

**BSc (Hons) Software Engineering**  
**Fathima Rahumath Rumy**

**“XploreEdTech” - Django Website Development**

## **Acknowledgements**

The effort taken to develop this project has been a challenge. However, it wouldn't have been possible without the support and help of many individuals and organisations. Hence, I would like to thank some respected persons, who deserve my greatest gratitude.

Firstly, I would like to give special thanks xxxxxxx, our supervisor for the review sessions that he had for us throughout the course of the project. We are highly indebted to him for his continuous guidance, support and suggestions that has helped me greatly in developing the project. I would also like to thank xxxx for his guidance and support.

I would like to give special thanks to my friends, xxxxxxxx and xxxxxxx who have constantly motivated me and have been a pillar of strength. Their motivation, support and suggestion has indeed helped me develop the project with greater output.

I would also like to thank xxxxxxx for providing us with the necessary resources in ensuring that we develop the project with a well-documented report adhering to the rules and guidelines.

I would also like to express my sincere thanks to my parents and family who have supported and helped me throughout the course of my degree. Without them, I will not be where I am today.

I would also like to thank those who have helped me in my survey. I would like to express my deepest gratitude to my friends and colleagues for their encouragement and support. And to all those who have directly and indirectly guided me in the completion of my Project.

Finally, I would like to thank the Almighty God for giving me the opportunity to expand my knowledge and take on the difficulties that came my way. No amount of written expression is adequate to show my deepest sense of gratitude and appreciation to them all.

## **Abstract**

Due to virtual schooling students find it very hard to stay focused and engaged during their lessons. It is well established that educators that use EdTech in their lessons find students more engaged and interested than those without these educational technologies. However, finding the right EdTech tool to teach as per the subject and the grade level of the student and figuring how it can be used is quite a challenge to the educators. This report aims to show the importance of using EdTech tools in classrooms that will help students greatly in being engaged and interacted during the lesson minimising learning loss. In addition, the project aims to show how various EdTech tools are available and how these can be used in their lesson plans. In this context, the term Educational Technology (EdTech) is defined as the combined use of computer hardware, software, and educational theory and practice to facilitate learning.

An online survey was distributed to educators. Based on the results, the majority have not used EdTech tools and 94% of them believe that using EdTech in classrooms will make students be more responsive. And another result says that 61% of them struggle to use EdTech. Analysing the results, it is understood that EdTech is important and needs to be implemented in the classroom ensuring that educators have easy access to various tools with guidance on how they can be integrated with their lessons. These results also suggest that if the EdTech tools and guidance on how to use them are available in one platform, users would find it easy to use the EdTech tool in their classrooms. Thus, keeping this in mind, various EdTech tools must be researched and understood how they can be used and integrated with various subjects. With this, the developed system will be efficient for the users as all EdTech will be available in one platform and they can easily select the tool they desire based on the concept and grade level they teach.

## TABLE OF CONTENTS

<i>Acknowledgements</i>	<i>i</i>
<i>Abstract</i>	<i>iii</i>
<i>Acronym</i>	<i>5</i>
<i>1. Introduction</i>	<i>5</i>
<i>2. Literature Review</i>	<i>7</i>
<i>3. Methodology</i>	<i>10</i>
3.1 Professional, Legal and Ethical issues	<i>10</i>
3.2 Project Management	<i>11</i>
<i>4. Design &amp; Implementation</i>	<i>11</i>
<i>5. Results</i>	<i>33</i>
<i>Figure 61 : Stripe payment gateway button displayed on screen</i>	<i>53</i>
<i>6. Conclusions</i>	<i>54</i>
<i>7. Recommendations</i>	<i>55</i>
<i>8. Reference List</i>	<i>56</i>
<i>9. Bibliography</i>	<i>57</i>
<i>10. Appendices</i>	<i>A</i>
• Appendix A: Chatbot	<i>A</i>
• Appendix B: Access the Files	<i>A</i>
• Appendix C: Links to all files	<i>B</i>

## List of Figures

Figure 1 : Xplore EdTech Logo and Slogan .....	12
Figure 2 : Sign Up page - Background Image .....	12
Figure 3 : Login page - Background Image .....	13
Figure 4 : Favicon of Xplore EdTech.....	13
Figure 5 : MVT based control flow (designed in Figma) .....	14
Figure 6 : Django Admin Dashboard .....	15
Figure 7 : MongoDB Connection.....	16
Figure 8 : Signup Page - 01 .....	17
Figure 9 : Signup Page - 02 .....	17
Figure 10 : Login Page .....	18
Figure 11 : Forgot Password .....	18
Figure 12 : Educator Dashboard .....	19
Figure 13 : Change Password.....	19
Figure 14 : Subject Categories .....	20
Figure 15 : Common EdTech Page .....	21
Figure 16 : EdTech that can be used with Language-based subject .....	21
Figure 17 : From the Home Page a subject can be searched from the search bar .....	22
Figure 18 : Search results page.....	22
Figure 19 : Terms and condition pop-up .....	23
Figure 20 : Upload Worksheets Section .....	23
Figure 21 : Worksheet Page .....	24
Figure 22 : Pictures of the proof of the donations given uploaded on the site. ....	24
Figure 23 : Payment Page .....	25
Figure 24 : Enter payment details page (Integrated with Stripe Payment Gateway).....	25

<i>Figure 25 : Content Based Filtering for 'Xplore EdTech'</i> .....	26
<i>Figure 26 : Chatbot interface on the website.</i> .....	28
<i>Figure 27 : Chatbot answering the query of the user.</i> .....	28
<i>Figure 28 : Past conversations of the user</i> .....	29
<i>Figure 29 : The footer of the website</i> .....	29
<i>Figure 30 : Procfile error</i> .....	30
<i>Figure 31 : Procfile error resolved</i> .....	31
<i>Figure 32 : Heroku Deployment Error</i> .....	31
<i>Figure 33 : Sign in with Google Account</i> .....	33
<i>Figure 34 : Sign in with Google updated in Database (T01-SG1)</i> .....	34
<i>Figure 35 : Sign in with Google not redirecting to user profile page (T01-SG2)</i> .....	34
<i>Figure 36 : Error message - user types in an email or username that already exists</i> .....	36
<i>Figure 37 : Error message - user enters a different password for the password and confirm password field</i> .....	36
<i>Figure 38 : Once signed in the profile page does not contain user details</i> .....	36
<i>Figure 39 : User details updated in the database and password is encrypted</i> .....	37
<i>Figure 40 : Error message that occurs when the once user logins with Google</i> .....	37
<i>Figure 41 : Last login time updated when logged in with Google</i> .....	38
<i>Figure 42 : Error message when the user logins using incorrect username or password</i> .....	39
<i>Figure 43 : User details appear on profile page once user logins to the account</i> .....	40
<i>Figure 44 : Edit profile of Subject by deleting Maths and having only Science. (2nd field)</i> .....	42
<i>Figure 45 : Edited profile has been updated in the database</i> .....	43
<i>Figure 46 : User is redirected to Change Password page</i> .....	43
<i>Figure 47 : Error message when user enters password that doesn't match and when the user enters the old password incorrectly</i> .....	43
<i>Figure 48 : Search for Geography in the Home page search bar</i> .....	44

