

**SEKHAO: AN E-LEARNING PLATFORM OF VIRTUAL CLASSROOM FOR
REMOTE EDUCATION**

BY

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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 Project/internship titled “Sekhao: An E-learning platform of virtual classroom for remote education”, submitted by Md Mahamudul Hasan, ID No: 163-15-8292 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. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 6th December 2019.

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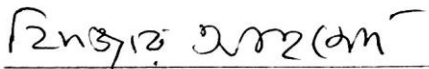
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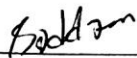
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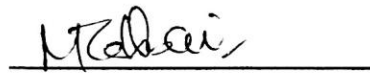
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DECLARATION

We hereby declare that, this project has been done by us under the supervision of Masud Rabbani, Department of CSE 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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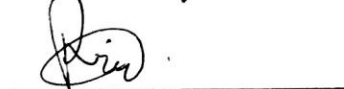
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ABSTRACT

Sekhao is an online educational platform with virtual classroom and many more features that helps students and teachers to collaborate online and taking classes. Teacher can provide their lecture both on video based and in live streaming while students can participate in the class with their multimedia device that is connected to internet. This project will also help teacher to take a class remotely for proper education while students can learn from a remote location with internet connection. It will overall help both student and teacher to save money and get quality content from remote location. Teacher can publish both paid and free courses in our project and schedule a live class for students. Student will join the class by paying the fee or freely in free class by enrolment and join the class. Teacher can also publish thread with class related tools and content for students. Student can attend the class from any location and ask questions to teacher via both video, audio and messages. Financial documents will also provide so teacher and publisher can see their enrolment and payout their balance. Wide range of workshop can be publishing through this project and publisher can enroll their audience to join. While our platform will serve as online host for workshop and conferences.

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CHAPTER 01

INTRODUCTION

1.1 Introduction

Sekhao, an e-learning platform with virtual classroom came up with idea to help both student and teacher to take and attend in the classroom online. It provides a platform for both individual and institute or organization to scale up their education in free or paid version.

Its key features are:

- Publish regular class
- Publish live class
- Attend in live class
- Publish workshop
- Paid or free courses
- Real time communication with teacher and students^[15]

1.2 Motivation

Here in Bangladesh, there are millions of students taking many courses in many institute. But it's not possible for everyone to get good quality teaching form far location specially from a remote location or rural area. So we came up with a solution for that, now everyone can provide quality class and students can join that particular classes and enhanced his skills.

1.3 Objective

Our main goal is building a complete virtual classroom and reach millions of students and teacher to help them collaborate online for education, where students can attend classes seamlessly and teacher can provide education in a big audiences and make their living.

1.4 Expected Outcome

A complete virtual classroom platform that helps a lot of students to take many courses online and through live streaming from teacher, where teacher can also publish live classes for students who enroll or purchase the courses.

1.5 Layout

Sekhao will be browser-based application, so it will mainly render on device browser application. It is responsive to all the modern mobile and computer devices. It will maintain a better user-interface for both child and senior users. The layout of frontend figure 1.1

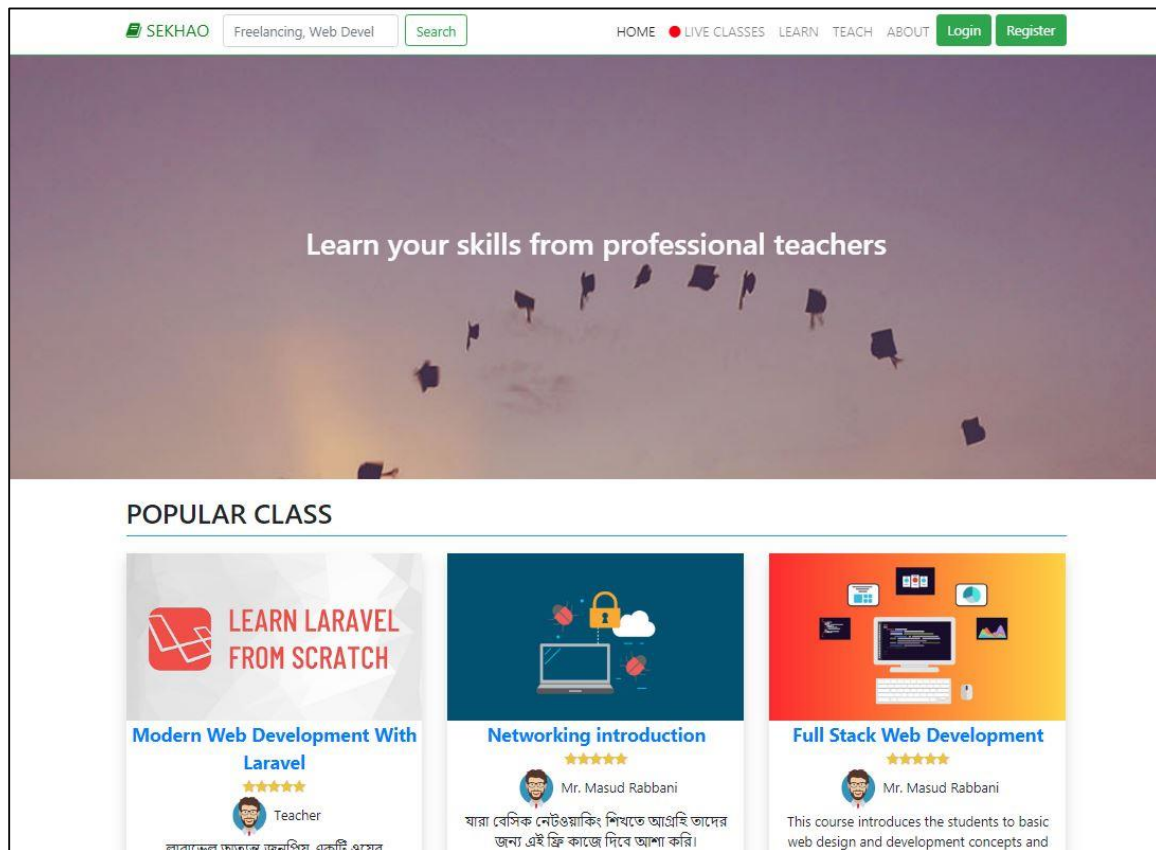


Figure 1.1: Screenshot of frontend layout of Sekhao platform

Sekhao teacher dashboard layout provide details information about how many students enroll in the courses, courses total views, sales amount of courses that is paid and total withdrawal amount. The layout of backend (dashboard) shown below in figure 1.2

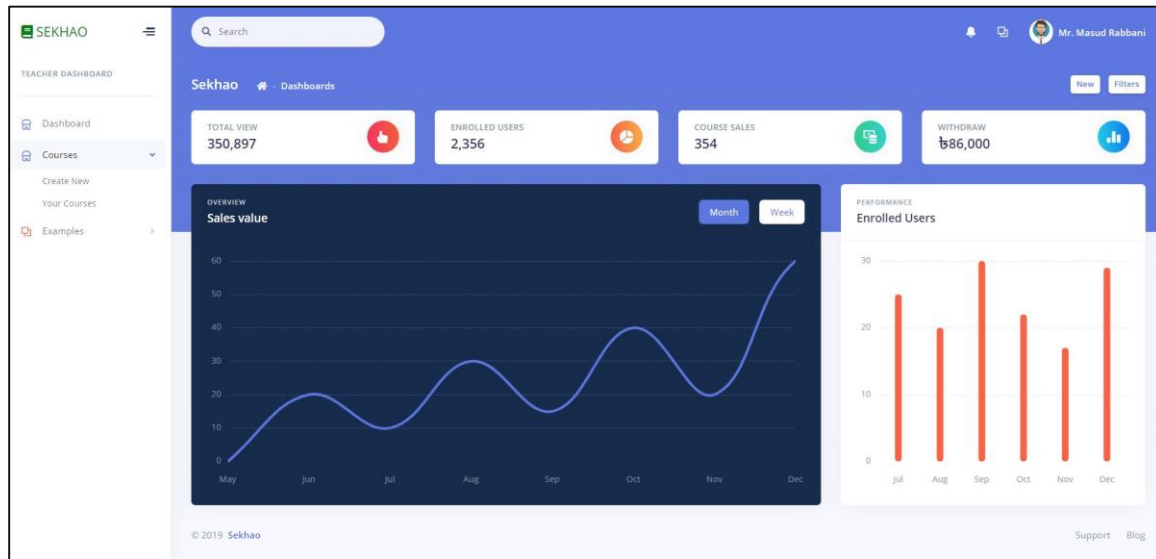


Figure 1.2: Screenshot of backend layout of teacher administration panel

Student dashboard layout designed with course related information. It's design in modern and very simply so any type of users/students can easily interact with the dashboard, because user can be child, young or elder. The layout of course view shown below in figure 1.3

