University of Diyala
College of Science
Department of Computers

Design and Implementation of E-Learning Platform System

Research Project Presented to the Department of Computers - College of Science - University of Diyala as a Part of the Requirements for Bs.c Degree in Computer Science

By

Mustafa Qahtan Yassin

Abbas Hussein Ali

Supervised by

Prof. Dr. Ziyad Tariq Mustafa

1441 A.H.   2020 A.D.

جامعة ديالى

كلية العلوم

قسم علوم الحاسوب

تصميم و تنفيذ نظام منصة تعليم الكتروني

مشروع بحث مقدم الى قسم علوم الحاسوب ـ كلية العلوم ـ جامعة ديالى كجزء من متطلبات الحصول على شهادة البكالوريوس في علوم الحاسوب

إعداد الطالبان

مصطفى قحطان ياسين

عباس حسين علي

أشراف

أ. د. زياد طارق مصطفى

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيم

(وَقُل رَّبِّ زِدْنِي عِلْمًا)

صدق اللَّهُ العظيم

سورة طه (114)

<div dir="rtl">

الإهـداء

الى من سكنت ضميري

فكانت خلاصة قلبي ... أمي

الى من اضاء ذاكرتي

بفيض من علمه وخلقه ... أبي

الى من اقتسمت معهم الرغيف

والشمعة والدمعة ... أخوتي

الى كل من لازمني خطوة بخطوة

وشد من ازري

</div>

شكر وتقدير

ABSTRACT

E-learning is an innovative approach to provide interactive, well-designed, and learner-centered electronic learning environments through the use of the Internet and digital technologies to apply educational principles. Today's mobile phone is the first companion for every person. Therefore, this research project offers the application of an educational electronic platform through the mobile phone by developing software technologies to facilitate learning in a remote university environment. The proposed application offers an interactive system between the student and the teacher where the teacher can create an electronic educational class and invite students to class through a specific code. Upon entering the code, the student can register in the system for the purpose of accessing various jobs by publishing publications and files related to the educational subject. The application also contains a special chat system to facilitate communication between students and the teacher or between a student and another student. The application was built using the Android Studio platform and the modern programming language Kotlin, with the use of the XML language as a front end for the design of user interfaces, and Firebase services were used as background services such as real-time database, storage and authentication. The designed application has been tested on (10) fourth-graders students in the Department of Computer Science with a teacher of evolutionary computing and it was successful. The application is distinguished by its Iraqi privacy, that is, it can be applied without the need for a Google account or email.

الخلاصة

التعلم الإلكتروني هو نهج مبتكر لتقديم بيئات تعلم ألكترونية تفاعلية ومصممة بشكل جيد ومتمحورة حول المتعلم من خلال استخدام الإنترنت والتقنيات الرقمية لتطبيق المبادئ التعليمية. ويعتبر الهاتف المحمول في يومنا هذا المرافق الأول لكل انسان ، لذلك يقدم مشروع البحث هذا تطبيق منصة ألكترونية تعليمية من خلال الهاتف المحمول و ذلك بتطوير تقنيات برمجية لتسهيل التعلم في البيئة الجامعية عن بعد.

يقدم التطبيق المقترح نظامًا تفاعلياً بين الطالب والمعلم حيث يستطيع المعلم من أنشاء فصل تعليمي الكتروني و دعوة الطلاب اليه من خلال رمز محدد . و عند ادخال الرمز يتمكن الطالب من التسجيل في النظام لغرض الوصول إلى وظائف مختلفة من خلال نشر المنشورات والملفات المتعلقة بالمادة التعليمية. كما يحتوي التطبيق على نظام دردشة خاص لتسهيل التواصل بين الطلاب والمعلم أو بين طالب مع طالب آخر.

لقد تم بناء التطبيق باستخدام منصة الاندرويد ستوديو ولغة البرمجة الحديثة كوتلنومع استخدام لغة الاكس ام ال كواجهة أمامية لتصميم واجهات المستخدم وتم استخدام خدمات الفايربيس كخدمات خلفية مثل قاعدة البيانات في الوقت الحقيقي والتخزين والمصادقة.