<i>Figure 49 : Search results displayed .....</i>	45
<i>Figure 50 : Search for Concept Geometry in Maths Page .....</i>	45
<i>Figure 51 : Search results displayed .....</i>	45
<i>Figure 52 : Search for EdTech tool ‘Padlet’ in Common Tools Page.....</i>	46
<i>Figure 53 : Search results displayed .....</i>	46
<i>Figure 54 : Search results displayed when user types in a word that does not match the search criteria .....</i>	46
<i>Figure 55 : Add in a EdTech tool from the admin dashboard .....</i>	48
<i>Figure 56 : EdTech tool appears in front-end .....</i>	48
<i>Figure 57 : Upload worksheet section.....</i>	50
<i>Figure 58 : Uploaded worksheet appearing on the front end of the website .....</i>	50
<i>Figure 59 : Search worksheets for Maths .....</i>	51
<i>Figure 60 : Search results displayed on Maths worksheets .....</i>	52
<i>Figure 61 : Stripe payment gateway button displayed on screen.....</i>	53
<i>Figure 62 : Stripe Payment Gateway.....</i>	53

## **Acronym**

EdTech – Educational Technology

UI - User Interface

MVT - Model View Template

WSGI - Web Server Gateway Interface

OAuth - Open Authorization

## **1. Introduction**

Covid has led the new norm for students and educators to be “Virtual Schooling”. They all have to adapt to the virtual environment. With new variants arising like Omicron which emerged in November 2021, they cannot predict when things will go back to the norm and when school will start re-opening for students as usual.

When lockdown was imposed for the first time which went on for a period 4-5 months, it was indeed a challenge for everyone. Schools had to quickly shift towards virtual classrooms and learn how to implement this system efficiently. Educators, parents and students had to start being tech-savvy. Getting the students to focus and be attentive during the lesson itself was the biggest challenge.

In the Hindustan Times it states that, ‘Due to online classes, owing to the pandemic, children have suffered psychological problems including screen or online gaming addiction.’ (Sood, 2021) Educators have encountered cases where students play games and basically get distracted during their lessons. Parents are not able to keep an eye during their child's session and the student takes full advantage to do things they desire during that time. This is because online education has been ineffective and monotonous for the student. Getting them to be interactive and getting them engaged has been a strenuous task for the educators.

To make the lesson fun and interactive for the students there are many EdTech tools that can be implemented in the classroom. Having game-based learning will motivate the learning experience in a classroom and thus get them engaged and interested. However, according to the results of the survey 66% say that finding the right EdTech tool for their lesson is the challenge. And 61% of them struggle to use a new EdTech tool. Some of the reasons being time consuming and hard to find the appropriate tool that best fits their lesson.

In addition, reading from textbooks, preparing presentations and YouTube videos have been some of the common ways students have been learning virtually. Taking out the textbook and

explaining the work is definitely an ineffective way to educate students. It is evident that such lesson delivery would lead to boredom for the student. According to the Michigan State University (Greenhow, 2020), it states that the Educators can not expect the same or better learning from students by scanning the textbook, recording the lessons and putting them online. Thus, it is important as educators that they find ways to make the students interact and engage during the virtual sessions that they have.

As 94% of the individuals who had answered the survey say that EdTech tools will make students more responsive during the lessons, the proposed system is developed to ensure that educators have access to all kinds of EdTech tools in one platform. Having this proposed system will be very much convenient for the educators as they can easily find the required EdTech tool that best fits the subject and the concept they wish to teach. In addition, educators also get guidance on how to use the EdTech tool as the majority struggle to use it.

Also, to make it convenient for the user, based on the subjects taught by the educator a few EdTech tools will be recommended to the user. This makes it easy for the user to be aware of the EdTech tools that best suit the user. In addition, a chatbot will be integrated by which the user can type in the subject and a list of EdTech tools will appear. Moreover, users can also chat if they need moral support when they feel upset.

According to an article from Sunday Times (Fazlulhaq, 2021) Sri Lanka, 70% of Sri Lankan students have no access to online study. Due to remote learning, there are students who do not have access to devices and internet connectivity as they are financially unstable to afford. Hence, with the development of the proposed system users will be able to contribute any worksheets by uploading them and these will be available for purchase for the other users. The income gained will solely be used to help the underprivileged students and help them in their education.

It is the responsibility of educators to do the best that can be done to make sure the students are being focused and attentive during the lessons to minimize learning loss. Most importantly, as humans we all need to ensure that each child has the right to education. Covid should not be a hindrance to these factors. And keeping these factors in mind, 'Xplore EdTech' will be a website that helps overcome these issues. Educators can explore a list of EdTech tools that will help Educators find the required tool with ease considering the subject and the concept they want to teach for their grade level. They will also be provided with a few videos guiding them on how the EdTech tool can be used in their classroom virtually. Using these EdTech tools will ignite the class and help educators and students learn virtually in a fun and interactive way ensuring the students stay focused and interested during the lesson. As the slogan of the developed website states 'Spark with EdTech' keeping this in mind.

## **2. Literature Review**

With the advancement of technology, the 4th Industrial Revolution is rapidly developing with technology. Generation Z and Alpha need to enhance the technological skills to be able to face the world of technology. According to Jenna, Digital literacy and technology skills are the common cited 21st century skills. (Anon, 2020)

*The effective use of digital learning tools in classrooms can increase student engagement, help teachers improve their lesson plans, and facilitate personalized learning. It also helps students build essential 21st-century skills. (Anon, 2020)*

The above statement holds the view that using EdTech tools in the classroom increases engagement and makes students interactive. Engagement is a vital component required in students. Without student engagement, conducting a class virtually can be quite a challenge for educators in classrooms. According to a survey which was participated by San Antonio schools, '54% of high school students said they were less engaged during distance learning than they were during in-person classes, and 64% of parents of younger students said the same about their children.' (Rosa, 2020)

Analysing these statistics, it is believed that the developed website will help educators find interactive tools that will make the learning process fun for the students and keep them engaged giving them the knowledge required.

Due to Covid students spend most of their time in front of the screen at the comfort of their home with no educators or peers around them. In addition, virtual learning from home can be distracting too which leads to learning loss in students. As an educator myself, I believe that if the student has the motivation, he/she will be attentive and interactive during the virtual lessons conducted. And I strongly believe, gamified learning is one of the best ways to keep them motivated and engaged.