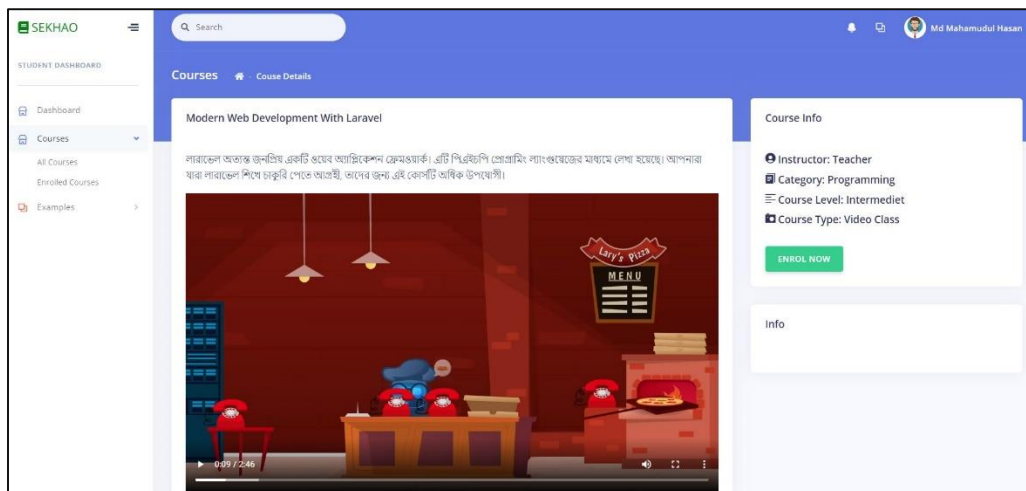


Figure 1.3: Screenshot of backend layout of student course details panel

CHAPTER 02

BACKGROUND

2.1 Introduction

In present there are lot of computer are unused in different institute, while they have internet connection and good configuration but there is not any good platform to use those devices to educate through online. Sekhao will be an e-learning platform with many facilities to provide seamless collaboration with students and teachers.

2.2 Related Works

At present there are only few virtual classroom platform exists worldwide because of its required costly equipment to build and maintenances. One of the biggest platform is “Crowd Cast” that provide virtual classroom facilities but with high cost and not a good platform for institute. Another good one is “Newrow” that provide similar features like us it’s also high costly. Newrow provides video collaboration and live streaming feature^[8].

2.3 Comparative Studies

There are only few virtual classrooms worldwide with limited features. Each one came up with different solutions that solve online education problems. Such as “Newrow” and “LearnCube^[9]”, screenshots is given below in figure 2.1

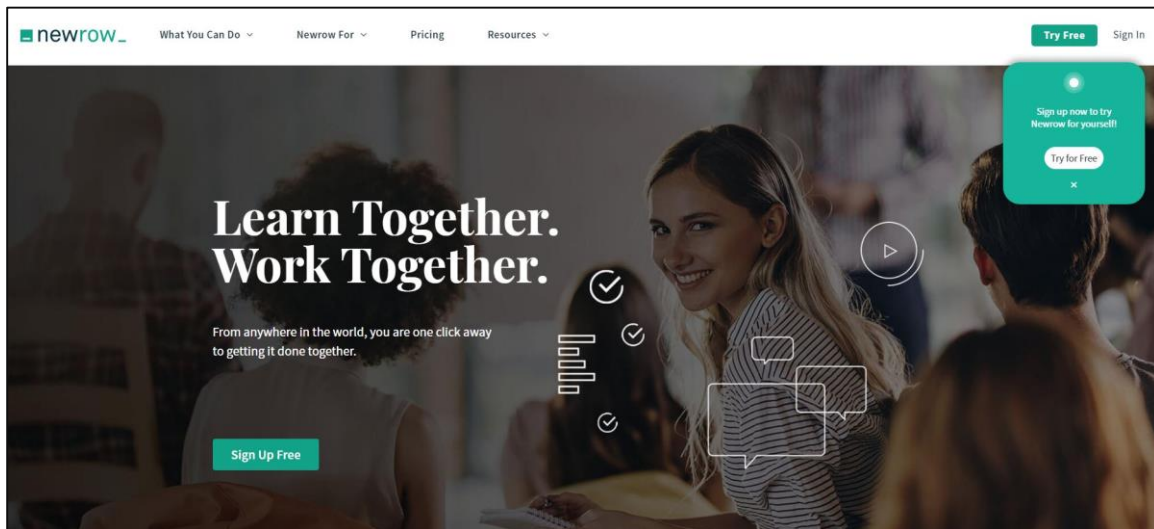


Figure 2.1: Screenshot of Newrow virtual classroom platform website

newrow and learncube are two virtual education system but they are totally commercial service based. While we are trying to impact in real life education system with both free and paid version by providing a complete virtual education system. Screenshots of newrow is given below in figure 2.2



Figure 2.2: Screenshot of LearnCube virtual classroom platform website

2.4 Scope of the problem

To build a safer and secure e-learning platform with virtual classroom system to scope with remote education and provide real-time class and workshops to rural areas. Our main goal is to solve the education problems in nation-wide that will help millions of students in Bangladesh and other countries.

2.5 Challenges

There are lot of challenges specially in building a live video streaming platform and that can be used by thousands of people at a time. Some of our key challenges are shown below:

- Build real-time P2P video conferencing system
- Handle large scale storage for video files
- Maintaining proper security for both transaction and class data
- Maintaining user's privacy and keep their data safe and secure
- Properly serve the bandwidth to a lot of users and keeping backups.

CHAPTER 03

REQUIRMENT SPECIFICATION

3.1 Business Process Modelling

Business process model of sekhaio is visualizing workflow of sekhaio process. It's including database and conditions tasks.

