DEVELOPMENT OF E-TUITION: A WEB-BASED APPLICATION
INTEGRATING AJAX

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ABSTRACT

Introducing ICT in education sector is one of our government strategies to improve the quality of learning and teaching across the educational and training system. With people nowadays getting more and more IT literate, this strategy has gained wide acceptance among teachers and students. One example of the use of ICT in our education and training system is the use of Electronic Learning or e-learning as a tool to support the education delivery. E-learning is not meant to replace teachers but to make process of learning to be more interactive, attractive and comprehensive. This paper presents the development of E-Tuition, a web-based e-learning application developed for Penilaian Menengah Rendah (PMR) students to learn English Language. The objective of this application is to provide students with a learning application that is interactive and easy to use. This web-based application is developed by integrating AJAX technologies. AJAX or Asynchronous JavaScript + XML is a Web interface development approach for development of Web applications with improved performance and interactivity. With the developed E-tuition, the students can experience learning with greater ease as AJAX developed web-based application improves interactivity using both Screen-Based development approaches and Page-Based development approaches.

Keyword: AJAX, Web-based application, e-learning, online learning

INTRODUCTION

The introduction of ICT in the education sector represents one of an important initiative by our government to improve the quality of learning and teaching for the country educational and training system. This initiative is targeted for the new generation of young people who are growing up in digital world and are comfortable with technology. With this young generation of people that are technological literate in using electronic stuff such as computers and internet, this strategy has gained wide acceptance among teachers and students. The use of ICT in today’s education and training system might range from the use of a simple Microsoft Office presentation, to the use of educational CDs and to the use of electronic learning or e-learning. E-learning is also known as Online Learning differs from the traditional education system because students are not required to visit an actual classroom for learning purposes. In other words, there is no face-to-face interaction between students and teachers. However, e-learning is not meant to replace teachers but to make process of learning to be more interactive, attractive and comprehensive.

Instead of e-learning as a replacement for the conventional delivery system, it is more of a supplement to the current educational and training system. Its value is linked to its suitability to individual learning and teaching styles and strategies. With e-learning, learning and teaching are considered an ongoing process where students and teachers have access to high quality, relevant and diverse resources. It also provides an avenue for students and teachers to create and share new ideas by making use of the technology.

In Malaysia, there are several e-learning applications already in use such as Universiti Teknologi PETRONAS (UTP) Blackboard Learning System, UNITAR e-learning and Portal Pendidikan Utusan (Bestari). This paper presents the development of E-Tuition, a web-based e-learning application developed for Penilaian Menengah Rendah (PMR) students to learn English Language. The objective of this application is to provide students with a learning application that is interactive and easy to use. This web-based application is developed using AJAX approach. AJAX or Asynchronous JavaScript + XML is a Web interface development
approach for development of Web applications with improved performance and interactivity (Paulson, 2005).

When building a Web application, two approaches can be used; the Screen-Based Approaches and Page-Based Approaches (Porter, 2005). With the former, users have the ability to manipulate information on small number of screens that can instantly be updated while for the latter there is no instantaneous updating. Users are forced to go through page-refresh for the changes to take effect. Each approach has its own advantages and disadvantages. AJAX gives an alternative for building powerful Web applications that combine the benefits of both Screen-Based and Page-Based approaches (Porter, 2005).

Other several web applications already developed using AJAX are Google Suggest, Google Maps, Meebo and Gmail (Mesbah, 2007). One of the many advantages of AJAX is it provides instant field checking and saving for users inputted data. This feature gives users the interactivity capability. AJAX technology also uses the single screen interface in which the users see the big picture of the whole application. By having these feature users are able to see all the steps necessary to complete the application thus giving the users the ease of use of the application.

RELATED WORK
AJAX in general is both technology platform and architectural style (Garrett, 2005). The types of applications best developed using AJAX is still unknown as this is a relatively new approach. But with the many advantages of AJAX such as freedom from page refresh, instant field checking and saving, and single screen interface have attracted Web developers to start using AJAX.

One known example of the use of AJAX approach is Google Maps. In Google Maps the maps can be zoom and pan quickly and smoothly (Mitchell, 2005). Also, if the users need a part of the map that is not shown on the screen, updates of the image can be done seemingly and smoothly when the users hold down the left mouse button and slide the cursor over the map (Paulson, 2005). In comparison with non-AJAX application, the entire page needs to be reloaded even for small changes to occur. For the developed E-tuition, after each question that the students have responded to in “Assessment” which is an online test, the total mark is increased instantly if the answer provided is a correct one. There is no need for the students to wait until the end of the test to find out how they are doing so far.

Another example of AJAX-developed Web application is Gmail. For instance in Gmail if the users supply a username that is already in use, suggestions are provided to the users. This is to guarantee the uniqueness of the username. Instant field checking such as this gives the users the ease of use required for online application such as this. For the E-Tution, navigational tabs such as this, is also being used. In the grammar page, the students are able to navigate the content of the online materials using the tabs.

Besides Google, Yahoo has also started to develop its Web application using AJAX. One example is the Yahoo! Mail that you are seeing today. Instead of having all the sub-windows serving as index for user’s current open task, users are now working with tabs. It avoids the messiness of finding the windows for currently open tasks. So basically, in today’s Yahoo! Mail users would see no tool-bar; it is now a chrome-less browser window, pull-down menus, and shortcut-key system (Rosenberg, 2007).