According to the Journal of Education for Business, a survey was conducted to investigate 'How participating in a gamified course motivated students overall and examined the individual effect of specific game elements.' And the results stated, 'Of the participants, 67.7% reported that the gamified course was more or much more motivating than a traditional course. Correlational data indicated that being a member of any measured demographic (e.g., gender, age, student status) was not a barrier to finding gamification motivating.' (Chapman and Rich 2018, p 314)

Traditional teaching is definitely an inefficient way when teaching online. And as proven in the article, gamified learning motivates students. 'Xplore EdTech' is a website that has a list of gamified learning tools that can be used in the classroom to teach students virtually. With a vast number of EdTech tools available, it can be quite time consuming to find the right tool that best

suits the subject. In addition, all tools are used differently and “How to use” can be a reason educator do not opt to use the EdTech tool. Thus, the developed website will provide links and guidance and how the EdTech tool can be used saving time for the users.

With the global pandemic, technology has taken a greater role in the education for school aged students. Technology has become a need among students just like how the pen and paper is an essential for them. As described in RingCentral blog, ‘But one thing’s for sure, whether classrooms are set to permanently re-open, or whether a more hybrid online/in-person approach will become the new norm, technology will be at the centre of the educational experience.’ (Anon 2021)

From this it is evident that despite virtual schooling may cease to exist after two or three years the developed website will indeed be useful for the foreseeable future as implementing EdTech tools in the classroom has become the new norm in the Education System.

However, how can educators be whatever the subject they teach, use technology for their virtual teaching? As mentioned in RingCentral blog, it contains benefits of using Educational Technology and how it can be integrated in the classroom. The 2nd method of integration being ‘Gamification’, it says that ‘It’s important, however, to ensure that your games and quizzes are designed with your students’ course learning objectives in mind.’ (Anon 2021)

With that being said, the developed system is built to ensure that the educators can find the required tool that best suits the subject and the concept. Sometimes, the EdTech tools available can be used for various concepts but due to the less exposure and guidance finding the right tool and implementing with the lesson plan can be arduous.

*That so many children and young people have no internet at home is more than a digital gap –it is a digital canyon. Lack of connectivity doesn’t just limit children and young people’s ability to connect online. It prevents them from competing in the modern economy. It isolates them from the world. And in the event of school closures, such as those currently experienced by millions due to COVID-19, it causes them to lose out on education. Put bluntly: Lack of internet access is costing the next generation their futures. (Fore, 2020)*

As stated by the UNICEF executive director, it is evident that the digital divide has led to school-age children around the globe to lose out on their education due to the lack of internet access. UNICEF further states that ‘Globally, around 60 per cent of school-age children in urban areas do not have internet access at home’. (UNICEF, 2020) With children having limited access to education, ‘Xplore EdTech’ hopes to bridge that gap. With users being able to upload their worksheets without expecting any return, other users are able to purchase them, and the income gained will be used to help the underprivileged children in their education.

There are websites like Common Sense, Tes Resources and Edutopia which have information similar to that of the developed project. However, the developed system is more catered towards having all EdTech tools with simple guidance on how it can be integrated in their lesson plans based on the subject and grade level in one platform. These websites do not have a recommendation system by which based on the user profile, similar EdTech tools will be recommended nor a chatbot to make the search criteria for the user more efficient and effective.

### **3. Methodology**

To collect the requirements quantitative and qualitative research were conducted. To finalize the development of the project and make it a successful one, research was done in the form of interviews, surveys and analysing existing systems. The outcome of these methodologies helped greatly in designing and implementing the project. With the results it was easy to understand the requirements that will be effective in the system.

#### **3.1 Professional, Legal and Ethical issues**

All user data will be kept confidential within the system. The personal privacy of the user will not be compromised for any reason. The database will be well protected to ensure that no third party can access the system. Passwords will be encrypted in the database, guaranteeing that no user can view the original password of the registered users. There will be one main Admin - the super user who can access the database to enter and modify data if required. Emails will be a required element to be entered by the user, however these emails will not be used to send unsolicited emails.

No malicious programs will be spread with the use of 'Xplore EdTech'. In the event of files to be downloaded, it will be ensured that the files are protected from any harm.

The payment gateway implemented within the system, will ensure that it is safe for the users. All income earned through the purchase of worksheet will be visible to the respective users who contributed and purchased by showing proof that all income gained was used for the intended purpose. The worksheet price will be decided by the admin and based on the quality and content of the worksheet. It will be ensured the worksheet is affordable and not overcharged to be purchased.

Pictures of the donations given will be posted on the website. Furthermore 'Xplore EdTech' is partnered with non-profit organizations and all income gained is donated to those organizations to help needy students. By being partnered with them it is believed that the trust in uploading and purchasing worksheets will be high.

The website will ensure that all EdTech tools and videos obtained will be linked to the original website and all due credits are given to them. During the uploading process of the worksheets, users will have to enter their details and these details will be visible to the other users viewing the worksheets that can be downloaded. This ensures that the credit is given to the rightful owner. The Images and icons used for the development of the website are taken from sites like Pexels, Icons 8 and Icons-Icons ensuring that the images and icons used in the website are free to use.

## **3.2 Project Management**

To track the progress of the project, a planner was created. Using planners makes it easy for the project managers to keep track of the progress. It is easy to check if we are far behind the schedule or on track accordingly. The Gantt chart created helps check the milestones of the project which is the date of submission. The work breakdown structure maintained helped identify the tasks needed to be done for the successful completion of the project.

Visual Studio Code was the platform originally planned for the development of the project, however due the technical issues that arose the backup platform - PyCharm Edu had to be used. With our initial deadline being 19th December 2021, there was less time to self-study and implement the technologies in the development. Having another assignment due on 22nd November 2021, it was tough and challenging to balance both the modules. Thankfully, the deadline was extended to January 4th, 2022, which gave us more time to learn and implement the technologies to the best that we could.

Technologies like Django, MongoDB, Machine Learning for the recommendation engine and Artificial Intelligence for the chatbot had to be learnt and implemented. Learning how these functions took time and implementing them bugs arose. As all the technologies are something new and had to be learnt from scratch, extra time had to be allocated for self-directed learning.

## **4. Design & Implementation**

The website was developed with the intention of helping educators around the globe to easily explore Educational Technologies at one spot making it easy for them to choose what best fits their subject and grade-level. Thus, the name 'Xplore EdTech' was branded for the site. Introducing these EdTech tools in classrooms, will greatly help students interact and engage more, making it a convivial learning. With a vast number of EdTech tools available, we hope to help the educators use these in their classroom and ignite the interests in their students to participate more in their learning classes. Hence the slogan 'Spark with EdTech'. Consideration and much thought was given with regards to the name and slogan as we had to ensure it stands out and is memorable, just like the 'I'm lovin it', which reminds everyone of McDonalds almost at a flash.

The logo was carefully and gracefully designed using Canva. The hex colour # 2c0c3d which is more of a dark shade of purple is the colour that represents 'Xplore EdTech'. As the colour purple signifies elements like creativity, wisdom and ambition, I wanted the developed project to indicate and represent these elements to the users.