لقد تم أختبار التطبيق على (10) طلاب من طلاب الصف الرابع قسم علوم الحاسوب مع مدرس مادة الأحتساب التطوري وكان ناجحا . ويتميز التطبيق بخصوصيته العراقية أي يمكن تطبيقه دون الحاجة الى حساب كوكل أو بريد ألكتروني .

Table of Contents

List of Figures

CHAPTER 1
INTRODUCTION

Chapter One
Introduction

1.1 Overview

Wireless communication is changing our life. The ability to communicate any time any where increases our quality of life and improves our business productivity[1]. Also, the usage of mobile technology is growing, and it affects other technologies by bringing in new innovation and methods. The reason for this growth is not only ease of use and mobility, but also improvements in interaction and functionality in different contexts [2]. With the development of ICT (Information and Communication Technologies) students can explore a world full of contents and information through the computer and the Internet. The great growth in sales and usage of mobile devices (pocket size computers (PDAs), cell phones, smart phones, notebooks or tablet PCs) with Internet access makes the creation of contents to these devices a discussed issue in the educational and technological field. Mobile and learn through the distance method will attract more students [3]. The mobile learning is based on the use of mobile devices anywhere at any time. These devices must support wireless technology and have a possibility to present teaching materials [4]. Mobile learning is not just about learning using portable devices, but learning across contexts [5].

The core of learning via mobile devices is that it allows students to be in the right place at the right time, so they can gain experience in an authentic learning environment, wherever that is. M-learning is identified by three different elements [2] :

- Usability and convenience:
  Learners are able to utilize their time even when they are in motion. For example, on the bus or on the train, they can write or read their notes.
- Efficacy   and   expediency:

a. Students can be in one place and collaborate with others who are somewhere else, either via voice calls or SMS messaging.

b. They can access the Internet from anywhere.

c. They can take photo material which they will edit later.

- Immediacy:

Students can directly share their ideas with their partners and thus get immediate feedback.

1.2 Related Work

The following are some studies and researches which can so far associated works to the proposed model of this project:

* Wiesław Półjanowicz et. al. in (2014) [6], showed the organization of distance learning, particularly the idea of b-learning, combining the accomplishment of classes carried on in the traditional way and via computers. The authors presented learning activities related to complementary education herein. Some of these course types may be successfully adapted to an e-learning background. The models and structure of the university virtual environment for distance learning are described. These models illustrated a new approach to creating a virtual space for medical and technical studies where e-learning courses are created to be used for distance education. This work further included a brief overview of technologies used to build interactive elements into learning materials. The authors presented the use of interactive elements in medical education based on examples of certain selected games and animations.

* Manopriya Karthiyayini in (2016) [7], explained M-learning concepts, techniques, components and its need have high level of interoperability between each other running on different operating systems. An outline of various aspects of

design and implementation of mobile-based authentication system for M-learning platform is presented in this project. The project discussed the security in M-learning as a new challenge in implementing the M-learning environment. Also this project was to download data to students using intranet with the help of mobile application.

* Shaibu Adekunle Shonola and Mike Joy in (2016) [8], presented a mobile security enhancement application, designed and developed for Android smart mobile devices in order to promote security awareness among students. The first functionality of the application is 'limiting unauthorized access' to the m-learning device by checking for password security. The second functionality is 'avoiding malware attack' by monitoring permissions requested by applications during installation and paying attention to unusual device behavior. This functionality scans for permissions granted to all installed applications and any suspicious application can be triggered for further analysis and subsequent removal if necessary. The functionality also scans the device for unusual activities in term of resource usage (memory and processing) and gives notifications to the users.

1.3 Problem Statement

The problem of this research is to design and implement a mobile learning system to implement learning at distance. This system has the following requirements:

1- The system is an interaction system between users (students) and supervisor (teacher).

2- The users and supervisor are using the mobile phones.

1.4 Aim of Project

The aim of this project is to build complete wireless interaction mobile phones learning system (E-learning platform). This platform is completely interacted between teacher and students. Also, the platform can be modified in future.

1.5 Project Outlines

The remaining chapters are:

Chapter Two which is entitled Theoretical Background

Chapter Three which is entitled The Proposed Platform and Results.

Chapter Four which is entitled Conclusions, and Suggestions for Future Work.