Business process modelling of sekhaio is shown on below figure 3.1

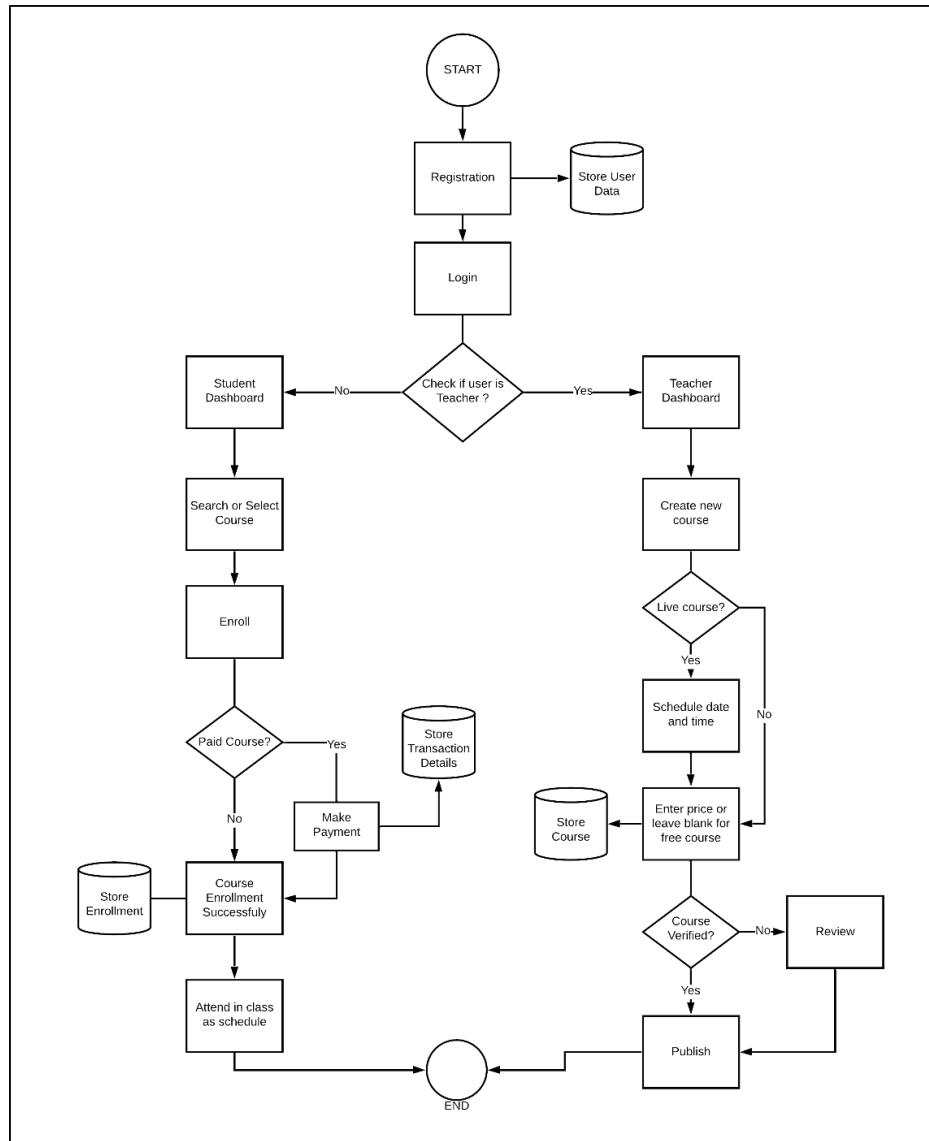


Figure 3.1: Sekhiao business process model

3.2 Requirement collection and Analysis

Requirements are collected in various process such as interviewing multiple students and teachers about their requirements for online educations. We've also analysis in local varsities and schools for their current activities and requirements. Students and teacher's requirements are breakdown below.

3.2.1 Students Requirements

- User can join with their email addresses
- Login and view course summery
- Security in login and registration
- Can join in live class with video and audio
- Can give feedback to teacher
- Can enroll in courses
- Talk with course teacher in real-time

3.2.2 Teachers requirements

- Able to create account with their details
- Able to create new course
- Join live class and broadcast
- Able to share video, audio, screencast
- Summary of enrolled students
- Update courses data
- Update course schedule

3.3 Use Case Modelling and Description

3.3.1 Use Case

Sekhao use case model showing activities of administrator Teacher and Students, it's visualizing main roles of individuals.

Use case of sekhaio is given in below figure 3.2

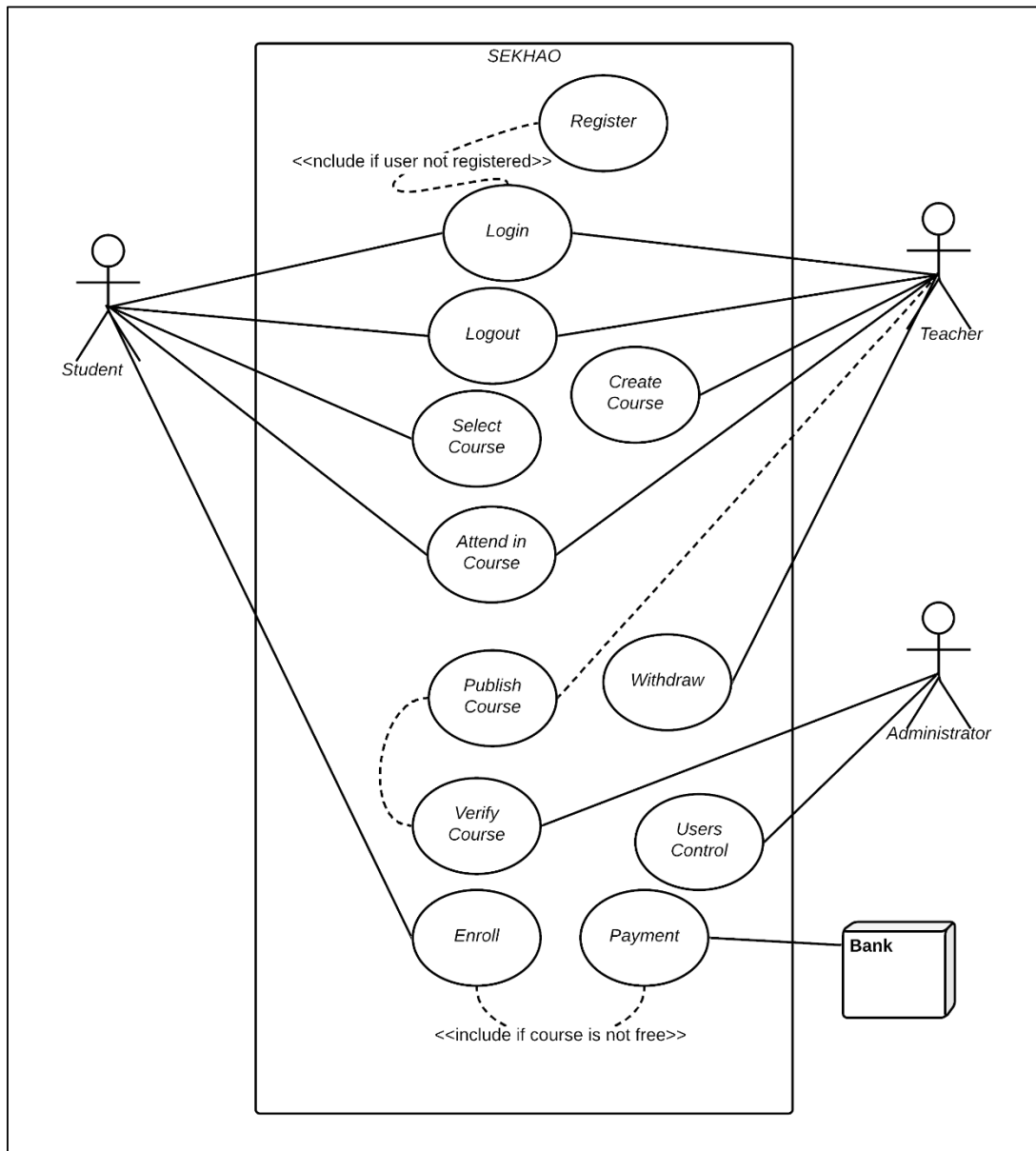


Figure 3.2: Use case of sekhaio

3.3.2 Use case Description

There are three character in above use case, there are student who can join in sekhaio, login then can enroll in courses and teacher who can join in the system by inputting his data and can create new course both free and paid. Teacher also can create live courses for students. when teacher will publish the course it will be under review by system administrator then after his verification courses will be available on website for enrollment.

3.4 Logical Data Model

Logical data model visualizing the relational entities in and data models.