Figure 1 : Xplore EdTech Logo and Slogan

The user interface of the website was designed in Figma. Designing the UI of the website was quite challenging as I would not call myself a designer or a perfectionist. The user interfaces of the websites were designed with very basic knowledge in operating Figma. However, later with research and help, the UI designs of the website were modified and created keeping in mind the UI perspectives in designing to the best that I could. A style guide was also implemented in Figma. Frames were created for each page and the pages were labelled and organised based on the process of the website. The background image for the signup and login page was designed from the beginning by creating hexagons and importing the logo of various EdTech tools into them. Afterwards, the Lunapic online editor was used to edit and reduce transparency of the image.

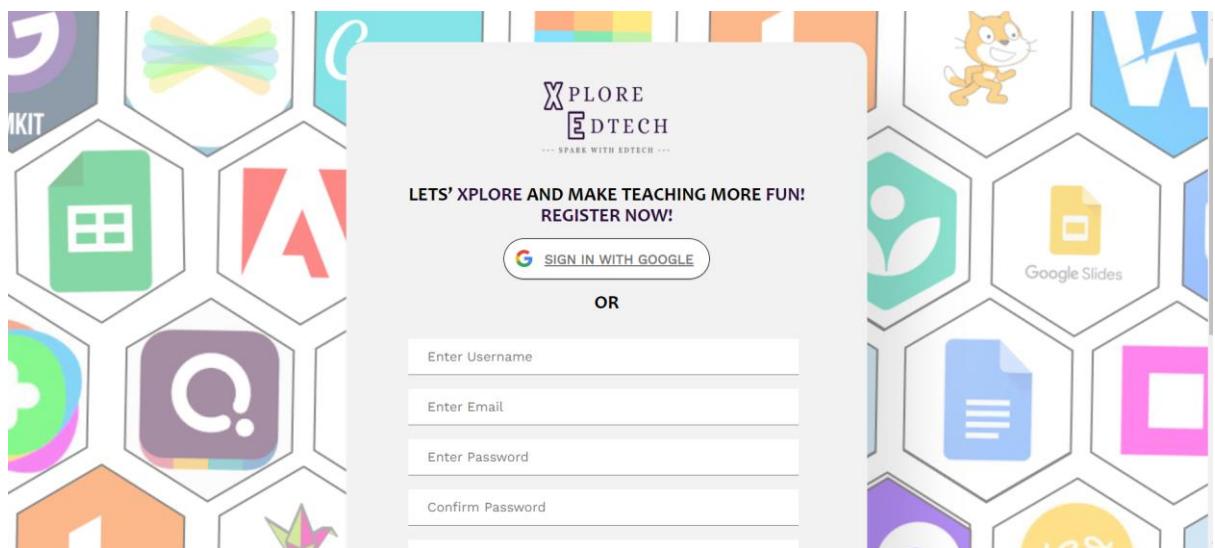


Figure 2 : Sign Up page - Background Image

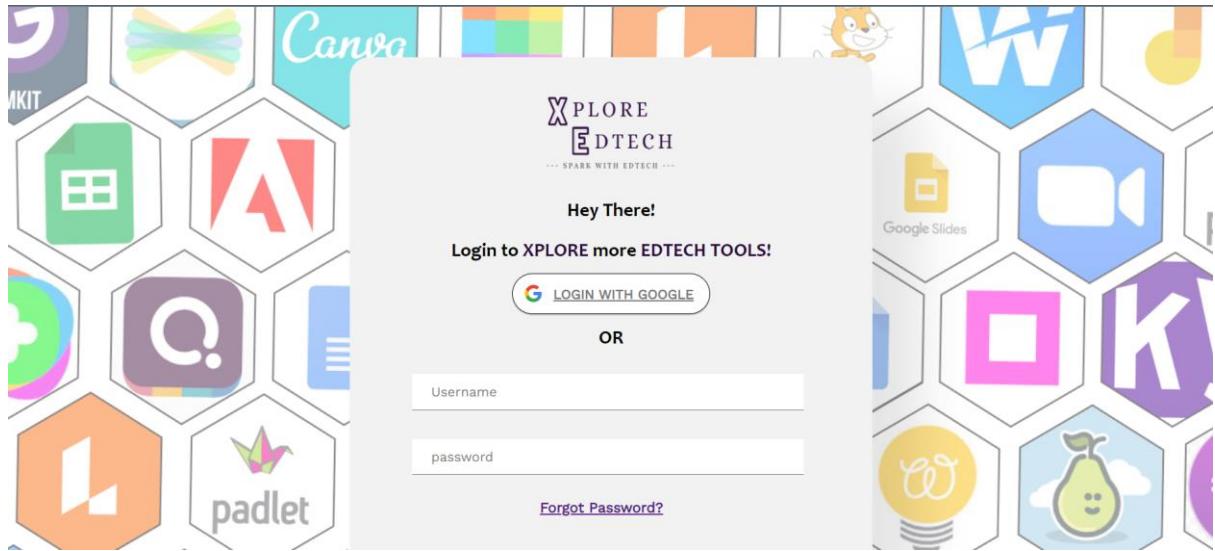


Figure 3 : Login page - Background Image

The favicon is designed with the initials of the website name, 'XET'. Favicons helps users easily identify the website from their bookmarks and even their history in their web browsers. It is even displayed on the search engine making it easier for users to identify what website it is.

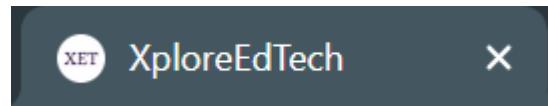


Figure 4 : Favicon of Xplore EdTech

Having developed websites previously using HTML and CSS integrating with PHP for data connectivity, this project has led me to discover new areas of learning. Wanting to venture and try new technologies, Django was chosen for the frontend development. This was also chosen as a recommendation engine - content based filtering had to be implemented on the website written in Python programming language. Thus, having developed my website using a python framework it would be easy to integrate the recommendation engine to the website.

Having zero knowledge on how to operate Django, self-directed learning had to be done to be able to develop the website. Edureka, Linkedin Learning, Codemy, Stack Overflow and most importantly the Django documentation are some of the websites that have helped me in the development process.

The website is being developed using the Django Python framework. The architectural pattern followed by Django is Model-View-Template. The Model in MVT software design pattern handles the databases. It is the data access layer which handles all the data. The Template is where all the user interface is handled, and by which eventually is being displayed to the User. Finally, the View is the business logic, and it helps interact with a model to carry data and render a template. In view, interfaces are created to show the actual output to the user.