CHAPTER 2
Theoretical Background

Chapter Two
Theoretical Background

2.1 Introduction

The explosive growth of information technology and communication systems makes our life always changeable. But, this growth depends on theoretical basis. Therefore, this chapter presents the theory of the used software and programming languages.

2.2 Android Studio

Android studio is a giant software environment, launched by Google in 2013, and is considered one of the most popular programming environments, in the field of programming and mobile applications. Android studio makes it easy for programmers to write the source code for Android applications. It also allows the developer to use various applications on different types and sizes of screens, without the need for extra devices or programs. It also supports a fully simulated environment for smart phones and tablets, which made it the first environment programmatically. Android studio supports more than a language such as the JAVA language and Kotlin language [9] .

2.3 Kotlin Language

It is a modern open source Oriented Object programming language developed from multiple languages such as Java and JavaScript.The language is supported by Machine Virtual Java, and JetBrains has developed that language and is the same company that developed IDEA IntelliJ which was built.It has the Android Studio environment and is the platform for building Android applications. This language is designed to be fully compatible with the Java language and JDK package [10].

2.4 Firebase Services [11]

It is a mobile platform that helps you to develop high quality applications, increase the interactive user base and gain profits quickly with your applications. The platform provides many offered and related features that you can mood according to match, including background wallpaper, analytics, and tools to increase app growth and invest in app success. firebase provides a tool for grouping your Android and iOS application formats together, without sharing user data. Firebase is fast and easy. With an easy API SDK, you can focus on solving customer problems and not wasting time building infrastructure.

I. Firebase Cloud Messaging

Formerly known as Google Cloud Messaging (GCM), Firebase Cloud Messaging (FCM) is a cross-platform solution for messages and notifications for Android, iOS, and web applications, which as of 2016 can be used at no cost.

II. Firebase Authentication

Firebase Authentication is a service that can authenticate users using only client-side code. It supports social login providers Facebook, GitHub, Twitter and Google as well as other service providers like Google Play Games, Apple, Yahoo, and Microsoft. Additionally, it includes a user management system whereby developers can enable user authentication with email and password login stored with Firebase.

III. Firebase Realtime Database

Firebase provides a real-time database and back-end as a service. The service provides application developers an API that allows application data to be synchronized across clients and stored on Firebase's cloud.[26][27] The company

provides client libraries that enable integration with Android, iOS, JavaScript, Java, Objective-C, Swift and Node.js applications. The database is also accessible through a REST API and bindings for several JavaScript frameworks such as AngularJS, React, Ember.js and Backbone.js.[28] The REST API uses the Server-Sent Events protocol, which is an API for creating HTTP connections for receiving push notifications from a server. Developers using the realtime database can secure their data by using the company's server-side-enforced security rules.

IV. Cloud Fire store

On January 31, 2019, Cloud Firestore was officially brought out of beta, making it an official product of the Firebase lineup.[30] It is the successor to Firebase's original databasing system, Real-time Database, and allows for nested documents and fields rather than the tree-view provided in the Real-time Database.

V. Firebase Storage

Firebase Storage provides secure file uploads and downloads for Firebase apps, regardless of network quality, to be used for storing images, audio, video, or other user-generated content. It is backed by Google Cloud Storage.

VI. Firebase Hosting

Firebase Hosting is a static and dynamic web hosting service that launched on May 13, 2014. It supports hosting static files such as CSS, HTML, JavaScript and other files, as well as support through Cloud Functions.[32] The service delivers files over a content delivery network (CDN) through HTTP Secure (HTTPS) and Secure Sockets Layer encryption (SSL). Firebase partners with Fastly, a CDN, to provide the CDN backing Firebase Hosting. The company states that Firebase Hosting

grew out of customer requests; developers were using Firebase for its real-time database but needed a place to host their content.

VII. ML Kit

ML Kit is a mobile machine learning system for developers launched on May 8, 2018, in beta during the Google I/O 2018. ML Kit APIs feature a variety of features including optical character recognition, detecting faces, scanning barcodes, labelling images and recognising landmarks. It is currently available for iOS or Android developers. You may also import your own TensorFlow Lite models, if the given APIs are not enough. The APIs can be used on-device or on-cloud.

