The next question was to explore how often students accessed the web and tried out each of the online lessons. Figure 9 depicts the frequency of accessing and trying out each lesson.



**Figure 9** Frequency of usage

It is apparent from figure 9 that most students tried out each lesson for more than 16 times, with the frequency range of 21-25 having the most number of students. This indicates that students enjoyed trying out lessons on their mobile devices to learn and improve their English skills.

Developing a web based learning system to teach English to students on mobile devices is a very time consuming process. Preparation of proper English lessons by professional English lecturers, converting the lessons into text and pictures suitable for small mobile screens, recording the voices of at least 2 native speakers, and converting the sound files to ogg and WebM all takes time and individuals involved expect to be compensated. This researcher wanted to know if students would pay to have more lessons for their mobile devices to try, so as for the last question, the researcher asked if the students would be willing to pay for additional lessons. Thirty seven percent replied “Yes”, and another 52% replied “Yes, if price is reasonable”.

In the survey, there were 2 open ended questions to seek the opinions of participants as they wished to express it. One question asked participants to express their “likes” and another question about their “dislikes” of using the web-based mobile learning to learn English. Majority did not reply to these optional open ended questions, approximately 20% of students replied to these questions. Their likes included “convenience”, “effective”, “just-in-time learning”, “easy to learn”, “technologically advanced”, and “good for listening and pronunciation improvements”. Their dislikes were “not having enough lessons”.

The next step will be to develop an app for iOS and Android environments so that the learners could install the app on their mobile device and use it even when there is no 3G or Wifi services.

## 6. Conclusions

The major findings of these research as follows:

1. Majority of students at Assumption University have a positive attitude towards mobile learning and are enthusiastic to learn English using their mobile devices.
2. A Web-Based mobile learning system is best optimized with an audio bit rate of 64 Kbps and the use HTML5 and jQuery javascript library.
3. The same HTML5 based mobile learning system could be also utilized for learning other languages.

4. Smart mobile phones and Tablets could have a positive effect in learning English as a second language at all levels of English learning.
5. Multimedia features of mobile English learning are perceived the most effective in English pronunciation, listening and reading comprehension.
6. Convenience and Just-in-Time learning features of web based English learning on mobile devices makes it ideal for learning English language anywhere.
7. The multimedia features of mLearning make language learning more effective.
8. Students are willing to pay for mobile lessons for their mobile lessons. This could be a good incentive for English lecturers and IT professionals to work together to develop and produce more English lessons for mobile devices.
9. Mobile English learning is at its best in a hybrid mode when supplemented with traditional English learning.
10. There is still much room for improvement in terms of technology and also preparing additional lessons to cover more areas of foreign language learning.

## **References**

- [1] Adam, N., Awerbuch, B., Slonim, J., Wegner, P., and Yesha, Y. **1997**. “Globalizing business, education, culture through the Internet”. *Communications of the ACM*, 40(2), 115-121.
- [2] Brown, E. (Ed.) **2001**. January 8. “Mobile learning explorations at the Stanford Learning Lab”. *Speaking of Computers*, 55. Stanford, CA: Board of Trustees of the Leland Stanford Junior University. <http://sll.stanford.edu/projects/tomprof/newtomprof/postings/289.html>
- [3] Thornton, P., and Houser, C. **2005**. “Using mobile phones in English Education in Japan”. *Journal of Computer Assisted Learning*, 21, 217-228.
- [4] McNicol, T. **2004**. “Language e-learning on the move”.<http://ojr.org/japan/wireless/1080854640.php>
- [5] Anaraki, F. **2009**. “A Flash-Based Mobile Learning System for Learning English as a Second Language”, IEEE Conference, January, Singapore.
- [6] Dale, E. **1969**. *Audiovisual methods in teaching, third edition*. New York: The Dryden Press; Holt, Rinehart and Winston.
- [7] HTML5 Audio. (n.d.). Wikipedia. **2013**. Available: [http://en.wikipedia.org/wiki/HTML5\\_Audio](http://en.wikipedia.org/wiki/HTML5_Audio) Accessed June. 25.