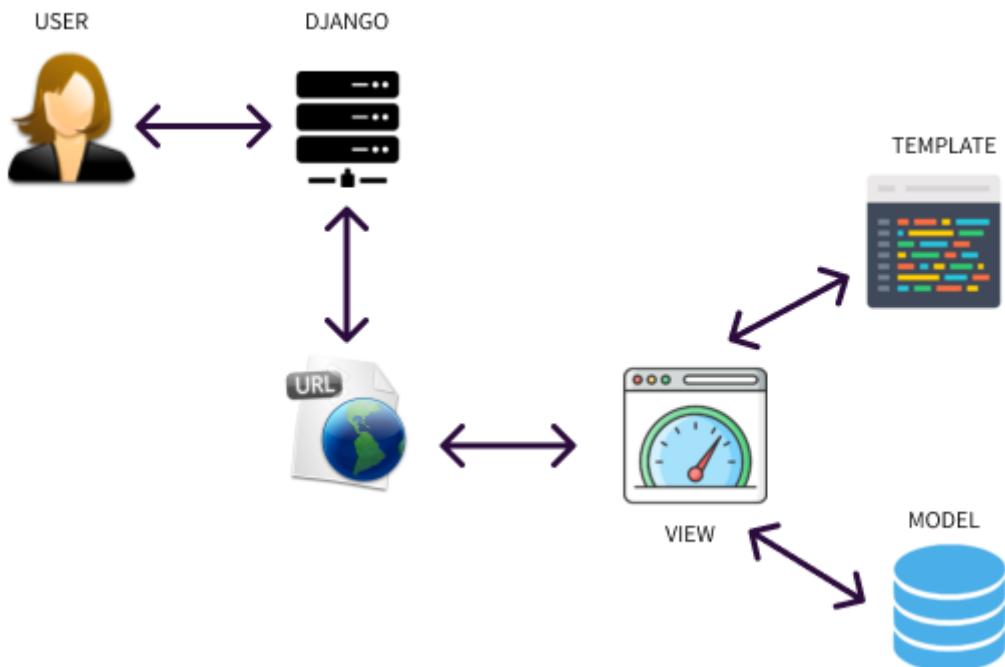


Figure 5 : MVT based control flow (designed in Figma)

Initially, the python framework was installed in Visual Studio code, due to technical issues I wasn't able to develop using this platform. Therefore, Pycharm was used as the alternative solution to develop the website. During the initial stages of development, I was unable to see the changes made after running the server multiple times. Having inadequate knowledge on this framework, it was believed that that error was in the code itself and time was taken to identify and fix the issue. With the help of Stack Overflow, it was understood that the changes could not be seen as the cache had to be cleared for the latest updates to be visible. This was a hindrance as the cache had to be constantly cleared every so often for the changes to be updated on the website.

MongoDB which is a NoSQL database program is used as the database to store all the data. Having knowledge of developing websites with SQL databases, I wanted to expand my knowledge and try developing the website with NoSQL, thus MongoDB was chosen as the database. With limited knowledge in handling MongoDB, I believe I could enhance my knowledge by learning and implementing this database for my project.

To connect to the MongoDB Compass, the Djongo package had to be installed to connect with it. The command ‘pip install djongo’ was executed for this. In the models.py page all the tables were created. Once the migrate command was run, the tables were made in the MongoDB Compass. The ‘auth\_user’ table had all the users who have created accounts and this account was linked to the ‘register\_table’ table with a one-one relationship. This table had other details of the user like the subjects, role, school etc. ‘techtool’ and ‘worksheets’ table were created to enter the EdTech tools into the database and for the worksheet files to be uploaded respectively. And these models had to be imported from the models.py file to the admins.py file to be displayed on the Django admin dashboard.

The screenshot shows the Django Admin Dashboard with a dark theme. The left sidebar lists several sections: ACCOUNTS (Email addresses), AUTHENTICATION AND AUTHORIZATION (Groups, Users), HOMEPAGE (Register\_tables, Tech tools, Worksheets), SITES (Sites), and SOCIAL ACCOUNTS (Social accounts, Social application tokens, Social applications). Each section has 'Add' and 'Change' buttons. To the right, a sidebar titled 'Recent actions' lists ten entries, each with a small icon, the action name, and a 'Tech tool' label.

Action	Description
Maths-test	Tech tool
Pre-school, Suitable for any subject-ABC ya	Tech tool
Pre-school-Toy Theatre	Tech tool
Pre-Toy Theatre	Tech tool
Suitable for any subject-Toy Theatre	Tech tool
Language-Flipgrid	Tech tool
Pre-school-Google Slides	Tech tool
Pre-school-Google Slides	Tech tool
Pre-school-Kahoot	Tech tool
Pre-school-Kahoot	Tech tool

Figure 6 : Django Admin Dashboard

Since the database was hosted locally, we had to create a MongoDB Atlas account which is a cloud database. A free cluster was created named ‘Final Project’ and a username (admin) and password was created for the cluster. Afterwards the cluster was connected using the MongoDB Compass and a link was created. This link was copied and pasted on the MongoDB Compass and a connection was made.

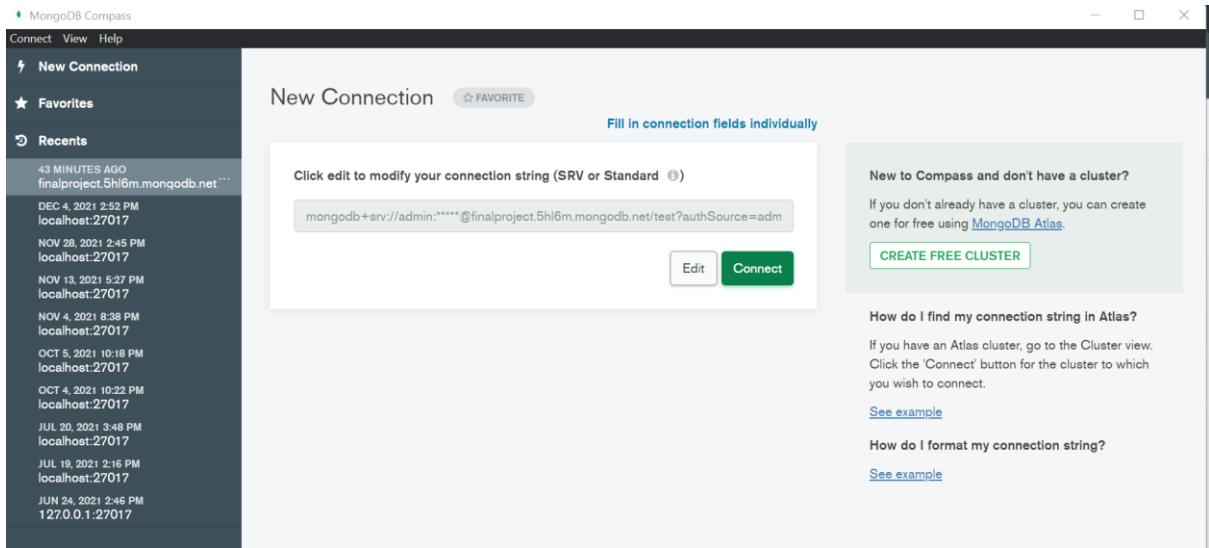


Figure 7 : MongoDB Connection

After creating the new connection, the database data had to be updated in the settings.py in Django. However, when executing the command ‘python manage.py migrate’ errors were raised. Therefore, the attempt of establishing the connection and hosting the database to the cloud was a failure.

*Whether big or small, animations can enhance the experience users receive when they visit your website. Animations make a website more engaging and interactive, but the best method is, ultimately, to keep your animations as simple as possible. (Anon, 2020)*

As stated above, using animations enhance the user experience. Thus, few simple animations were implemented in the development of the website to make it more engaging and interactive to the user. It helps improve the overall website experience. CSS and JavaScript are the main technologies used to create the web animations.