VIII. Crashlytics

Crash Reporting creates detailed reports of the errors in the app. Errors are grouped into clusters of similar stack traces and triaged by the severity of impact on app users. In addition to automatic reports, the developer can log custom events to help capture the steps leading up to a crash. Before acquiring Crashlytics, Firebase was using its own Firebase Crash Reporting.

IIX. Performance

Firebase Performance provides insights into an app's performance and the latencies the app's users experience.

IX. Firebase Test Lab

Firebase Test Lab provides cloud-based infrastructure for testing Android and iOS apps in one operation. Developers can test their apps across a wide variety of devices and device configurations. Test results—including logs, videos, and screenshots—are made available in the Firebase console. Even if a developer hasn't written any test code for their app, Test Lab can exercise the app automatically, looking for crashes. Test Lab for iOS is currently in beta.

X. Firebase Dynamic Links

Dynamic Firebase links are smart URLs that dynamically change their behavior to provide "the best available experience" across multiple platforms, including desktop web browsers, iOS, and Android, and in-depth links to mobile apps. Dynamic Links work in all app installs: if the user opens Dynamic Link on iOS or Android and the application is not installed, the user will be prompted to install the app first. Once installed, the application will start running and can access the link.

CHAPTER3
The Proposed System

Chapter Three

Proposed System and Results

3.1 Introduction

In this chapter the details of the proposed system is presented. Description and architecture of the proposed system are explained in this chapter. The results are given implicitly through sections of this chapter.

3.2 Proposed System Description

The proposed system is a special system for the e-learning process that contains tools that help in the education process. The proposed system includes the creation of electronic classes to make the interaction between the student and the teacher more easy, as well as it contains a chatting system. Chatting system makes communication easier between the (student and the teacher) and (the student and another student). The proposed system contains a special notification system to alert the students to all new notifications. The architecture of the proposed system is shown in figure (3.1).
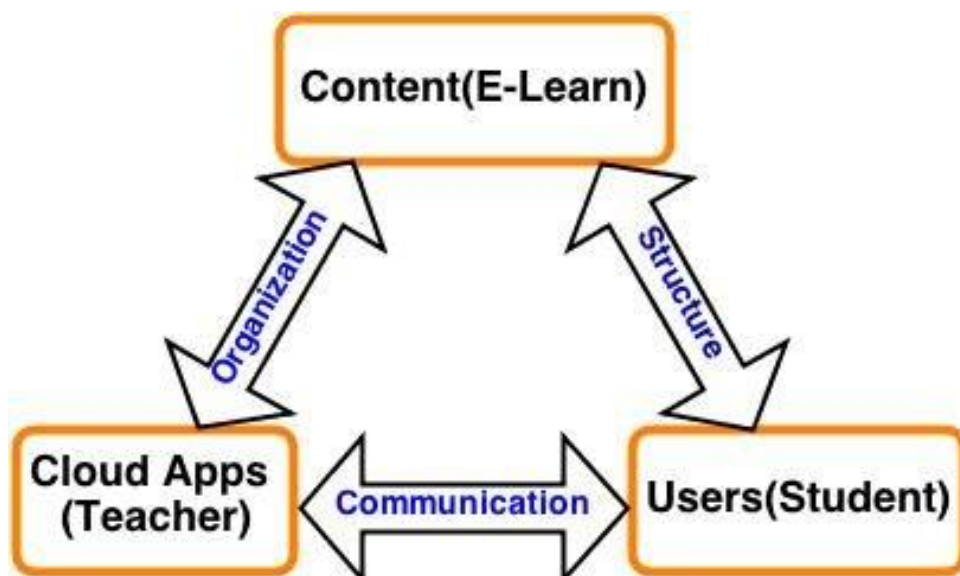
Figure 3.1: The Proposed System Architecture

3.3 Registration in the Proposed System

The first step in the proposed system is to register in the system where you need to enter your basic personal information. These information are full name, email, and password. If the user does not enter one of the required data and left it blank or enter the wrong data, the application will send an alert to the user to inform him or her about that. the registration page is shown in figure (3.2).