The E-tuition developed for this paper does not have all the features discussed above. We have included some of the features where it seems fit and will continuously enhancing it.

SYSTEM DESIGN
Figure 1 illustrates the functionality that can be performed by the students and teachers using the application. The functionalities that can be performed by users are login, logout, membership registration, accessing materials, downloading materials, performing online exercises and tests, viewing online dictionary and accessing their progress report. The teachers can do the updating of announcement and schedule.
The data modeling used to define the relationship between the classes is shown in Figure 2. The constructed class diagram represented the database design for the application. The formation of this diagram shows all the data of the application that could be stored and retrieved in most efficient manner. Based on the diagram, there are five classes for this application which are Student, Registration, Online_Materials (exam papers and notes), OnlineAssessment and StudentPerformance.

From the functionalities available in the application we have chosen two functions that integrate AJAX technology which are the online assessment and student performance. Online assessment consists of exercises and tests which the students may attempt. Performance report is generated after completion of the test.

THE APPLICATION

Figure 3 is the login interface. It is the initial interface of the application the users see when they log in into the application. For new users, they need to perform registration process by clicking the “Register” link. They need to fill up a personal information, username and password. Once the registration is completed, users could login to the application. “Forget Password” link is used if the users cannot remember their password.
Figure 4 shows the introduction page after users have successfully login into the application. The users may view the available functions from the provided menu. Users could view the interface of notes, announcement, exam tips, by clicking the menu “English PMR Notes”, “Announcement” and sub-menu “Exam Tips” respectively. In order to download past year questions, users need to click the menu “Download”. All set of past year questions will appear. Clicking the “Download” link starts the downloading process.

Figure 5 shows the grammar page and vocabulary page of e-Tuition. The students may learn about English language from this page. The grammar page comes with tabs that provide the students the ability to navigate the content of the online grammar materials. In the vocabulary page students are able to do searching for synonyms or antonyms of words.

Figure 5: Grammar and vocabulary page

Students could perform online exercises or tests by clicking the menu “Assessment” as shown in Figure 6. There are 2 types of assessment for this application; exercise and test. For the exercise, the students have to click on the radio buttons in order to choose the best answer for the question and click the “Check” button to find out the correct answer for the question. Navigation of the exercise questions can be done using the “Next” button. The difference between the exercise and test is test provides students with marks. Students can access their marks in graphical format by clicking the sub-menu “Report”.

Figure 6: Exercise page

IMPLEMENTATION OF AJAX TECHNOLOGY

AJAX is a Web interface design development approach which is used in the development of E-Tuition. The integration of AJAX technology involves two approaches; Screen Based System Approach and Page Based System Approach.

The Screen-Based Approach is applied in the “Assessment” part which is the test as shown in Figure 7. The total mark is increased instantly if the students answered each of the test questions correctly. “Submit” button is to update the students’ assessment report. The implemented approach allows the users to enter and manipulate information on a small portion of a screen that instantly being updated with any submitted changes. Fragment of the
code is as shown in Figure 8a and Figure 8b is implementing AJAX approach. The code is reusable throughout the module.

```
function calculate() {
  var ques1, ques2, ques3, ques4, ques5, ques6, ques7, ques8, ques9, ques10;
  ques1 = test.q1.value * 1;
  ques2 = test.q2.value * 1;
  ques3 = test.q3.value * 1;
  ques4 = test.q4.value * 1;
  ques5 = test.q5.value * 1;
  ques6 = test.q6.value * 1;
  ques7 = test.q7.value * 1;
  ques8 = test.q8.value * 1;
  ques9 = test.q9.value * 1;
  ques10 = test.q10.value * 1;
  total_marks = ques1+ques2+ques3+ques4+ques5+ques6+ques7+ques8+ques9+ques10;
  test.total_marks.value = total_marks;
}
```

**Figure 7:** Online test page

//Linkage to AJAX Technology (Screen Based Approach) by using Javascript

```
//Question 1<br>
Read the message below and answer the question.<br>
Lucy will probably have _________ for lunch.<br>
A &nbsp; fried chicken<br>
B &nbsp; beef rendang<br>
C &nbsp; sweet and sour fish<br>
D &nbsp; mutton curry
```

**Figure 8a**

**Figure 8b**
Page-Based Approach has been implemented in reporting page as shown in Figure 9. To view the report, students need to click on the sub-menu of “Assessment”. The Report page is refreshed once the students have submitted their test results as in Figure 10. It displays the updated students’ performance in graphical format. Using this approach, there is a load-reload effect of normal web pages. As a result, students must sit through a page refresh in order for the changes they made to take place.

CONCLUSION
Web development approach using AJAX is an alternative to the traditional approach of developing web applications. E-learning application is only one example of where this approach can be used. E-Tuition has several features of AJAX such as single-screen interface and instantaneous update. With single-screen interface the students are able to see the complete application thus giving the students ease of use of the application. The instantaneous update frees the students from having to do page reload and refresh.

With the development of e-learning application such as E-tuition by using suitable web development approach, more interactive, easy-to-use, enjoyable and beneficial e-learning can be developed. With more improvements that can be made for the current E-Tuition application and more features of AJAX that can be incorporated at the various parts of the application, such learning and teaching application may contribute towards high quality e-learning application.

REFERENCES