Logical Data model are given below in figure 3.3

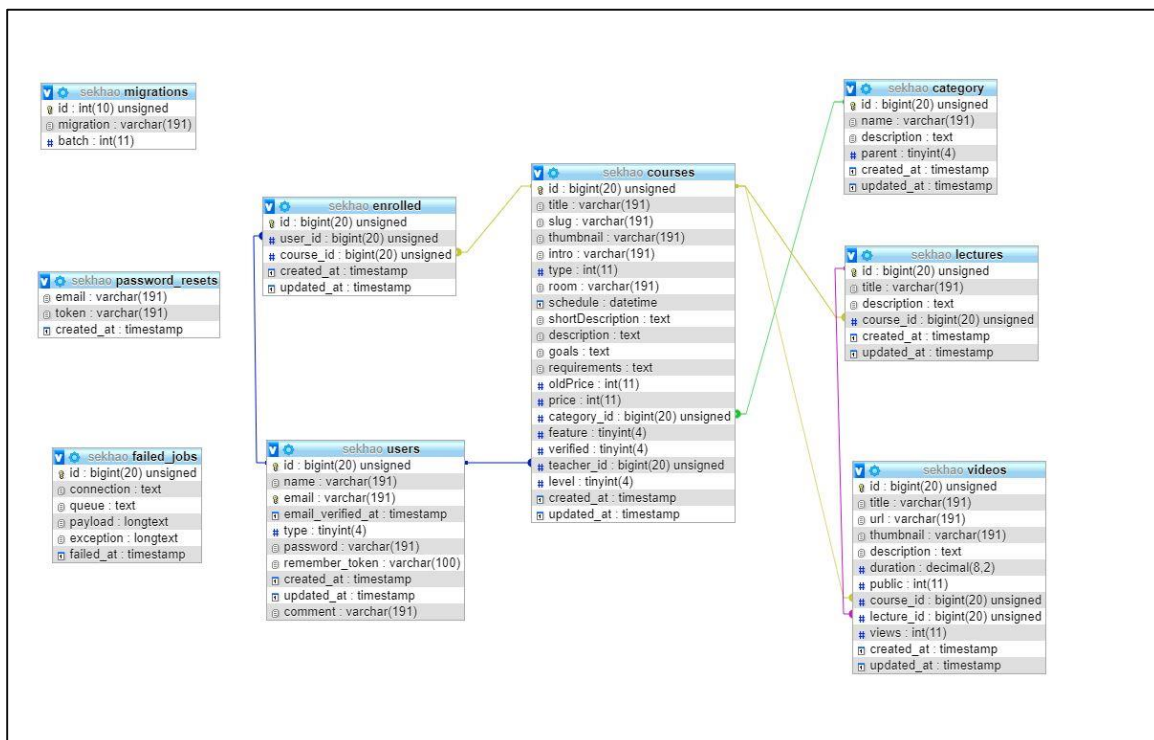


Figure 3.3: Logical data model of sekhaio e-learning platform

3.5 Design Requirements

- Should support all modern devices
- Design can be scalable
- Support orientation
- Faster loading
- Simple user interface for all categories users
- Simple and fast interaction
- All information should be readable easily
- Courses info should display accurately
- Use standard color to maintain brand quality
- Searching form
- Login, register, forget pages
- Blog pages

CHAPTER 04

DESIGN SPECIFICATION

4.1 Front-end Design

Front-end design mainly focusses for website visitor, where users can see details about sekhao and see courses list and categories. Screenshot of sekhao front-end is given in below figure 4.1

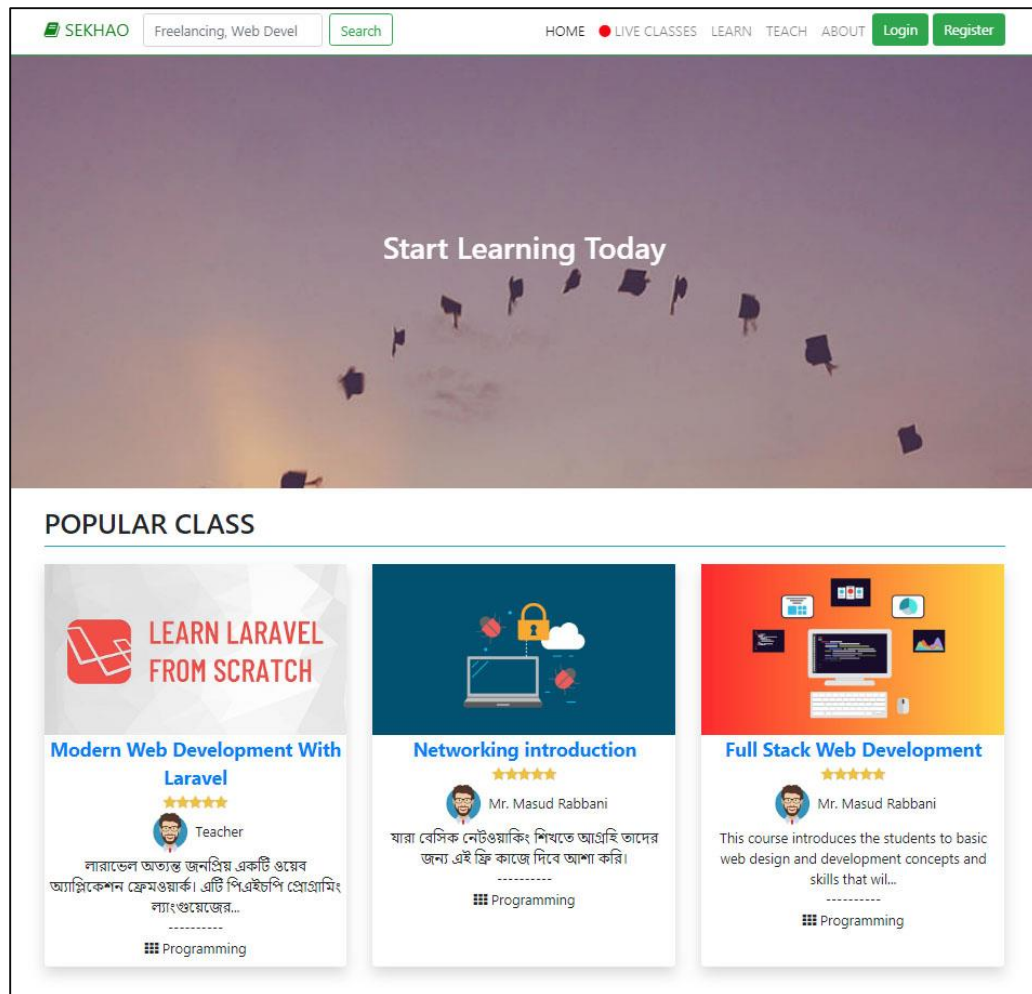


Figure 4.1: Screenshot of sekhao front-end

4.2 Back-end Design

Back-end design mainly focusses register students and teachers. Where teacher can create courses and edit their courses. Teacher also join live classes from backend panel. Students can enroll in courses and participate in live courses. Screenshots are given below in figure 4.2