Figure 3.2: Registration Page

3.4 Login in the Proposed System

After registration in the proposed system with the email and password, the student logs in automatically.   But if you have logged out of your account or want to switch the account, the system automatically saves your registration information. The login page is shown in figure (3.3).

Figure 3.3: Login page

3.5 Electronic Class Creation

The teacher can easily create an electronic class by writing the class name and the department name for that class. When the teacher clicks on the electronic class will be created with a unique random code for that class so that students can enter the class through it. The page of creation electronic class is shown in figure (3.4).

Figure 3.4: The Page of creation Electronic Class

3.6 Joining an Electronic Class

The student can join any electronic class through unique random code that the system was generated. After inserting student code, the system will check the code and search whether the code and the class are correct. The proposed system will send an alert to the absence student. The web page of joining a class is shown in figure (3.5).
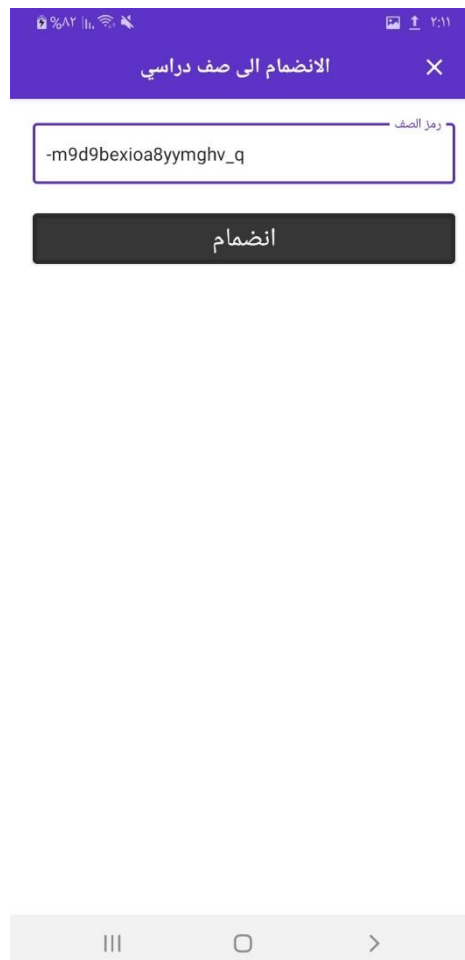

Figure 3.5: Page of Joining A Class

3.7 Classrooms

After creating the specified class by the teacher, and the students joined this class, all classes appear on the classroom page as shown in figure (3.6). The class name, the name of the department, and the number of students are appeared to the teacher. But the name of the class, the name of the department, and the name of the teacher are appeared to the student. The student can cancel his \ her registration in the class. But, the teacher can delete the class.

