GAMIFICATION AND AI IN EDUCATION

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering.

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APPROVAL

This thesis titled "**GAMIFICATION AND AI IN EDUCATION**" submitted by Md.Ashiqur Rahman Rifat, ID No: 151-15-5264 & Mejbah Uddin, ID No: 151-15-5286 & Md. Nurul Alam Tawhid, ID No: 151-15-5063 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial. Fulfillment of the requirements for the degree of B.Sc. (Bachelor of Science) in Computer Science and Engineering (BSc) and approved as to its style and contents. //The presentation has been held on 09-12th December 2018.

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We hereby declare that, this project has been done by us under the supervision of **Dr. Sheak Rashed Haider Noori, Associate Professor and Associate Head Department of CSE,** Faculty of Science and Information Technology, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

During these days, Gamification has become a great tool to create a more engaging and efficient e-learning. In this report, various technologies / websites which deal with gamification and provides IT interaction between students and teachers are conferred and examined. In this report a new system of gamifying E-education which might be used at universities to permit participation of scholars in lectures and competition between students, is analyzed and created. Documentation for this method is additionally contained within this report. Thesis is over with possible future upgrades of developed system.

Keywords: Gamification, E-Learning Platform.

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CHAPTER 1

Introduction

1.1 Introduction to Gamification and AI in Education

Like the internet, social networks and mobile phones are an enormous range of contemporary technologies are on the market these days thanks to the fast development of data technology that contributes to the flourishing of human life. Technology has a very important impact on learning. E-learning is one amongst the foremost common platforms of learning for student featured by new Technology [1], [2], [3], [4], [5], [7]. The primary focus of E-learning is to create a platform for the coed to find out and remotely make a reference to the teacher. However most of the e-learning systems don't win the required objectives because of non-compliance and lack of techniques and strategies for the event of online information systems. User Satisfaction is one amongst the foremost vital factors in achieving success in Education. The educational methodology and analysis methodology in education is thus monotonous. So, the thought of rematerializing game mechanics for learning isn't new [6], [7], [8]. Adapting game mechanics for non-game application is defined as Gamification. Gamification in Education's main goal is to have interaction with the scholars additional in Education through a game where score board, leader board and change feedback provides gamified surroundings in non-gaming context. Adaptation of technology and gamification can produce fun surroundings in learning which is able to take away the monotonous methodology of learning and analysis. Gamification can increase the engagement of student in e-learning with effectiveness, potency and motivation. In an exceedingly gamified content, the learners are hooked by fun and rewarded with data and ability. The deployment of gamification in Education is obtaining standard day by day. This report presents a prototype of a learning and analysis platform supported by gamification. The prototype is based mostly on a website wherever students can know completely different form of choice to learn and also the assets themselves in an exceedingly gamified platform.

1.2 History

Gamification refers to the appliance of game dynamics, mechanics, and frameworks into non-game applications. The thought of Gamification has been around for quite a hundred years. However, with recent enhancements and advancements in technology also as accumulated interest in creative person approaches to education, gamification has recently become associate degree interest to educators. Although the term of Gamification was appeared within the context of pc code in 2008. But before 2010, it was not that abundant in style. In Education Gamification was 1st appeared in 2009 wherever a sixth-grade category completed quest to find out during a game-based setting. In 2012 45000 folks listed during a course of Coursera regarding Gamification [7],[8].

1.3 Rationale of the Study

Education with E-learning is obtaining standard day by day. However, the monotonous system of learning and analysis contains a Brobdingnagian impact on education. Learning programming looks laborious and at intervals some days it makes bore the coed. Game connect individuals therefore fleetly that the gamers don't even notice the deep bonding between them [3], [4]. Programming learning in a very game may be a non-gaming context. To form fun surroundings in learning and measure a student's ability through a game are going to be more practical in learning and analysis. It will facilitate the coed and teacher to attach themselves in a very diverse platform which is able to provide a lot of fun than the regular lectures. A gamified E-learning platform will amendment the full E-learning System.

1.4 Research Questions

What are the significance of Gamification on students who are learning on an E-learning platform and participating in self-assessment? The main purpose of this study is to find the effect of Gamification on an E-learning platform as well as on the evaluation of learners. This also enables us to provide a platform with a greater teacher student interaction.

1.5 Expected Outcome

In this project we will be evaluating the effect of gamification on an e-learning platform which mostly prioritizes on evaluation of what the learners have learnt. Gamification in E-learning will take over the monotonous and boring learning method. Students will be able to interact with the study materials and will get interest in learning. Learning about programing and evaluation method will be easier and gamified platform will increase the engage and effectiveness in learning.

1.6 Report Layout

In this chapter, we have discussed the introduction, history, rationale of study, research question and expected output of our research on Gamification and Ai in Education. Later followed by the thesis layout.

In chapter 2, we will discuss about the current situation of E-learning, related work comparative studies and scope of the problem in this section.

In chapter 3, we will discuss about our research subject and instrument as well as our research methodology.

In chapter 4, we will discuss about the development of our Gamified platform.

In chapter 5, we will discuss about the development tools and language to be used in our research.

In chapter 6, we will discuss about the experimental result and descriptive analysis of our research.

In chapter 7, we will discuss about the conclusion and the future scope of development for this project.

CHAPTER 2

Background

2.1 Introduction

In this section, we are going to discuss about the related works on gamification, compare between some similar gamified e learning platforms, also with our developed platform. This area was chosen for its vast diversity and sectors that can be worked with.

For this project, we needed to concentrate on a few things. An important aspect of this project was to find out the area which we wanted to work on. We chose the area by evaluating existing works on gamification on e-learning platform.

2.2 Related Work

There are some E-learning platform which are gamified but not in the evaluation part or if its, there is no learning section [10], [11], [12]. Although we get some related work for it like, These examples prove that the technology can be used in cooperation with teaching practices to make life for teachers and students easier, better and more engaging .They also show that the technology is still not being used to its maximum potential in education sphere .One of the aims of this research will be to create technological tool that is easy to use, so it can be used throughout all educational system, if that will be desired. Here we state some related work in our research sector:

In the paper "Raising engagement in e-learning through gamification" [14], authors talked about the persuasive technologies in aspect of gamification. For this they applied Fogg Behavioral Model [15]. The model is based on three key elements: motivation, ability and trigger. A target behavior is determined when these three occurs at the same time [15]. The authors also explained the concept and definition of gamification as well as exemplifying how gamification can be applied in e learning platforms.

In the paper "Gamification in E-Learning" [16], authors talked about the potential of using game components in e-learning. They also explained the reasons to ask learners to play. Afterwards the explained the components of gamification designing model.

In the paper "How to gamify? A method for designing gamification" [17], authors sought to advance the understanding of the best practices related to Gamification. Following Design Science Research Approach, firstly they synthesize the available body of literature at that

time on methods of designing gamification and also interviewed 25 gamification experts. Then from the gathered knowledge they developed a method for gamification design. At the final stage they evaluated their method by interviewing 10 gamification expert.