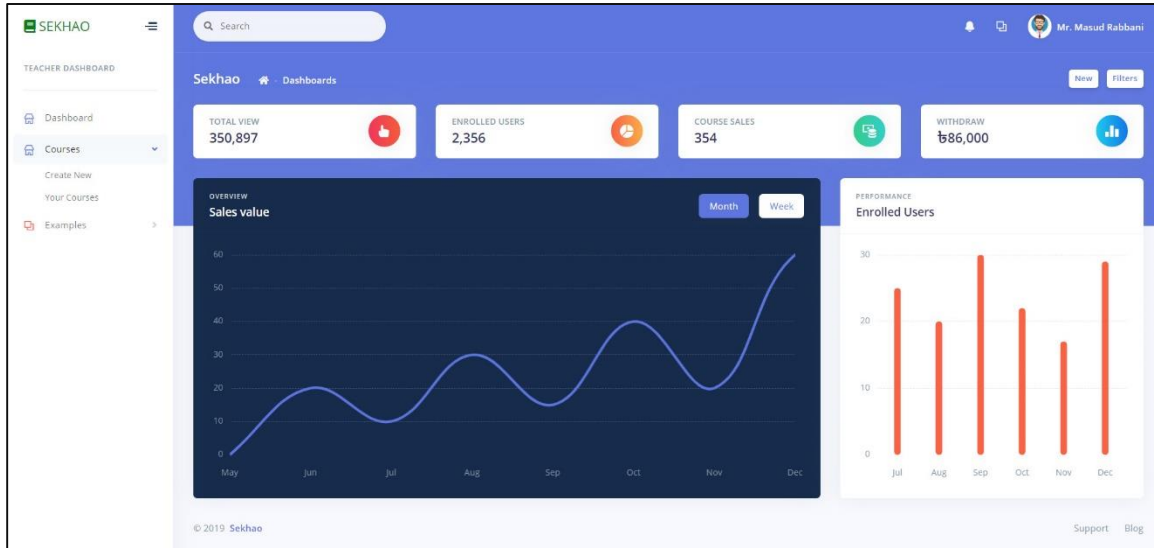


Figure 4.2: Screenshot of sekhao back-end

4.3 Interaction Design and UX

Sekhah has multiple pages for interaction in the system in many ways. This page is linked to another pages. These page contain all the information required to display information of the system.

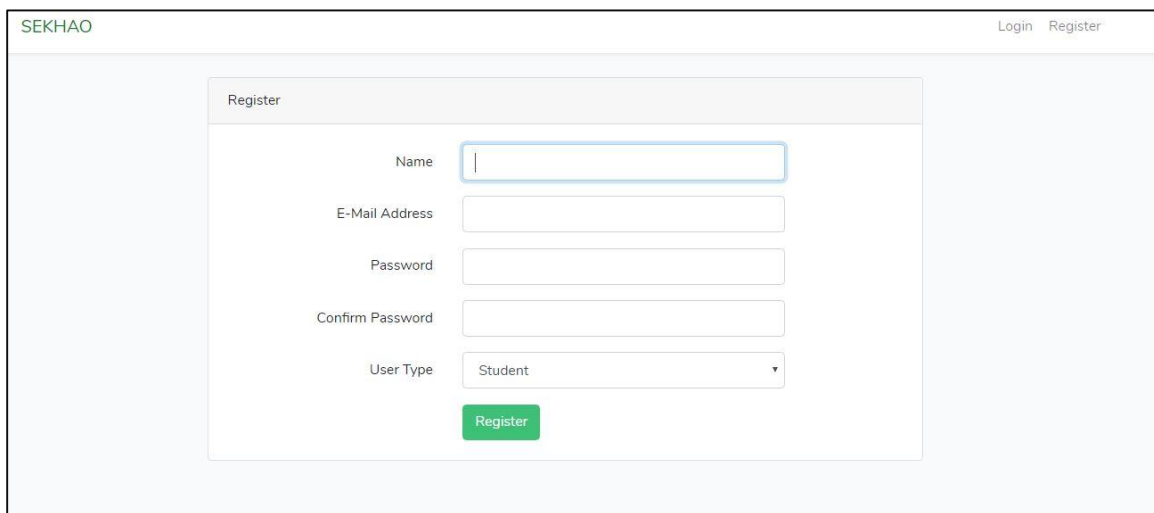
Some pages for interaction:

- Registration
- Login
- Forget Password
- Create course
- View Courses

- Enrollment
- Course details
- Live Courses

4.3.1 Registration

This page including many input field to input user details. User will enter all the information as want and click submit. If any data has any error, it will show error. Example: email can be already registered or password may not fulfil validation as platform. Screenshots are given below in figure 4.3



The screenshot displays the registration interface of the SEKHAO platform. At the top left, the brand name 'SEKHAO' is visible. At the top right, there are links for 'Login' and 'Register'. The main content area features a 'Register' form with the following fields: 'Name' (a text input field with a blue border), 'E-Mail Address' (a text input field), 'Password' (a text input field), 'Confirm Password' (a text input field), and 'User Type' (a dropdown menu currently showing 'Student'). A green 'Register' button is positioned at the bottom of the form.

Figure 4.3: Registration page

4.3.2 Login Page

User can login by using this page by entering his or her login credential. Login page screenshots are given below in figure 4.4

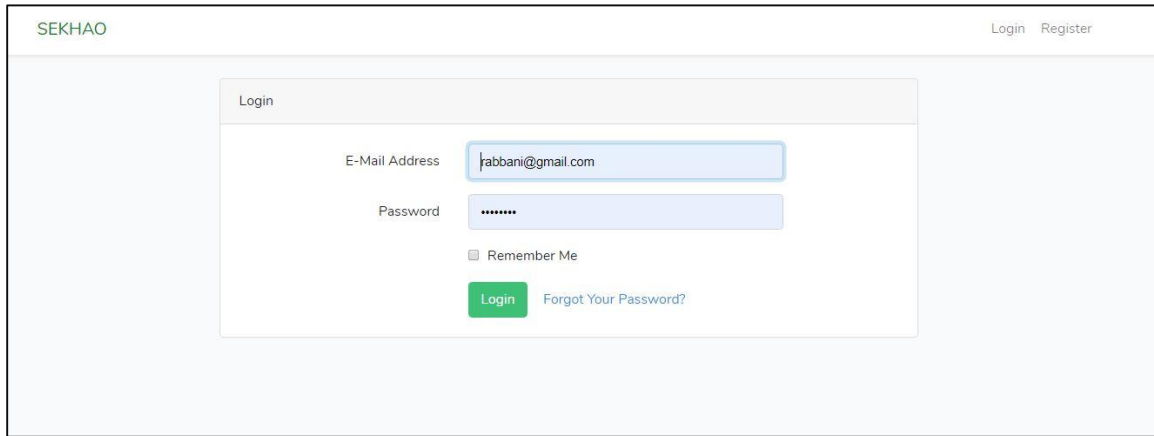


Figure 4.4: Shown login page with sample input

4.3.3 Forget password

User can retrieve their forgotten password by using this page. User need to enter his email and he will receive an email with password recovery details. Forget password page screenshot are given in figure 4.5

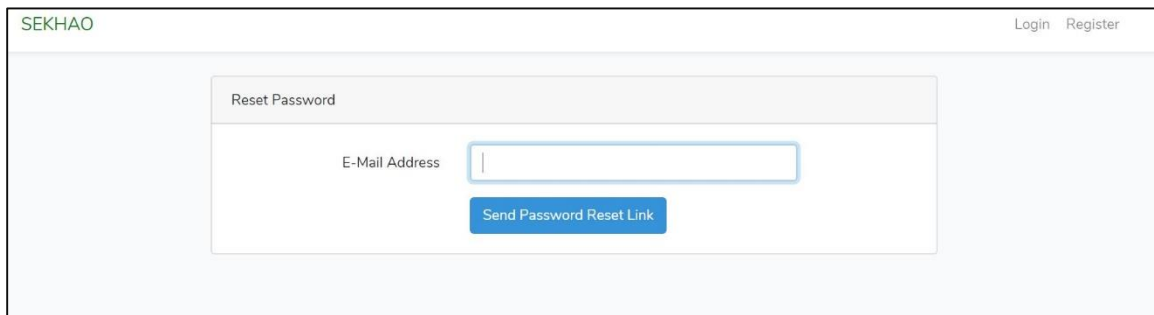


Figure 4.5: Forget password page

4.3.4 Create course

Teacher will create courses using this pages by entering all course information. Teacher can see required information for classes in the right side. Create Course page screenshot are given in figure 4.6