Figure 3.6: Page of Classrooms

15

3.8 Posts Pool

When the classroom is opened, the formal teacher and students will meet in post pool page. In this pool the teacher and students are interacted by their posts and comments. The date of posts are documented in the pool. The option of deleting comments are permitted. posts pool page is shown in figures (3.7 and 3.8).
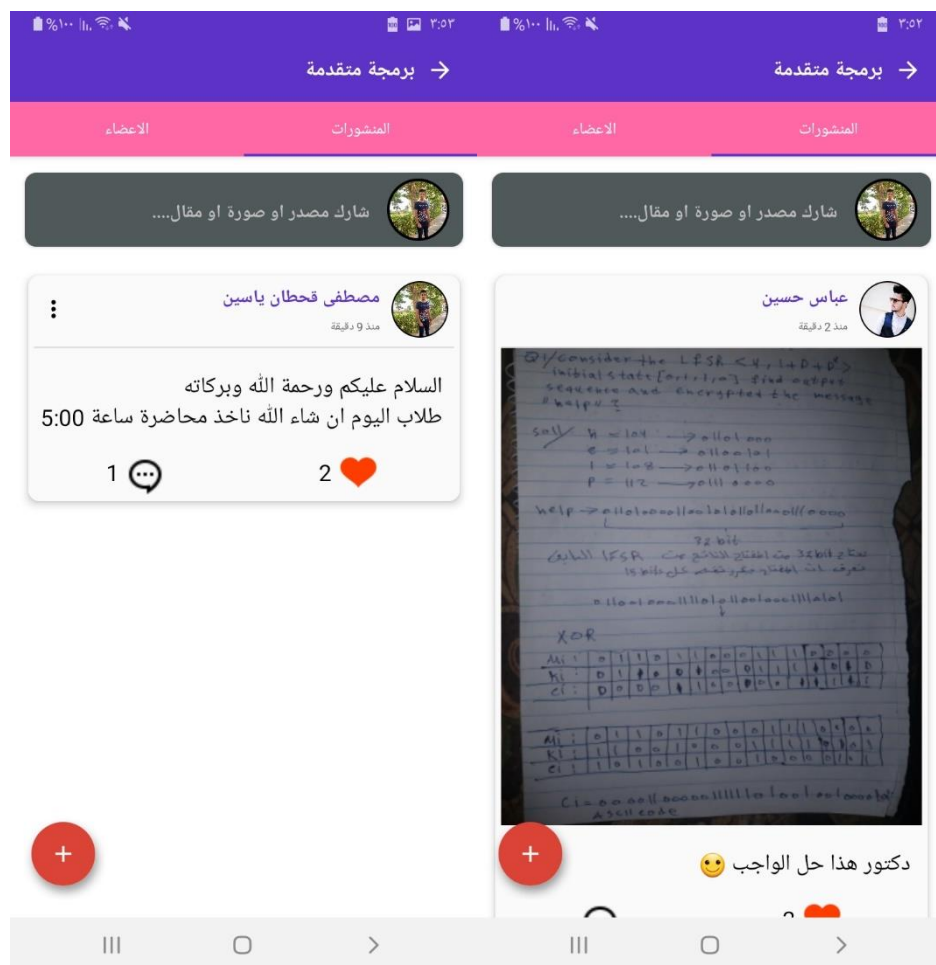

Figure 3.7:Posts Page with Text Post   **Figure 3.8:Posts Page with Image Post**

3.9 Members Page

The list of teachers and members can be illustrated in this page as shown in figures (3.9 and 3.10). Also the code of classroom is clarified in this page and can be given to students who are not participating in class.
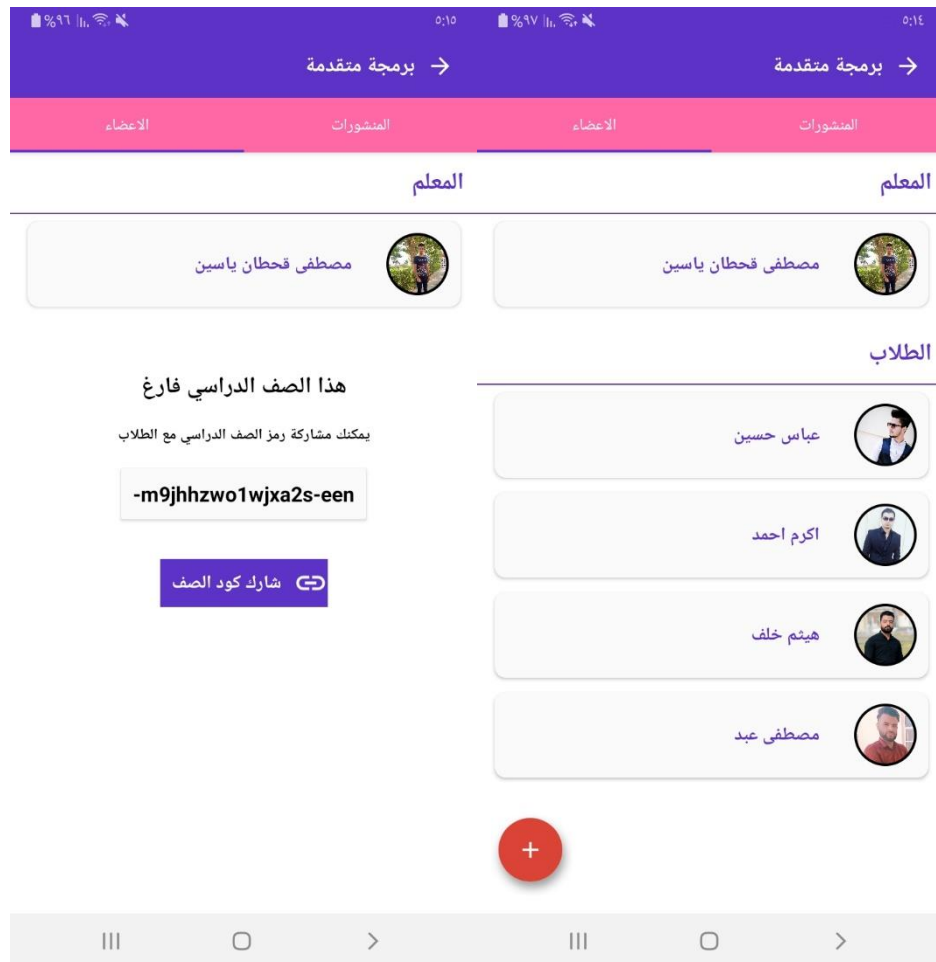