In the paper "Measurement of the effects of e-learning courses gamification on motivation and satisfaction of students" [18] authors present the result of a two stage study where first stage was the literature search findings of other author's research. And the second stage was their own assessments.

In the paper, "Effect of personalized gameful design on student engagement" [19] authors studied the possibility of a personalized gameful experience in motivating and engaging students. Their study revealed that personalization works better than generic approaches in all aspects.

The websites "Kahoot"[10], "SoloLearn"[11], "CodeCombat"[12] [Accessed 24 August, 2018] are all commercial gamified platform that is vastly used. They provide various types of games to educate their learner on a specific topic.

Existing works on gamification have indicated that education and learning are the most common contexts for research on gamification (Koivisto & Hamari, 2017; Hamari, Koivisto & Sarsa, 2014; Seaborn & Fels, 2015). Literature reviews on gamification of education and learning specifically have also been conducted, however, all of these reviews have limited their scope in one way or another: Caponetto et al. (2014) as well as Marti-Parreño et al. (2016) concentrate mainly on bibliometric analyses and terminological aspects. Marti-Parreño et al. (2016) also categorize constructs studied in the literature. Some literature reviews have been limited by the number of studies included: de Sousa Borges et al. (2014) limited their review to 26 studies; Dicheva et al. (2014) included only 36 studies, and Dichev and Dicheva (2017) have reviewed 63 studies. Nah et al. (2014) have included 15 studies in their review.

2.3 Scope of Problem

Since the beginning of e-learning, it has grown beyond imagination. The influence of technology in all aspect of life has made it more acceptable to learners as well as teachers. After the word Gamification surfaced in 2008[13], the concept of e learning has drastically changed its course. But the main problem of e-learning is that it lacks the emotion and

teacher-student engagement. Addressing this problem, combining game concepts and mechanics with e- learning platforms have created a powerful learning tool. The vast majority of e-learning platforms are devoted mainly on creating a platform through they can teach. But about none of them has any proper gamified method to evaluate what the learners have learnt from the platform. Addressing this issue, we created an e-learning platform with the capability of evaluating what the learners have learnt from the platform.

CHAPTER 3

Research Methodology

3.1 Introduction

For this study, we constructed a gamified learning platform with the capability of evaluating learners. We selected a group of undergraduate level students and encouraged them to use our platform. Their feedback was the primary data for our research. Additionally, we collected the feedback data from our platform.

3.2 Research Subject and Instrumentation

For our research subject we choose undergraduate students of various University. They all consensually participated in our study experiment. We choose undergraduate level students because they possess better knowledge for understanding our platform and capable of providing unbiased opinion.

3.3 Data Collection Procedure

Primary data is defining it as data that has been collected for the purpose for which it is originally used [9]. Primary data for this particular research was collected using questionnaires. These questionnaires were given to our research subjects after they have tested our gamified platform. We divided the volunteers into two groups "Group A" and "Group B". "Group A" used our developed gamified platform "Epitome" and filled up the survey form. On the other hand "Group B" used a simple non-gamified assessment platform. Primary data collection was given higher priority in this research as there were not much previous published data on this particular topic.

CHAPTER 4

System Architecture

This part of our report contains all relevant information about the system architecture of our developed gamified platform and ER diagram of our database.
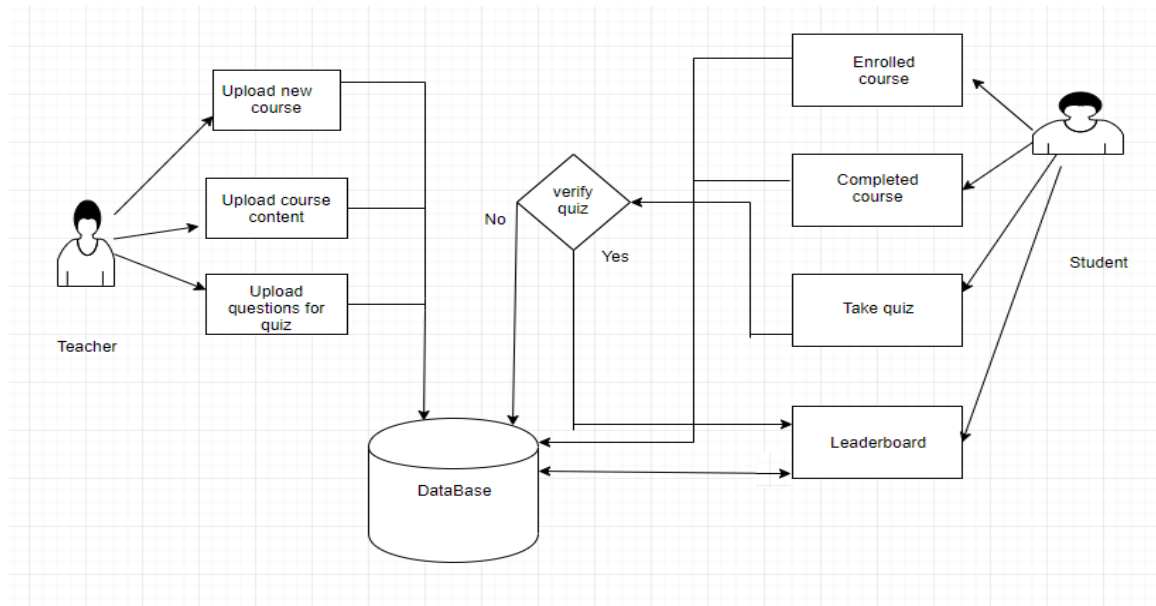
4.1 Architecture

Figure 4.1: System Architecture

From Figure 4.1, we present the system architecture of our gamified e-learning platform Epitome.