During the development of the signup, login and user profile page a lot of bugs occurred. Using Django, forms can be created by default. Thus, when customising them to suit the needs of the project there were bugs. And when one functionality worked, the other did not. Unable to debug the errors, there was a thought to discontinue with Django and go for REACT instead. However, since there was less time, changing midway would be a hassle and time consuming. With more research and learning with the help of Django documentation and YouTube videos the bugs were finally resolved.

Google sign-in and login is integrated with the website with Google APIs. The OAuth credential had to be allowed for the user to be able to access the Google APIs. The authentication backend and apps had to be entered to the setting.py file. Even though once the user signs and logins using Google, the database is updated accordingly. Afterwards an error occurs in the front end of the database.

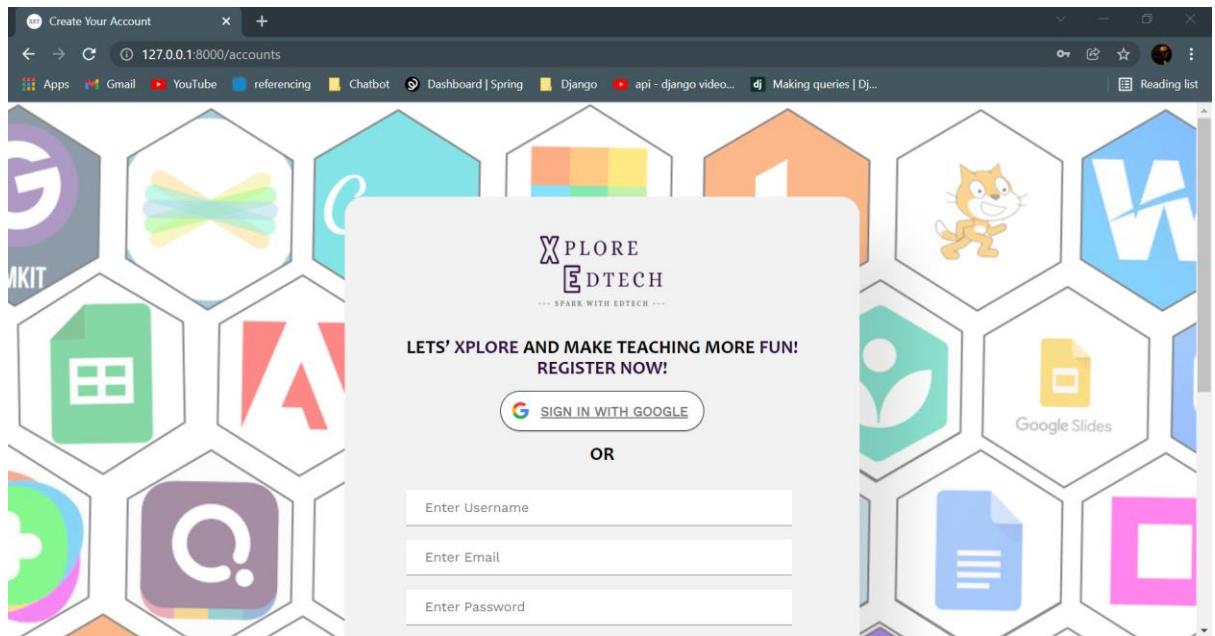


Figure 8 : Signup Page - 01

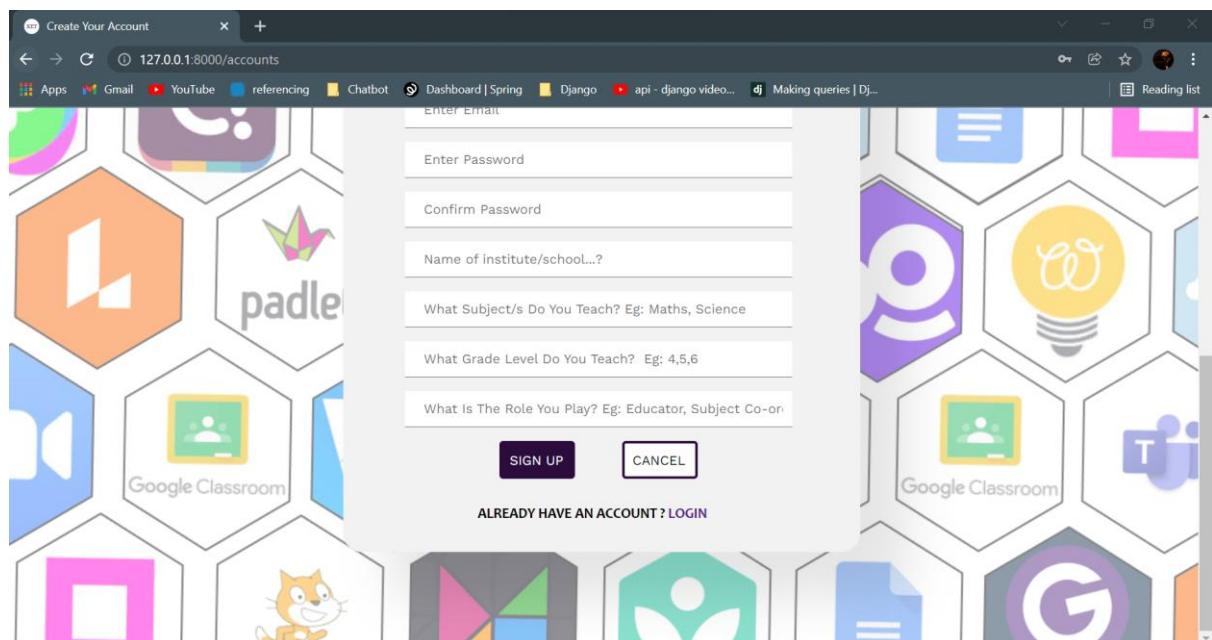


Figure 9 : Signup Page - 02

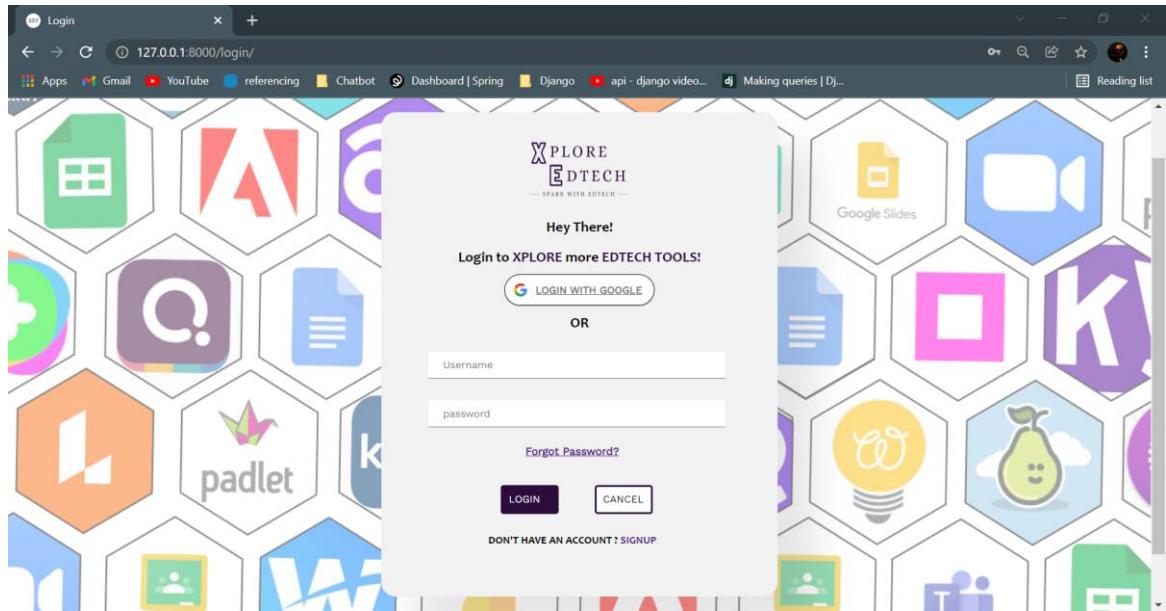


Figure 10 : Login Page

In case the user forgets his password, the user may click on the 'Forgot Password' link and enter his email. Thereafter an email will be sent to the user, and the user also gets to view his/her username if forgotten. However, this functionality doesn't work due to errors.

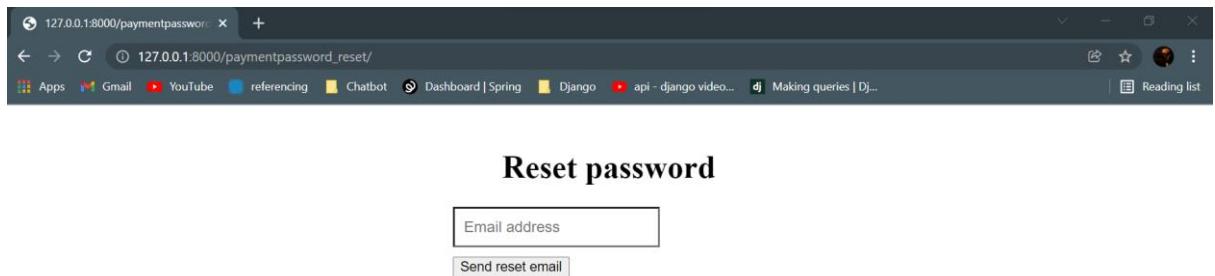


Figure 11 : Forgot Password

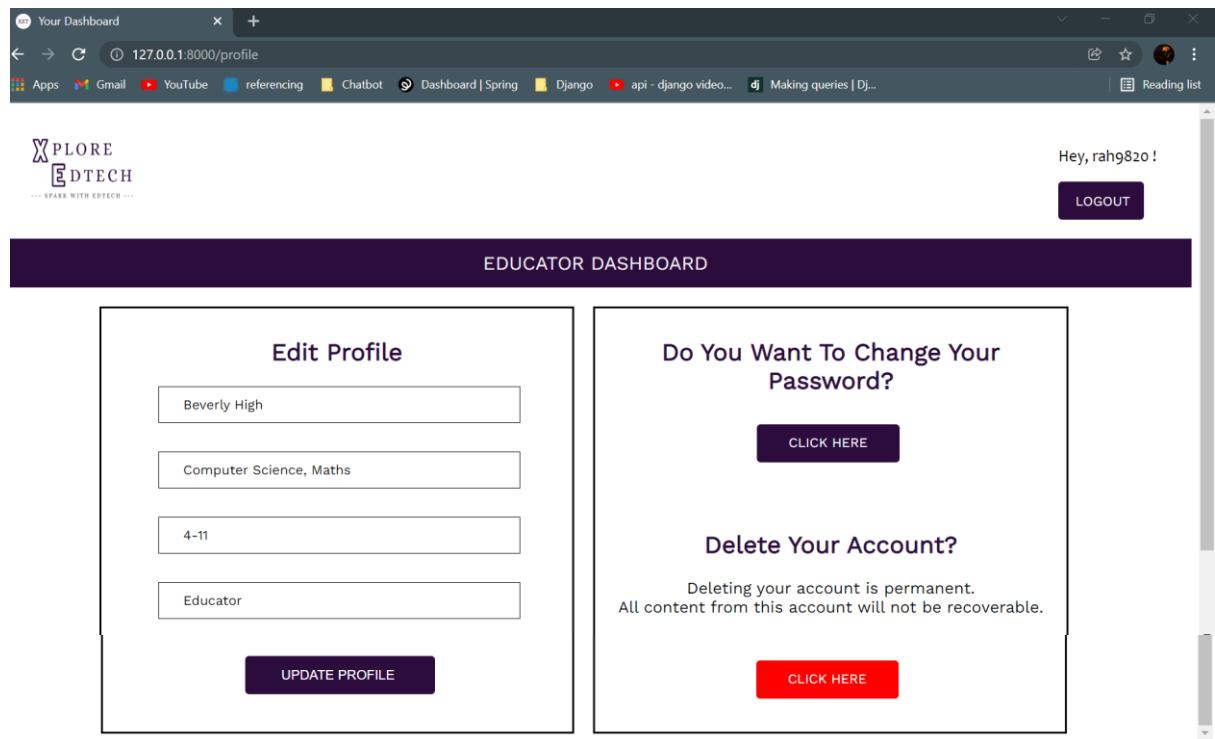


Figure 12 : Educator Dashboard

As shown in Figure 12, once the user logs in to their account, their details will appear in the Edit profile section and the username is displayed above the logout button. And the user is able to change the password and delete the account. However, the delete account functionality does not work.