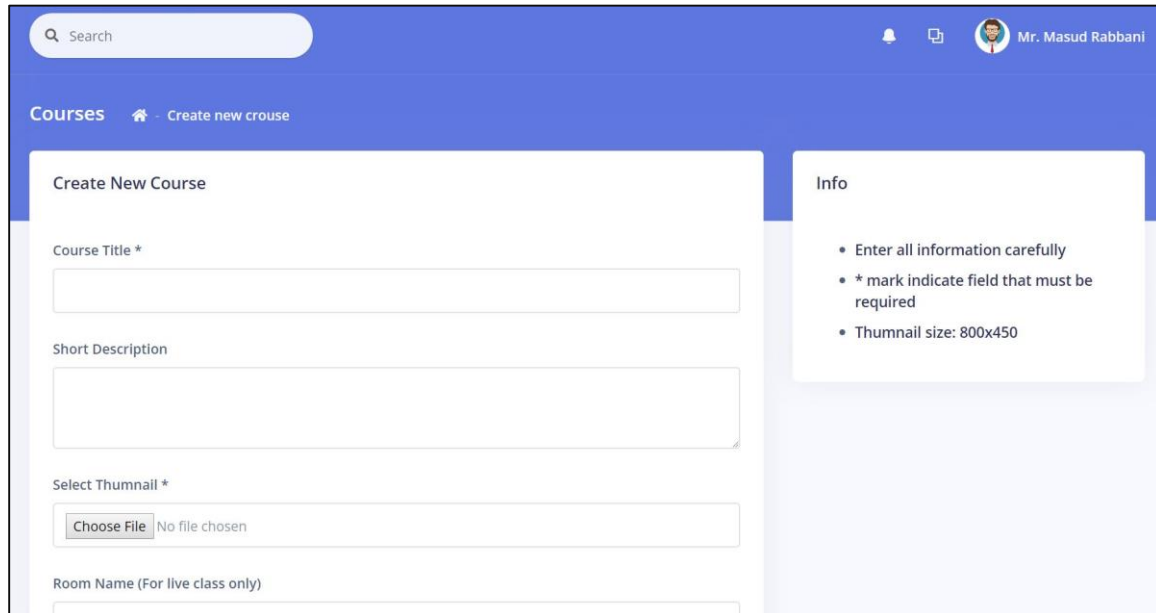


Figure 4.6: Screenshot of create course

4.3.5 View Courses

Here teacher will view his all created courses for editing and viewing and joining live class. Courses page screenshot are given in figure 4.7

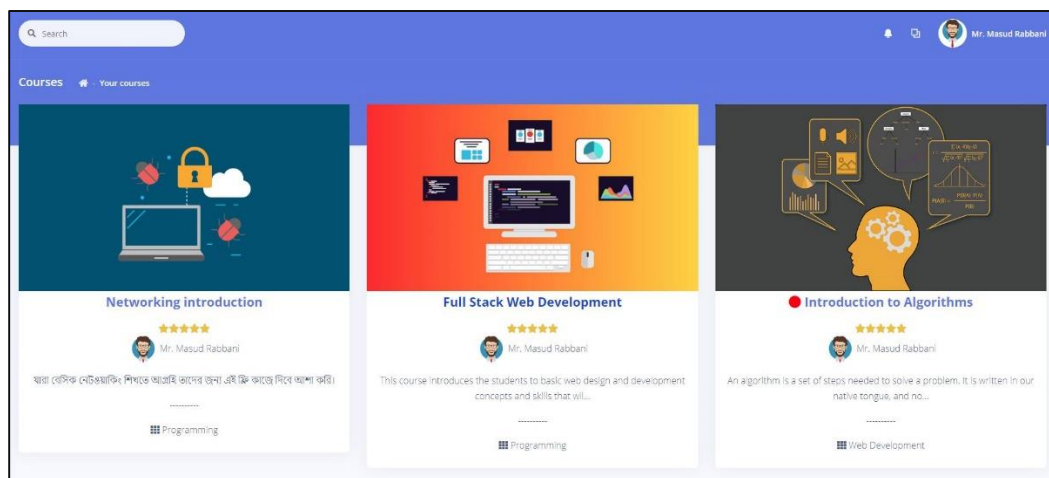


Figure 4.7: All courses page created by logged in teacher

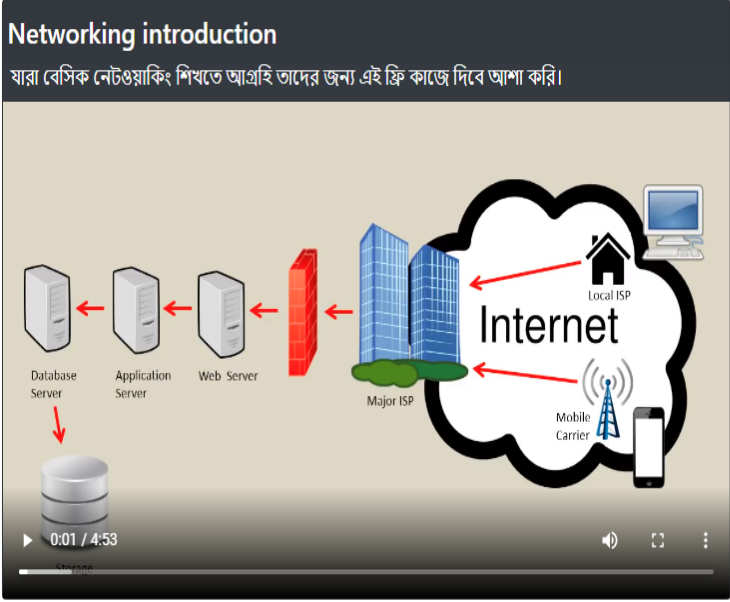
4.3.6 Course Enrollment

Student can view course details and enroll in the courses by clicking “ENROL NOW” button. Course enrollment page screenshot are given in figure 4.8

Course Details

Networking introduction

যারা বেসিক নেটওয়ার্কিং শিখতে আগ্রহী তাদের জন্য এই ফ্রি কাজে দিবে আশা করি।



Database Server Application Server Web Server Firewall Major ISP Internet Local ISP Mobile Carrier

0:01 / 4:53

COURSE INFO

- Instructor: Mr. Masud Rabbani
- Category: Programming
- Level: Intermediat
- Course Type: Video Class

ENROL NOW

COURSE DETAILS

Figure 4.8: Course Details and Enrollment

4.3.7 Live courses

Here students can see the live class schedule and join in live class with his webcam or screencast. If class didn't start yet, students will see a countdown of when the class will be started. Teacher can update the schedule any time. When the teacher will be in live class it will show "Class Ongoing" so user will join too in the schedule time.

Below figure 4.9 is shown live classroom while the class is ongoing.