At starting of the process the teacher needs to login after completing the registration process, then he can create new courses where he or she can upload the course material teacher also can upload the question for evaluation regarding that topic. After completing the registration process, student can login .Then students can enroll in desired course he/she wants to. After enrollment students can collect the course material which is provided by the course teacher. After getting familiar with the course material, a student can evaluate themselves by taking the Quiz provided by the teacher. Participating in a quiz, depending on the number of correct answers, students XP level is increased. The system provides a leaderboard based on this XP level.
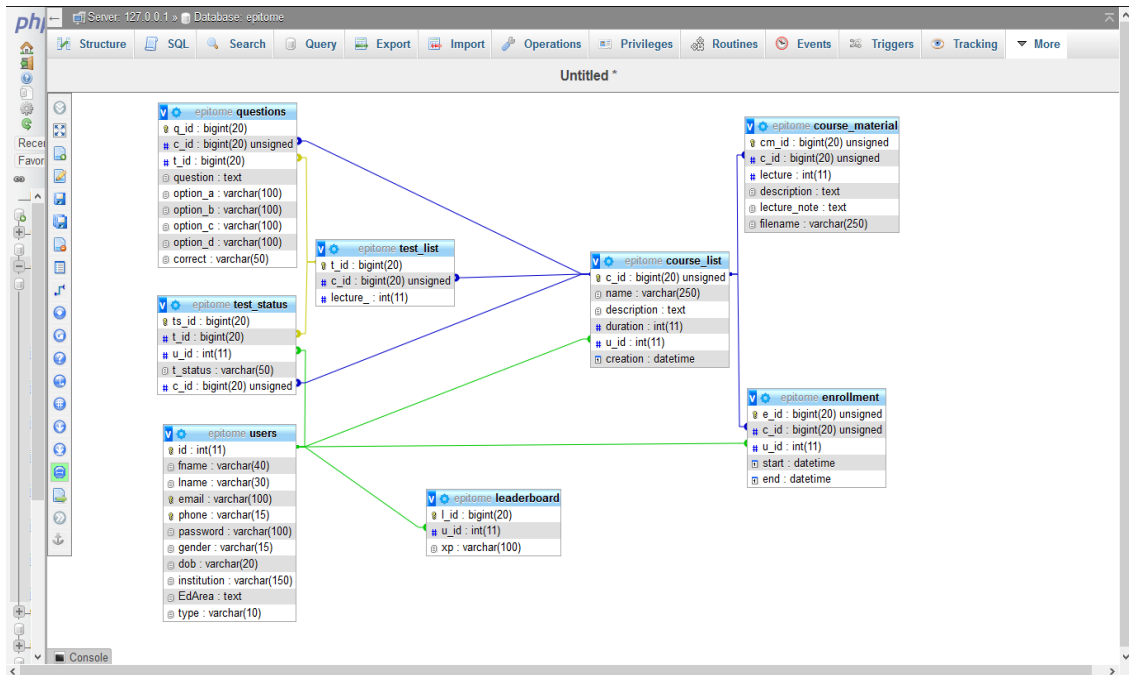
4.2 ER Diagram

Figure 4.2: Entity Relationship Diagram

From Figure 4.2, we present the entity relationship diagram of our database. Our database contains 8 tables in total. Table "questions" contains all quiz questions, Table "test_status" contains information of tests completed by a student. Table "users" contains all personal details and login information of a user regardless if the user is a teacher or a student. Table "test_list" contains all test and their corresponding lecture number. Table "leaderboard" contains xp level required to create and show leaderboard. Table "course_list" contains course details and description and table "course_material" contains lectures, heir description and other uploads by course teacher.

CHAPTER 5

Design Specification

5.1 Gamified Platform Development

In this chapter we are going to discuss in detail about our developed gamified platform "Epitome" and the navigation throughout the platform.
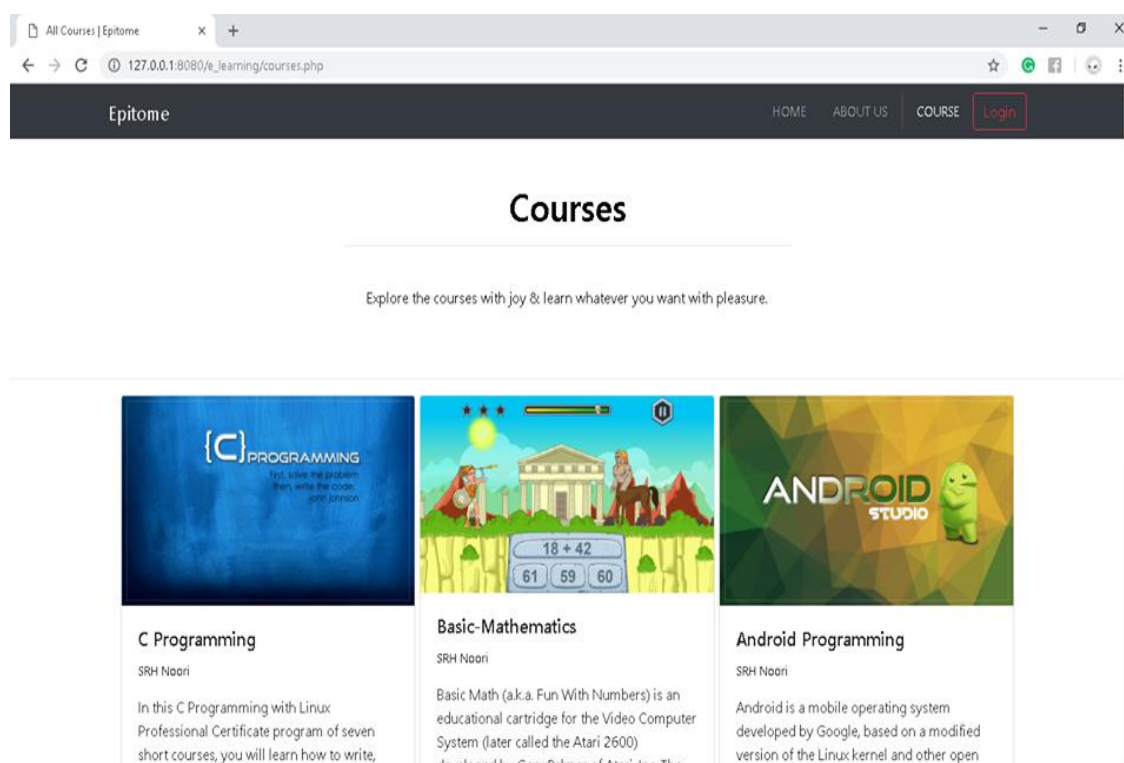

Figure 5.1: Landing page

From Figure 5.1, we present a screenshot of our platforms landing page. Upon entering this page will be shown to the user. This page facilitates all basic information about our work, our motto and all the courses we currently provide. A visitor can see those course details. But to enroll in course visitor has to log in as a user or if they don't have an account they might open one from Student Sign Up page shown in Figure 2.
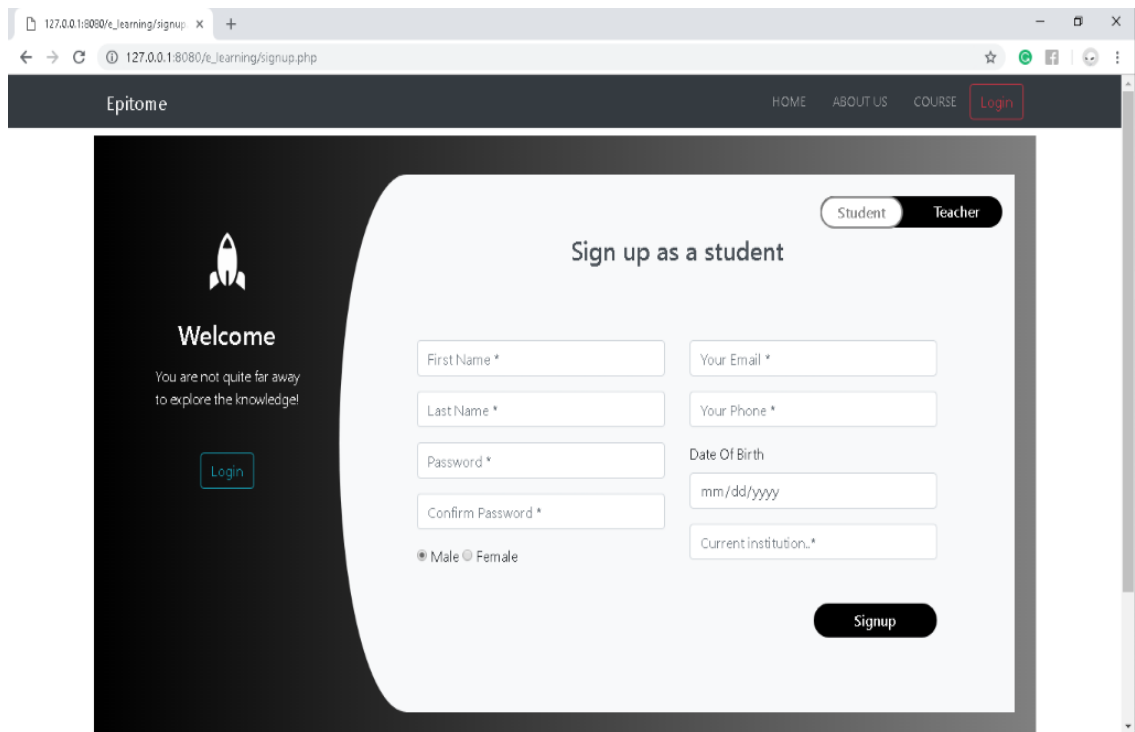
Figure 5.2: Student Sign Up page

