This paper presents development of web application to support smart classroom. This research develops web application which run on server side and client side. Teachers and students can use their mobile devices such as smartphones, tablets or laptops to run our web application. This work motivates the students to study in the classroom. The population of our research is 50 computer engineering students. Our web application is run completely and efficiently. The survey shows that the ease of using the application score is 4.40. The function of the application score is 4.44. The run time performance score is 4.32. User experience score is 4.48. and User Interface score is 4.44.

Keywords: Smart Phone, Tablet, Smart Classroom, Web Application

Introduction

Education in Thailand is very traditional. Smart classroom is the innovation of education which integrates technology into classroom. It improves the performance of educate the students.

Nowadays, smart classroom is the technology which supports education. However, there are limitations in the class. The teacher needs to understand tools, and equipment in the smart classroom before use them for example, smart board is the equipment which is similar to touch screen monitor. It can be written by hand or smart marker. Moreover, it consists of computer for processes the data and shows the output on the smart board. The students can interact with the large area of board. However, the students need to study inside the smart classroom that is the limitation of this equipment. On the other hand, tablets and smartphones are the devices which is easy to bring to other location.

This research aims to study and develop web application for smart classroom. This application can use to improve the performance of learning in SuanSunandhaRajabhat University.

There are related work about smart classroom and web application. In 2001, Xie W. et al. (Xie, W., Shi, Y., Xu, G., &Xie, D. (2001, October)) developed smart classroom for teleeducation. Teachers can write on a wall-size media-board just by their hands, or use speeches and gestures to conduct the class discussion involving of the distant students. In 2008, Suo, Y. et al.(Suo, Y., Miyata, N., Morikawa, H., Ishida, T., & Shi, Y. (2008)) developed real-time interactive virtual classroom with teleeducation which can use with
mobile devices of students called Open Smart Classroom. In 2010, Sevindik (Sevindik, T. (2010)) presented Future’s learning environments in health education: The effects of smart classrooms on the academic achievements of the students at health college which determines the effectiveness of smart classroom for nursing education. The result shows that smart classroom applications are effective environments that can be used as an alternative and a supplement to face to face educational environments. In 2011, Williams and Pence (Williams, A. J., & Pence, H. E. (2011)) used smartphone for chemistry classroom. They applied augmented reality and QR Code to improve the interactive in their class. Our recently work, we presented Packaging label scanner application (Rattanatranurak, A. (2019)) which developed on android operating system to help the student in classroom to increase the performance of studying. The students are very satisfied to use this application.

Research Methodology

In this research, web application for smart classroom in SuanSunandhaRajabhat University is developed. User interface is designed for user experience. It is designed for 3 types of users: teachers, students and administrators. The first page of the application is shown in Fig. 1. The types of users are divided automatically. To sign into our application, the users should type the username and password. Then, check on the captcha checkbox for security and click on sign in.

After the users are signed into the web application, there is the different of the page in each type of user. Fig 2, 4, 6 show teachers, students, and administrators first pages, respectively. In the teacher page, their subject codes, semester, sections, names, and number of students are appeared.

Fig. 2 shows teacher first page which consists of subject names including number of students in that section. The teachers can choose the subject to operate that classroom.

Fig. 3 shows main menu of teacher which consists of the course description, student names in section, attendance system, documents, exercise management system, scores, chat room, and logout menu.

This system can show the student name which registered in the section of this course. The attendance system is the system which can check the attendance of the student which connected to the system. It saves login time and logout time of the student who attends this class to study in this subject. The teacher can upload the document to the system for the students.

The exercise can be uploaded into this system via .csv file and it can be checked automatically. The teacher can check the scores of all students and can ask the questions via chat room system. Note that, chat room system contains 2 modes. Firstly, teacher instant message mode, the students can send the messages to the teacher directly. Secondly, section mode, all of students can send the messages to the section which they attended.

The administrator can manage the database such as add, edit, remove the data of subjects, courses, teachers, and students in the classroom. Note that, they can import the data from the registration system of the university and export scores of students.
Experiments and results

In this work, the survey is gathered from 50 users in department of computer engineering, faculty of Industrial Technology, SuanSunandhaRajabhat University, Bangkok, Thailand. It consists of 24 percentage first year students, 24 percentage second year students, 22 percentage third year students, and 30 percentage fourth year students as shown in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>number of students</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>2nd year</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>3rd year</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>4th year</td>
<td>15</td>
<td>30</td>
</tr>
</tbody>
</table>

The survey consists of the ease of using the application, the function of the application, the run time performance, User experience, and User Interface scores. The results are shown in Figure 4 to 7.
In this work, we developed the web application which run on mobile devices. The survey shows that the satisfaction of the application which can be run completely and efficiently that chosen satisfied and very satisfied is up to 31 percentage. The summation of very satisfied and satisfied of run time performance is 36 percentage. It can be due to the application can be interacted with the users very fast.
Conclusion

In this paper, web application which is used to support smart classroom is developed. It can be run on smart devices such as smartphone, tablets, and PC. The application is developed on both server and client side. Safari on iOS and Google chrome on android operating system is supported. Its roles are divided into 3 roles: administrators, teachers, and students. Our web application is run completely and efficiently.

The survey shows that the ease of using the application score is 4.40. The function of the application score is 4.44. The run time performance score is 4.32. User experience score is 4.48. and User Interface score is 4.44.

![Fig. 6 - The satisfaction of run time performance](image1)

![Fig. 7 - The satisfaction of User experience](image2)
Fig. 8 - The satisfaction of User Interface

Reference