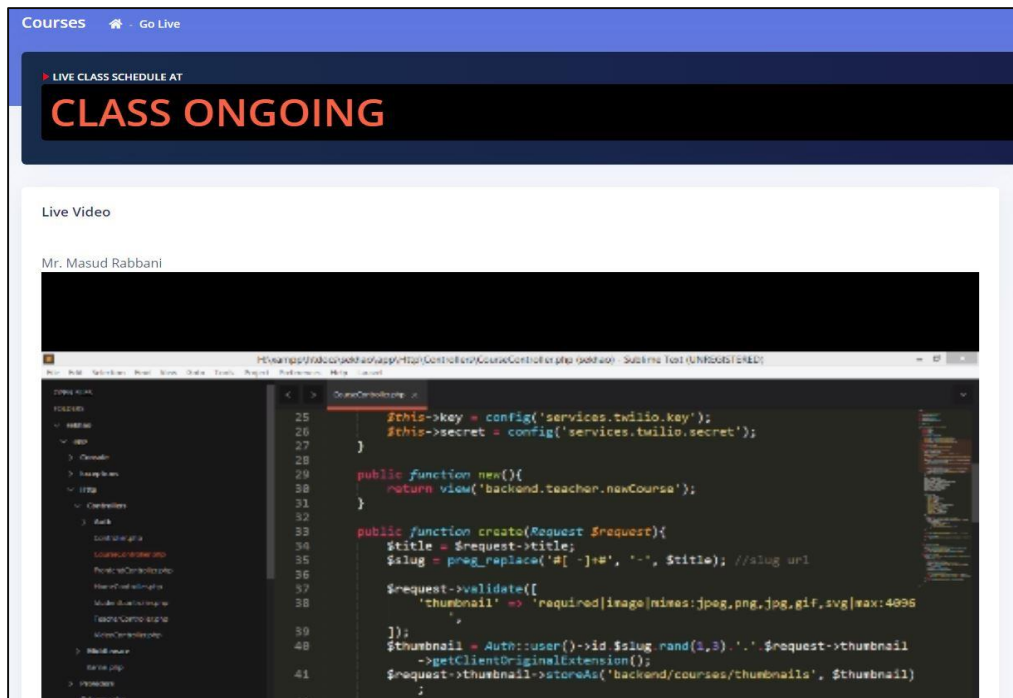


Figure 4.9: Screenshot of live class with screencast

4.1 Implementation Requirements

We will use twitter bootstrap framework for front-end design and responsive support and PHP 7^[1] for server side programming. We will use a framework called "Laravel^[7]" to scale up and give power to our platform and twilio^[5] programmable video server for video streaming and broadcasting to large scale users.

Teachers also required tools to broadcasting media from their devices, we will use ManyCam tools for broadcasting teacher screen and other's media as live video feed^[13].

CHAPTER 05

IMPLEMENTATION AND TESTING

5.1 Implementation of Database

We will use MySQLi database for our application and keeping user's data. There will be relationship between multiple tables. Relationship are one-to-one, many-to-one, one-to-many. There will be a unique 'id' field as primary key in every table, it will auto increment.

We will host database in our primary server that is scalable and can handle large scale data. We design the database in standard format so it can be understandable via each developer so it can be scale later if needed in the system. Database can be backup and restore from our admin panel and server control panel.

We also use laravel schema builder for our database design so it will be hassle free for database switching. Sekhao database also included relationship as cascade on delete so if any courses or user will delete it also delete courses and videos created by that user, it will both save database space and disc storage by clearing unnecessary data.

We will also use amazon or google^[6] cloud services so database availability can assure when it's require and large audience can join and collaborate at the same time.

Database structure is shown below in figure 5.1

Table	Action	Rows	Type	Collation	Size	Overhead
<input type="checkbox"/> category	★ Browse Structure Search Insert Empty Drop	2	InnoDB	utf8mb4_unicode_ci	16 K1B	-
<input type="checkbox"/> courses	★ Browse Structure Search Insert Empty Drop	4	InnoDB	utf8mb4_unicode_ci	48 K1B	-
<input type="checkbox"/> enrolled	★ Browse Structure Search Insert Empty Drop	3	InnoDB	utf8mb4_unicode_ci	48 K1B	-
<input type="checkbox"/> failed_jobs	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	16 K1B	-
<input type="checkbox"/> lectures	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	32 K1B	-
<input type="checkbox"/> migrations	★ Browse Structure Search Insert Empty Drop	9	InnoDB	utf8mb4_unicode_ci	16 K1B	-
<input type="checkbox"/> password_resets	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	16 K1B	-
<input type="checkbox"/> users	★ Browse Structure Search Insert Empty Drop	4	InnoDB	utf8mb4_unicode_ci	32 K1B	-
<input type="checkbox"/> videos	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	48 K1B	-
9 tables	Sum	22	InnoDB	latin1_swedish_ci	272 K1B	0 B

Figure 5.1: Database table structure provided in phpmyadmin panel

5.2 Implementation of Front-end Design

Front-end implementation done with various steps. First of all, we will require a webpage for content. We enter the content using HTML5^[2] markups then we need to give it a look, for that we use CSS3^[3] to design the whole page with many id and classes. Id and class name are related with the content area so it will be easy to understand which part we are designing.

Then we need to do responsive the page so it will be perfect for mobile, laptop and desktop device, for that we used twitter bootstrap^[4] as front-end framework. We also used many third-party tools and library for design purpose.

Here is list of tools we used to implement the Front-end:

- HTML5
- CSS3
- Twitter Bootstrap 4
- Javascript
- JQuery
- Sass
- Font-awesome
- Date-picker
- Blade template engine

5.3 Implementation of Interactions

For interaction we have used plain javascript and JQuery to interaction with user in many areas in the platform such as slider, responsive menu etc. There is a slider in the homepage that can be both control by click the icon and using touch interaction by mobile phones.

We have to think about every possible user to interact in life human lifestyle. Live video should stream seamlessly and with higher and lower bandwidth and voice data also need to be clear. If any users go to website from a mobile device if he or she orient the phone the design should interact in that case, we implemented it so images and font size will automatically match the screen size for better user experience. We also enable controls for media playing and live video feed, teacher or student can view the video in full screen so they can understand the topic more easily.

5.4 Testing Implementation

For testing implementation, we will enter some demo data and demo courses to check the platform if it's working perfectly. We will demonstrate login and registration checking by opening the homepage and going to login page and entering user credentials if it's working or not.

5.4.1 Login Module

This module used to enter user email address and password and try logged in the system, if user data are correct system will redirect him to teacher page or student page by checking user type. If data are incorrect it will throw an error to check the data and login again or register as new user.

5.4.2 Registration Module

Registration module is used to create new user account as a teacher or as a student with data type. If anyone want to register in the system, he or she need to all the require information correctly and click on register button. If all information is correct then user will be registered successfully and redirect to dashboard. If he enters any information incorrectly system will generate error message to enter data correctly. Below figure 5.2 shown error messages for test and user type.

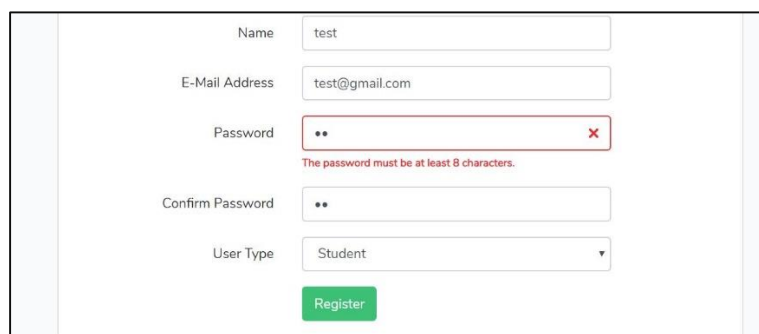
A screenshot of a user registration form. The form contains the following fields: 'Name' with the value 'test', 'E-Mail Address' with the value 'test@gmail.com', 'Password' with two asterisks and a red 'X' icon, 'Confirm Password' with two asterisks, and 'User Type' with a dropdown menu showing 'Student'. Below the 'Password' field, there is a red error message: 'The password must be at least 8 characters.' At the bottom of the form is a green 'Register' button.

Figure 5.2: Error message while testing user registration with wrong data

5.5 Test Result and Reports

We will demonstrate test in the login and registration module, where we will show every step and demo data for testing and give comments as output.

Testing result and reports are given in below 5.5.1 table.