From Figure 5.2, we present a screenshot of our student sign up page. This page enables a user to sign up as a student. To sign up a student has to provide his/her name, mailing address and a phone number. They also have to provide a password to log in, their birthdate and the current institution they are in.
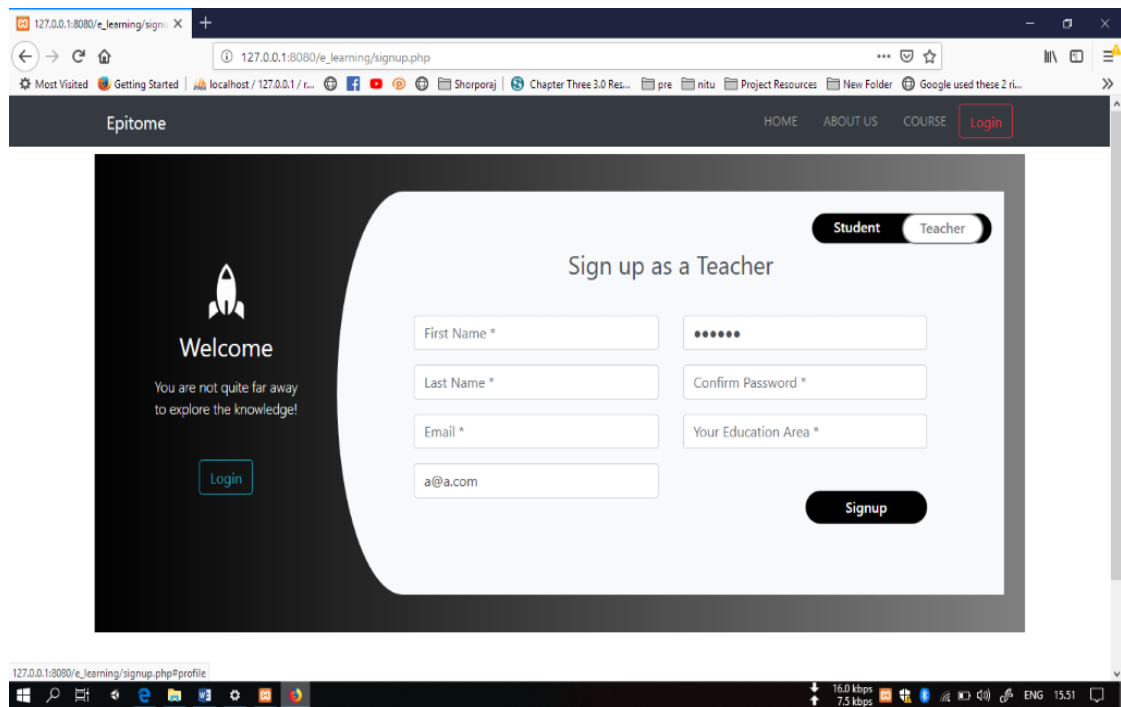
Figure 5.3: Teacher sign up page

From Figure 5.3, we present a screenshot of our Teacher Sign up page. This page is for those who wants to create a class in our system, provide study materials and equivalent evaluations for that course. Teacher needs to provide his/her name, mailing address and a password for relevant account. Teacher also needs to provide his/her teaching area for signing up.
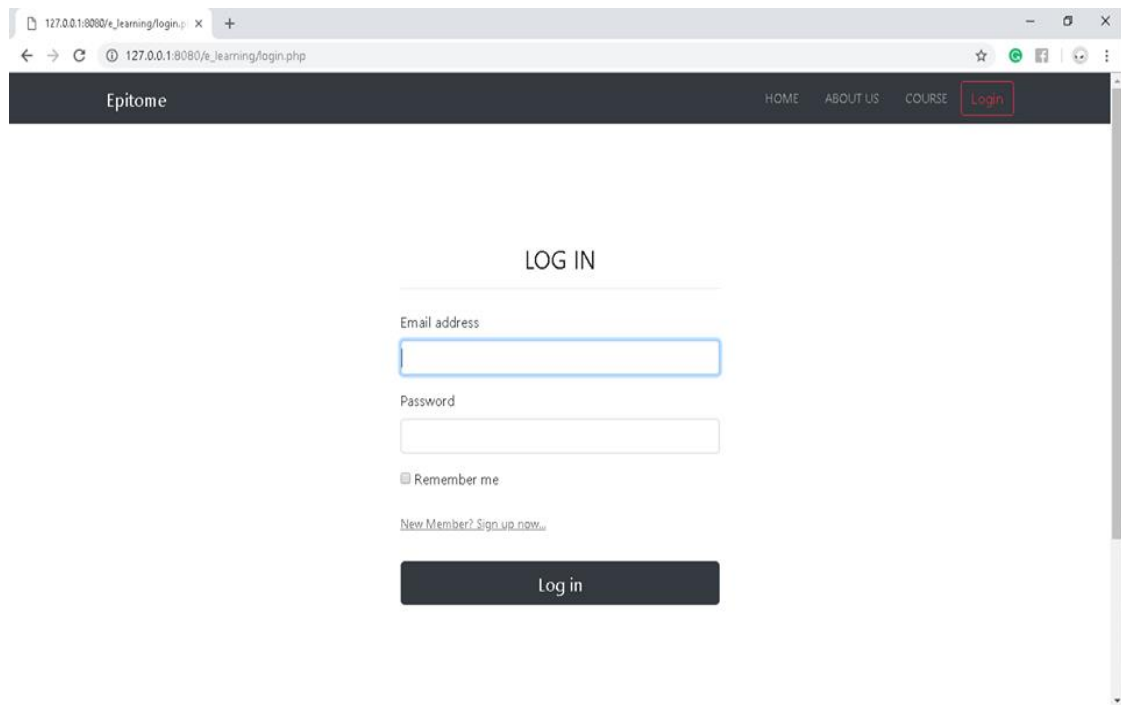
Figure 5.4: Login page