Figure 3.9:An Empty Page of Members Figure 3.10:Page of Members with Students

3.10 Comments Page

All comments can be seen when comment icon or any post are clicked. The student and the teacher can interact easily with any post through this page. Comments page is shown in figure (3.11).

Figure 3.11:Comments Page

3.11 Add Post

This page is used to add posts to the class where the student and teacher can publish any posts related to this class. Two types of medias (text and image) can be shared. This page is shown in figure (3.12).
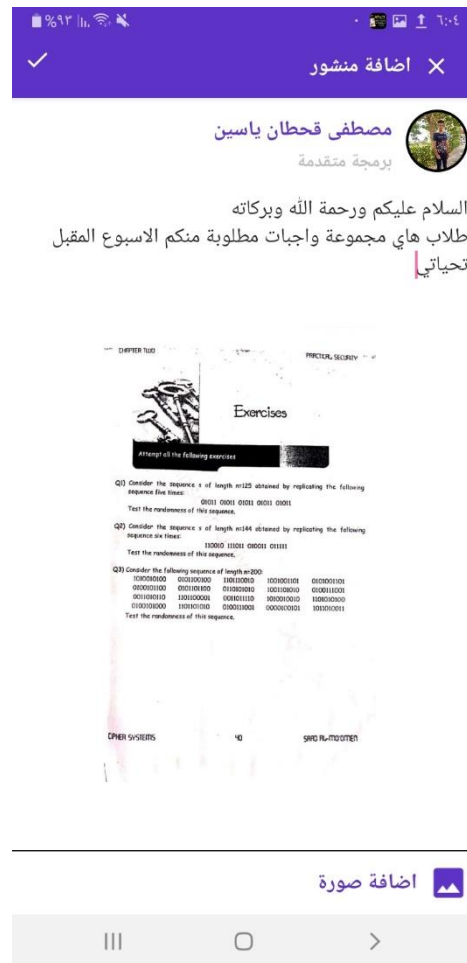

Figure 3.12:Add Post Page

3.12 Private Chat Page

In this page, the student can have a private chat with any other student in the class or with the teacher of class. The time of each private chat is recorded. The private chat page is shown in figure (3.13).
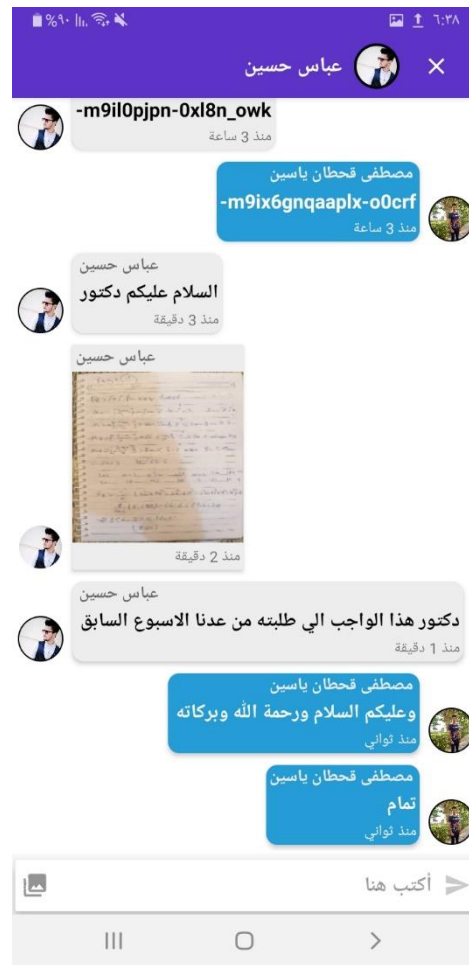

Figure 3.13: Private Chat Page

3.13 Notifications

In this page, a notification will be sent to all class students to alert them about what the teacher has shared. There is a feature to receive all notifications while the application is in the background. This page is shown in figure (3.14).