Test Case ID: Sekhao_1	Test Designed by: Md Mahamudul Hasan
Test Priority (Low/Medium/High): Med	Test Designed date: <28-10-19>
Module Name: Sekhao login and registration	Test Executed by: <Md Mahamudul Hasan>
Test Title: Register user and verify login with valid username and password	Test Execution date: <28-10-19>
Description: Test the sekhao login and registration	

Pre-conditions: User has valid username and password

Dependencies:

Test steps and result shown in table 5.5.2

Steps	Test Steps	Test data	Expected Result	Actual result	Status	Comments
1	Open Registration Page	https://sekhao.com/register	Load page	Page loaded	Pass	Successfully page loaded
2	Register user	Test, test@gmail.com, 123456, student	User register	Registration complete	Pass	User registration success
3	Open login Page	https://sekhao.com/login	Load page	Page loaded	Pass	Successfully page loaded
4	User login	test@gmail.com, 123456	Logged in user	User logged in	Pass	User login successfully
5	Logout user		Logout user	User logged out	Pass	User successfully logout

CHAPTER 06

Conclusion and Future Scope

6.1 Discussion and Conclusion

We have tried hard to implement virtual classroom features in sekhaio that also motivated us to solve a large scale problem and give them a solution. We are also really glad to completed the project and taking steps to run the projects in real-life. The resources required to build this system are really costly and need very high configuration to management for huge audience and specially with video content that are broadcasting live and streaming by many users.

We are also looking forward to implement new features in our system so students and teacher will be more user friendly. While we are taking steps to make it more simple so any user can access courses by registration. The project gives us an opportunity to interacting with teacher and student and gain a lot of experience from them.

With hypothetical tendency of our syllabus it turns out to be exceptionally fundamental to take at most favorable position of chance of increasing functional experience that tang along. We learn a lot from this project. We try to update this system until it goes to a suitable position.

As a startup project we will need some resources for live our project in real world, so we have need an office space and computers and others tools to support our work.

For that we will need some investment. Gradually our project work will be continuing. We will make update our system day by day and try to publish it online so that user faces more comfortable to use this site. Later on we will add more feature that both student and teacher are benefited. And try to solve the problem of our beta version project.

Our virtual classroom system can help millions of people in real life to educate and teach.

It will also help a to grow our nation smartly, anyone can take any courses online so they can enhance their skills and will be ready for corporate life.

6.2 Scope for further Developments

We are continuously looking forward to develop the project further, we are also looking for seed money that can help us running in real life and goes to user level and take physical office to scale up our project.

We are planning to implement sekhaio in many institute and organization to help them achieve virtual classroom feature in their institute such as university, school/college, training institute and many more.

Appendix

Appendix A:

Sekhao.com the domain for our project, it's now running in server

Figure A shown the screenshot of database structure.

Table	Action	Rows	Type	Collation	Size	Overhead
<input type="checkbox"/> category	★ Browse Structure Search Insert Empty Drop	2	InnoDB	utf8mb4_unicode_ci	16 KiB	-
<input type="checkbox"/> courses	★ Browse Structure Search Insert Empty Drop	4	InnoDB	utf8mb4_unicode_ci	48 KiB	-
<input type="checkbox"/> enrolled	★ Browse Structure Search Insert Empty Drop	3	InnoDB	utf8mb4_unicode_ci	48 KiB	-
<input type="checkbox"/> failed_jobs	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	16 KiB	-
<input type="checkbox"/> lectures	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	32 KiB	-
<input type="checkbox"/> migrations	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	16 KiB	-
<input type="checkbox"/> password_resets	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	16 KiB	-
<input type="checkbox"/> users	★ Browse Structure Search Insert Empty Drop	4	InnoDB	utf8mb4_unicode_ci	32 KiB	-
<input type="checkbox"/> videos	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	48 KiB	-
9 tables	Sum	22	InnoDB	latin1_swedish_ci	272 KiB	0 B

Figure A: Screenshot of sekhao.com homepage

Appendix B:

Business process model of sekhaio with user and teacher processes

Figure B shown the business process model diagram

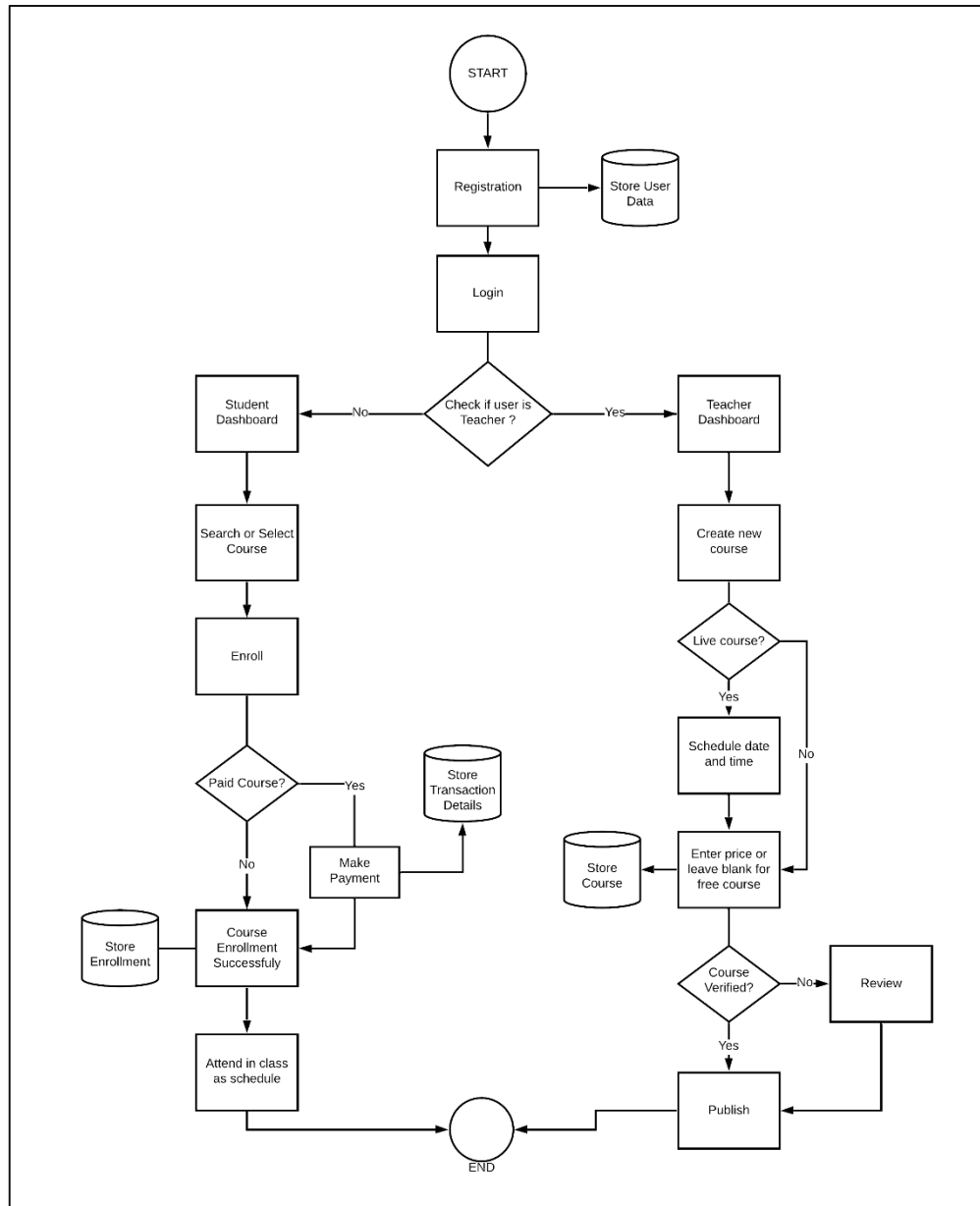


Figure B: Sekhiao, Business process model diagram

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