From Figure 5.4, we present a screenshot our login page. Logging in this page allows a Student to enroll in various courses provided by our Teachers. They can also manage their account, view his/her course Dashboard shown in Figure. On the Other hand, this page also enables Teachers o log in. Logging in as a teacher unlocks features like Creating Course shown in Figure 4., upload study material as shown in Figure 4., and upload questions for his/her respective course evaluation. Our system allows Teachers to create multiple course and within those multiple courses they can create multiple quiz for evaluating his/her student.
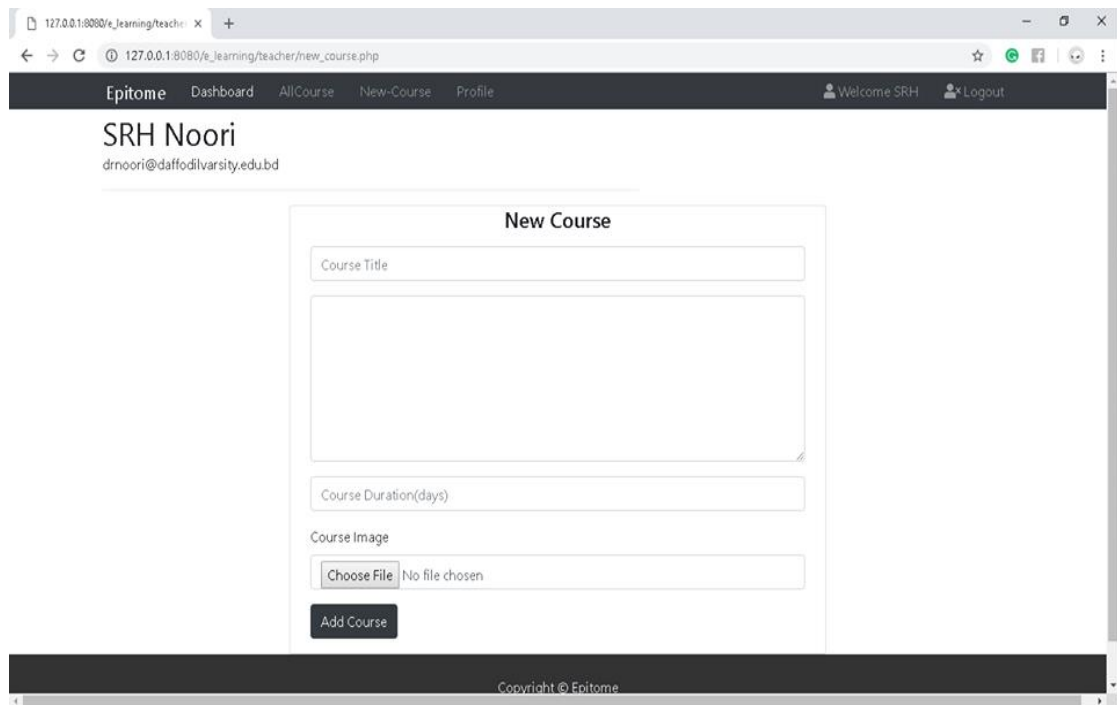
Figure 5.5: Course Creation page

From Figure 5.5, we present a screenshot of our course creation page of a teacher. To create a course Teacher must provide a course name, a small description about the course. Teacher can also upload a cover photo for the course. After creating a course, a Teacher is provided with the option of creating various lecture as shown in Figure 5.6.
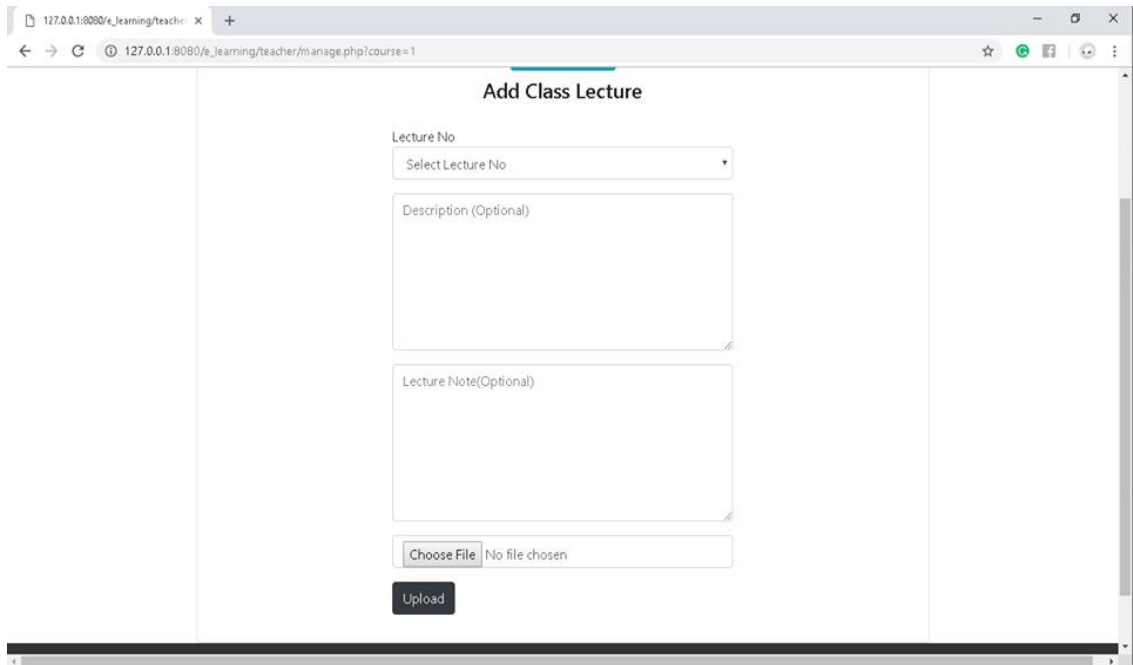
Figure 5.6: Adding Class Lecture as teacher