Figure 3.14: Page of Notifications

3.14 Account Settings Page

In this page, the student can update his\her name in the account, update the profile picture, log out, or delete the account. Account setting page is shown in figure (3.15).

Figure 3.15:Account Settings Page

CHAPTER 4
CONCLUSIONS AND SUGGESTIONS FOR FUTURE WORK

Chapter Four
Conclusions and Suggestions for Future Work

4.1 Introduction

In this chapter, some inferred conclusions are presented and some suggestions for future work are given.

4.2 Conclusions

In this research a proposed system for e-learning platform has been presented. This platform works on Android phones by Android Studio Framework as front end and Firebase service as back end. This combination added high flexibility in the process of storing data.The proposed project is able to provide an e-learning environment by providing tools that aid in education, such as creating electronic classes and providing private chat used to enhance interaction between the teacher and students.

4.2 Suggestions for Future Work

In spite of the proposed system is working properly , but it needs some modifications such as :

- Add new tools for security.
- Adding other ways to register in the system, for example through a Google account or a Facebook account.
- Adding feature in private chat to send different types of files such as video files, audio files and pdf files... etc.

- Adding a teacher's section for homework.

- Adding more information on the profile page.

- Adding voice and video chat to facilitate more interaction between students and the teacher.

- Adding ability to know who liked your post.

- Programming the proposed system to work on the iOS phones system.

References

[1] S.Hassan Hashem, " Modifications to improve the Mobile Commerce Security", Ph.D dissertation, University of Technology, 2006.

[2] Saeed Zare, "Intelligent Mobile Learning Interaction System (IMLIS)", A Personalized Learning System for People with Mental Disabilities, Bremen, germany, 2010.

[3] Bottentuit Junior and João Batista, " Virtual Laboratories and MLearning: learning with mobile devices.", Proceedings of International Milti-Conference on Society, Cybernetics and Informatics, pg. 275-278, Orlando, EUA. Julho, 2007.

[4] Evgeniya Georgieva, Angel Smrikarov, and Tsvetozar Georgiev, " A General Classification of Mobile Learning Systems ", International Conference on Computer Systems and Technologies - CompSysTech' 2005.

[5] Chung-Ho Su and Ching-Hsue Cheng, " 3D Game-Based Learning System for Improving Learning Achievement in Software Engineering Curriculum", TOJET: The Turkish Online Journal of Educational Technology, Volume 12, Issue 2, April 2013.

[6]   Wiesław Półjanowicz, Magdalena Roszak, Barbara Kołodziejczak, and Wojciech Kowalewski, " Using a Virtual Learning Environment as a Key to the Development of Innovative Medical Education ", Studies in Logic, Grammar and Rheroric, Vol. 39 , No.(52), Poland, 2014.

[7] Manopriya Karthiyayini, " Developing M-Learning Application in Intranet ", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 6, Issue 5, India, May 2016.

[8] Shaibu Adekunle Shonola and Mike Joy, " Enhancing Mobile Learning Security", International Journal on Integrating Technology in Education (IJITE) Vol.5, No.3, September 2016.

[9] Frederic Lardinois, Internet survey, "Kotlin Google's Preferred Language for Android Application Development ", https://techcrunch.com/2019/05/07/kotlin-is-now-googles-preferred-language-for-android-app-development, Retrieved in May 8, 2019.

[10] Internet survey, " Learn Kotlin " , https://kotlinlang.org/docs/reference/ , Retrieved in 1/3/2020.

[11] Internet survey, " Firebase ", https://en.wikipedia.org/wiki/Firebase , Retrieved in 26/1/2020 .