From Figure 5.6, we present a screenshot of our lecture upload page. A teacher can upload his lecture from this page. To upload a lecture a Teacher needs to provide a Course name and related course materials. A Teacher can also add short description for the lecture he/she is creating. Uploading a lecture enables the quiz creation feature shown in Figure 5.7.
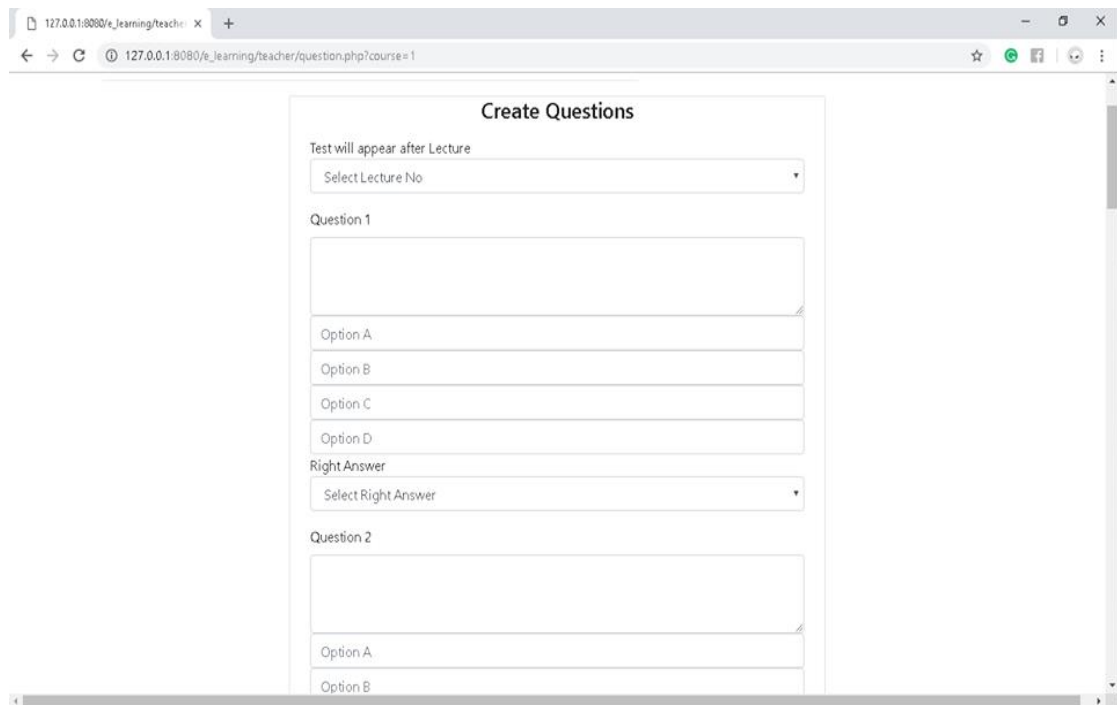
Figure 5.7: Creating Quiz question as Teacher

From Figure 5.7, we present a screenshot of a Teachers Quiz question creation page. To create a quiz Teacher first has to select the lecture number the test is for, then he/she has to provide 10 multiple choice questions and their respective options. After providing question Teacher has to provide the right answer for the questions. After creation this will appear in enrolled students' dashboard.
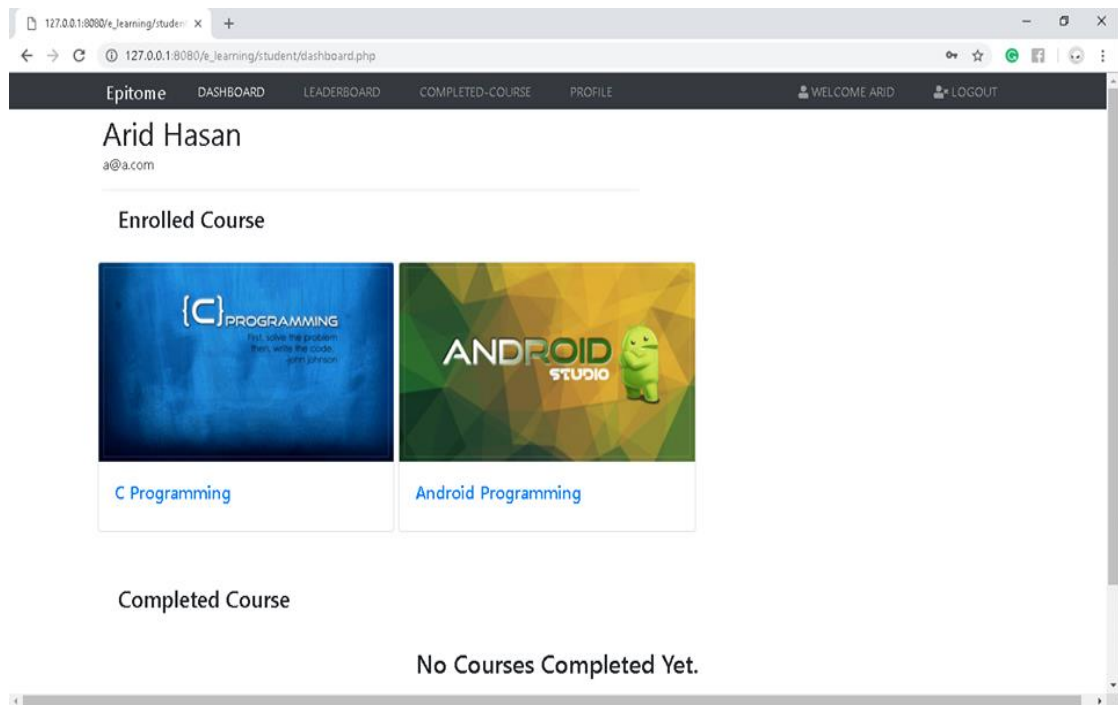
Figure 5.8: Student Dashboard

From Figure 5.8, we present a screenshot of our student dashboard. Student Dashboard provides all the information about a student enrolled courses and the courses he/she has completed. Entering a Enrolled course provides him all the resource material of the course and take quiz option as shown in Figure 5.9.
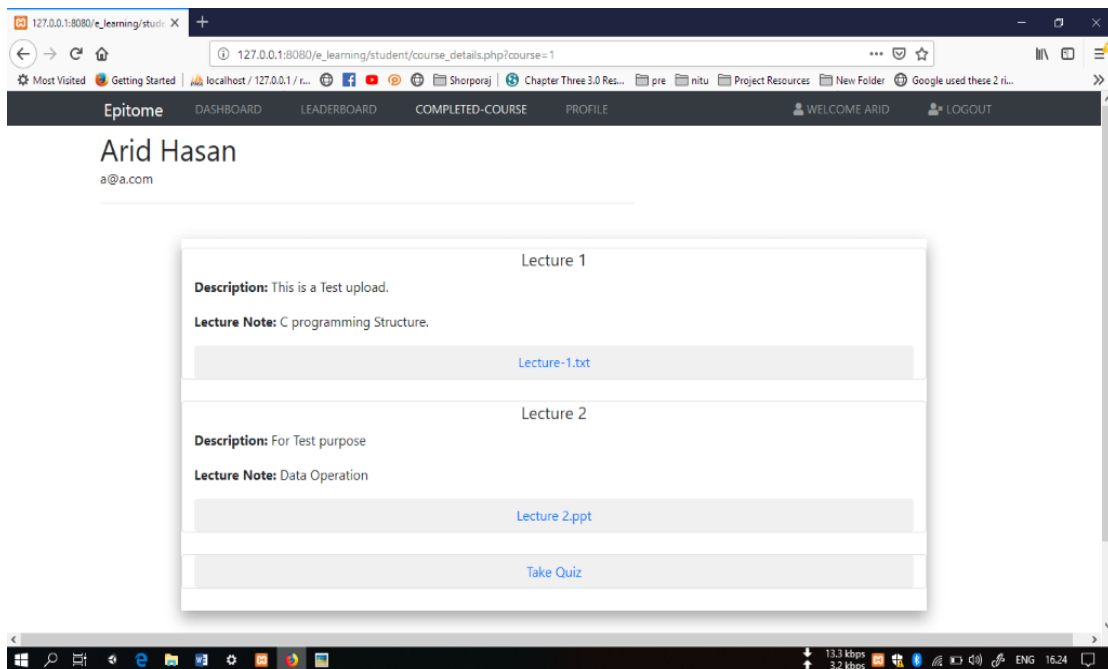
Figure 5.9: Enrolled course Details

From Figure 5.9, we present a screenshot of a student's enrolled course. In this page he/she can download his/her course material from all the lectures provide by Teacher. This page also enables a student to play a quiz game shown in Figure 5.10 for different lectures provided by the Course Teacher.
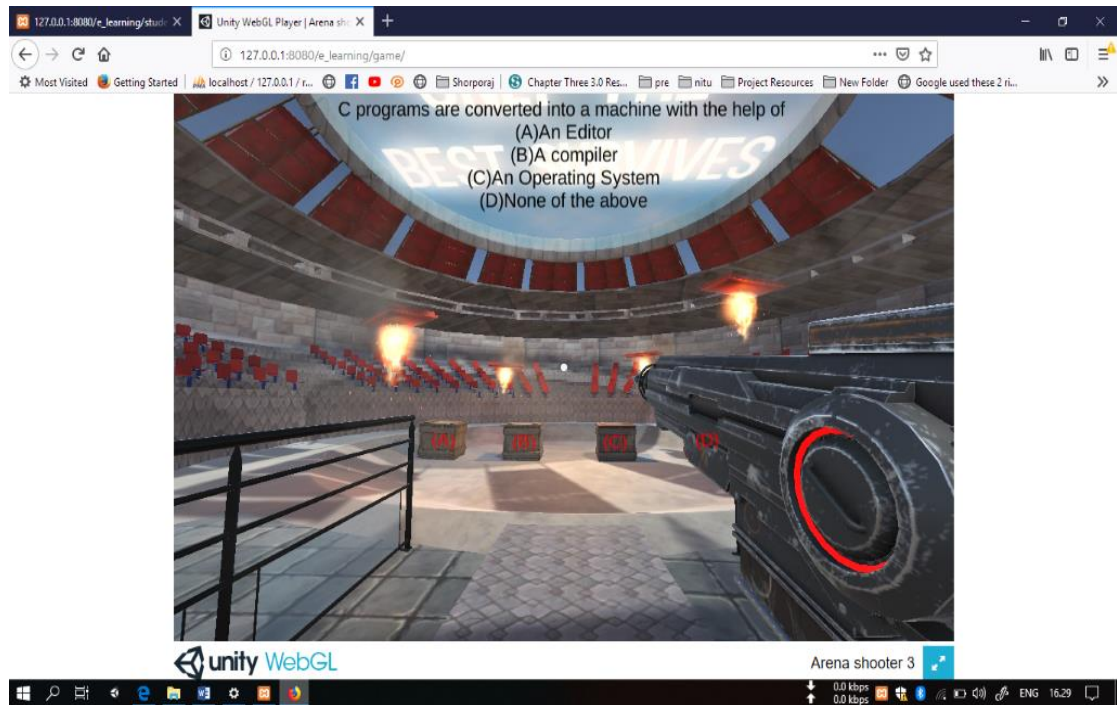
Figure 5.10: The game

From Figure 5.10, we present a screenshot of our quiz game. After a student choose to take a quiz for a lecture, he/she will be redirected to the game where the questions provided by the teacher will be shown and student can shoot down, he options crates to choose his/her answer. Choosing a right answer will take him to the next question and a wrong answer will end the quiz. Then the student will be provided with the XP he/she gets from the quiz. This XP will be added to his/her profile and will be used to create the Leaderboard as shown in Figure 5.11
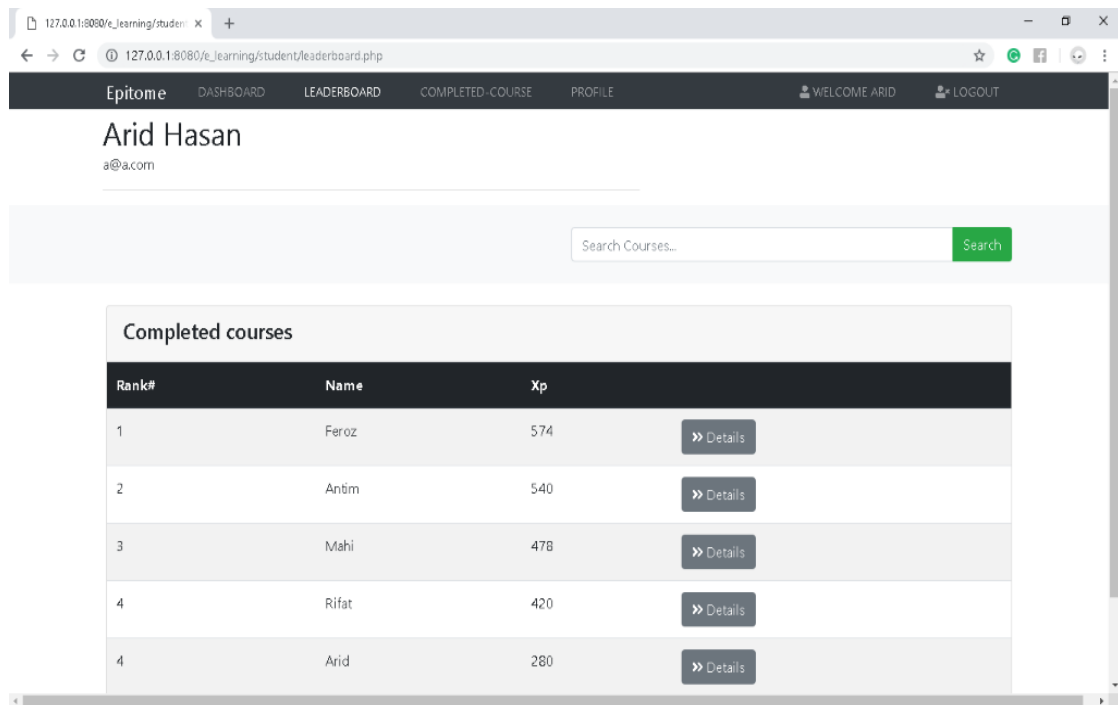
Figure 5.11: The Leaderboard

From Figure 5.11, we provide a screenshot of our leaderboard. This Leaderboard is accessible both from teacher and student side. This Leaderboard shows which student has scored most XP. And more XP means a student has performed better than other students throughout his/her learning period in our system.

5.2 Development Tools

HTML (Hypertext Markup Language)

HTML is a markup language by which we complete whole markup of our development [5].HTML is used in this project to create the basic structure of our gamified platform.

CSS

CSS stands for Cascading style sheet. CSS is used to describe the display style of the elements of HTML. CSS stylesheets are stored as .css files. The CSS specifications are maintained by the World Wide Web Consortium.

Bootstrap

Bootstrap is a framework which makes website designing faster and easier which is based on HTML and CSS templates. Bootstrap supports JavaScript plugins for responsive designing so that the web page can be compatible within mobile, tablets and desktops. It is relatively easy and comfortable to operate with respect to behavior customization. It is also highly customizable.

JavaScript

JavaScript is the most adapted and highly recommended client side scripting language. It is commonly used as a bridge to connect between the HTML contents and the actions browser intends to complete after receiving a user request.

PHP

PHP is a programming language. It is very popular language in new generation developers in web. Because this language is very flexible to use with html. We can easily write PHP code in any HTML tag. As our system is a web-based system for that reason we use PHP for our Back-end Development Language.

MySQL

MySQL is a relational database management system which works on the principals of Structured Query Language. It is mostly used to develop web database as it has the ability of working with ease and flexibility which also includes swift processing with significant reliability.

Unity & Microsoft Visual Studio

Unity is a widely used cross-platform game development engine. It is highly appreciated because of its user friendly interface and cross platform diversity between Windows, HTML5 and mac OS.

Microsoft Visual Studio is an IDE developed by Microsoft Corp. with built in support for Windows Forms, Windows API, Windows presentation Foundation, Windows Store and Microsoft Silverlight. MVS works greatly alongside Unity for Game scripting.

Chapter 6

Experimental Results and Discussion

6.1 Data collection

To reach a conclusion for our research question, we took help of two groups of volunteers naming Group A and Group B. Group A had 31 volunteers who tested and played on our gamified platform Epitome. On the other hand, Group B hand 33 volunteers who used a non-gamified platform (Google Forms). They answered the same survey form and from that we formed our result of this research.

6.1.1 Survey Form

In this subsection of our report, we present our questionnaire used to collect opinion from our volunteers.

Gamification and AI in Education

Gender: Male ☐ Female ☐

NO	Question	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)
1	I liked the core idea of this Platform	☐	☐	☐	☐	☐
2	By using this platform, I can evaluate myself more successfully	☐	☐	☐	☐	☐
3	The usage of this platform helps me to complete my evaluation faster.	☐	☐	☐	☐	☐
4	After using this platform, I am more eager to see what I have learnt comparing to others.	☐	☐	☐	☐	☐
5	I would like to put my time and energy in using this platform for evaluating myself	☐	☐	☐	☐	☐
6	This platform made me more engaging towards learning and evaluating myself.	☐	☐	☐	☐	☐
7	After I used this platform, I found it easier to compare my knowledge with others.	☐	☐	☐	☐	☐
8	I can enhance my knowledge and skill by evaluating myself through this platform.	☐	☐	☐	☐	☐
9	I could easily develop empathy with the tasks and goals of this platform.	☐	☐	☐	☐	☐
10	I would love to continue playing this type of application.	☐	☐	☐	☐	☐

6.2 Experimental Results

In order to answer the research question, the data analysis method is described in Table 6.1, as follows

Table 6.1: Analysis Summary

Research Question	What are the significance of Gamification on students who are learning on an E-learning platform and participating in self-assessment?
Process	A comparison of Group A and Group B in terms of engagement and satisfaction.
Method	Mann Whitney U test
Input	Survey

We run Mann Whitney U test, which is commonly used to check the heterogeneity of two ordinal sample. The starting observation is that the observation of both groups are independent. Therefore, under the null hypothesis we can state that, the starting distributions of both groups is same, whereas the alternative hypothesis states that the values of one of the sample tends to exceed those of the other(Group A vs Group B). As we have a p value of p=0.00072 which is lower than the confidence level of 0.05, we can reject he null hypothesis implying that one group has more statistical significance than the other. Descriptive analysis is shown as follow:

Table 6.2: Comparison between groups

GROUP	Descriptive Analysis					
	N	Mean	StDev	Min	Median	Max
Group A	31	41.806	4.558	35	42	50
Group B	33	37.636	3.927	28	37	45

From Table 6.2, we can clearly see that Group A has larger mean than Group B. So we can conclude that Group A data is more significant in this particular case.

6.3 Summary

Evaluating data from 6.1, we can say that Group A, who used our gamified platform Epitome, provided more statistically significant data. Therefore we can conclude by saying that Group A test subjects indicated more satisfaction and engagement toward gamified platform.

CHAPTER 7

Summary, Conclusion, And Implication for Future Research

7.1 Summary of the study

Gamifying the evaluation part is a difficult task because collection of data is one of the most important things from the teacher where he or she select the question and also the answer as well as. In this section perhaps, teacher may be bored. So, it's a challenge for us to make the teacher's part also gamified as well as students. Teachers play a vital role in e-learning sites so it's very important to make the sites also gamified, thus teacher give the content easily and the evaluation part will generate easily. In order to reduce this problem, we build a platform (Epitome) where teachers can take courses and also evaluate but we did not all the part gamified yet. We just gamified the evaluation part and we are also planning to make all the part gamified very soon.

7.2 Conclusion

The fundamental objective of this theory was the plan and execution of gamified interaction system between students and lecturers. This system was designed and implemented and is currently not unavailable at the site, it will up soon. This framework has been tried for usefulness and convenience and demonstrated as a win or this method has been tested for practicality still as usability and established as a hit. Per feedbacks from lecturers, additional practicality of scholars having the ability to post feedback to lecturers throughout lectures was supplemental. Tiny redesigns of the computer program might convince be a lot of attracting for a few students and lecturers, nevertheless the system contains lots of innovative and interesting mechanics that set it aside from its competition.

This system will sway be pioneering project for the education system, providing great use of computers and mobile phones during lectures with the intent of interaction between students and teachers. Interaction and poll systems are already getting used at conferences all throughout the globe and it's solely a matter of your time till such systems begin getting used in education and faculties. Just in case this method is desired all throughout the school, college, and Universities, these theses are often used as a documentation of the options and

use case for the lecturers. Personal training can also be offered by the author of this thesis as well as continued work on this system.

7.3 Implication for future scope

Since it's a research-based project, many of researchers gamified the learning contents and they try to make the system best user interaction, we also try to do the same but in future we will make the system more user friendly thus the user does not lose their interest. At now we are working only for the undergraduate level students of computer science for making it easier to learn the programming language but for the future we have a plan to build the system for all the students of all aspects. We will add some more features and functionality, some more interactive game and more evaluation part thus they do not lose their concentration and interest. We will update our project for making more efficient and more helpful for the user. In future we will include:

- A real time competitive feature
- Make user admin account more secured by phone number verification and email verification.
- Make android apps for this web application.
- set up data mining to predict user behavior
- Now this system is using MYSQL. In future it will be transferred into oracle and another further step should be taken as needed.
- Make it for free for the universities for getting feedback for update the system thus we can make it more efficient.

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