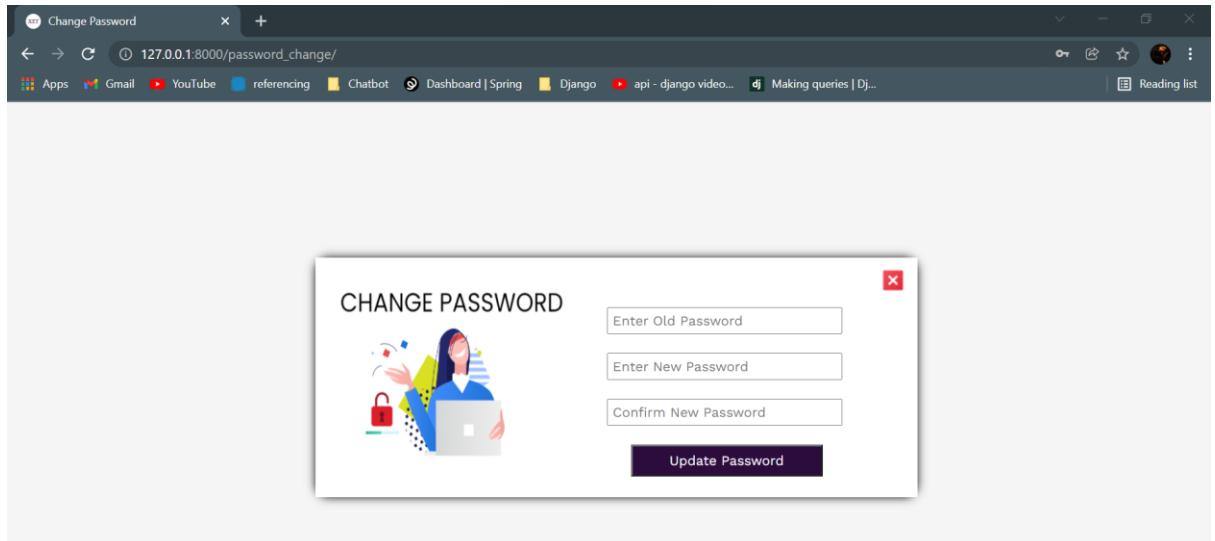


Figure 13 : Change Password

The website being about EdTech, tools had to be selected for various subjects and grade-level. All the tools and required data had to be examined attentively and chosen to be uploaded to the website to be displayed. To start off the subjects: Maths, Science, Languages and for Pre-schoolers EdTech tools were selected and updated with a minimum of 4 in each area. In addition, tools that can be used overall in all areas of education are categorised under common tools. Ample time was taken to watch multiple videos and go through sites in researching and gathering the appropriate EdTech resources to be uploaded on the website. It is important to find the right resources so that it makes it easier for the users to immediately, figure out the EdTech tool they need and know how to use them.

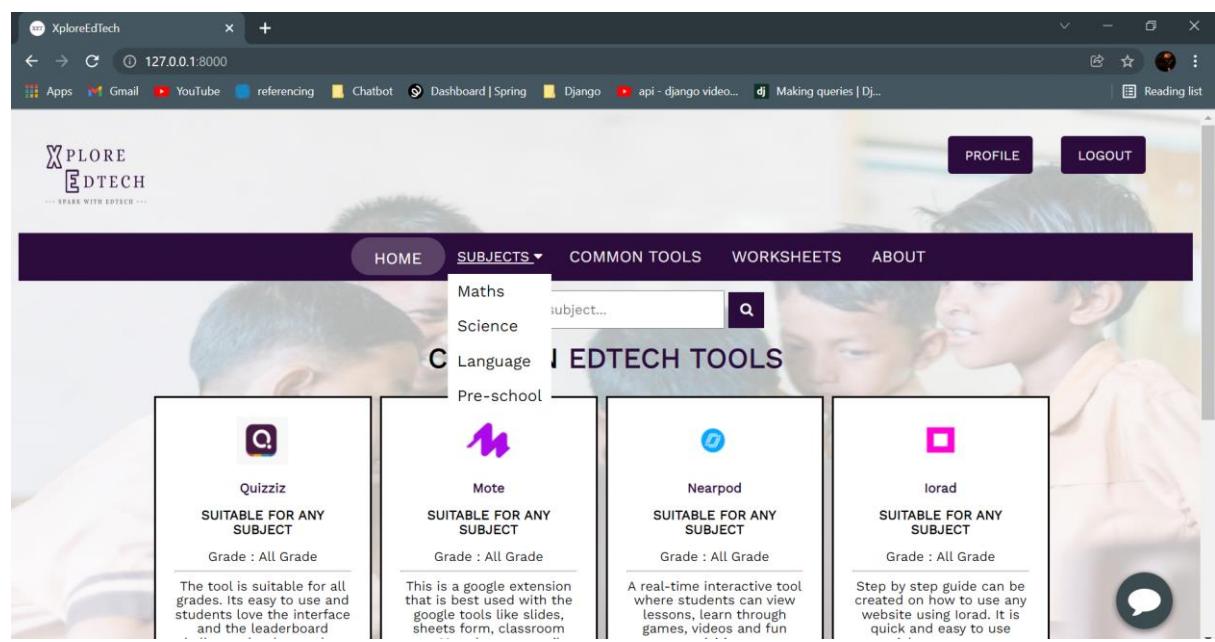


Figure 14 : Subject Categories

The Home page of the website has 4 common tools displayed and if users wish to see more common tools, ‘view more’ can be selected by which the user will be redirected to the Common tools page.

The screenshot shows a web browser window titled "Common EdTech Tools" at the URL 127.0.0.1:8000/common. The page has a dark purple header with navigation links for HOME, SUBJECTS, COMMON TOOLS (which is the active tab), WORKSHEETS, and ABOUT. There is also a "SIGNUP" and "LOGIN" button. A search bar at the top right contains the placeholder "Search by EdTech Tool...". Below the header, there are four cards, each representing a different EdTech tool:

- Quizziz**: Grade: All Grade. Description: The tool is suitable for all grades. Its easy to use and students love the interface and the leaderboard challenge that hypes them to do better. **How To Use :** [WATCH VIDEO 1](#) [WATCH VIDEO 2](#)
- Mote**: Grade: All Grade. Description: This is a google extension that is best used with the google tools like slides, sheets form, classroom etc. Mote lets you easily add voice comments and audio content. **How To Use :** [WATCH VIDEO 1](#) [WATCH VIDEO 1](#)
- Nearpod**: Grade: All Grade. Description: A real-time interactive tool where students can view lessons, learn through games, videos and fun activities. **How To Use :** [WATCH VIDEO 1](#) [WATCH VIDEO 2](#)
- Iorad**: Grade: All Grade. Description: Step by step guide can be created on how to use any website using Iorad. It is quick and easy to use tutorial creator you can find! **How To Use :** [WATCH VIDEO 1](#) [WATCH VIDEO 2](#)

Figure 15 : Common EdTech Page

The screenshot shows a web browser window titled "Language EdTech Tools" at the URL 127.0.0.1:8000/language. The page has a dark purple header with a search bar containing the placeholder "Concept... Eg : All". Below the header, there are four cards, each representing a different EdTech tool for language learning:

- Prezi**: LANGUAGE GRADES : 8,9,10,11,12,13 CONCEPT : Presentation, Language, Speaking. Description: Prezi Video lets you interact with your visuals on screen. This tool is perfect for your students to give out their language speaking skills and also helps enhance their presentation skills. **How To Use :** [WATCH VIDEO 1](#) [WATCH VIDEO 2](#) [Tool Guide](#)
- Duolingo**: LANGUAGE GRADES : All Grade CONCEPT : Starters and for reinforcing old concepts. Description: Duolingo helps students learn new languages from the basic. Students can practice speaking, reading, listening, and writing to build their vocabulary and grammar. **How To Use :** [WATCH VIDEO 1](#) [WATCH VIDEO 2](#) [Tool Guide](#)
- Flipgrid**: LANGUAGE GRADES : All Grade CONCEPT : Create videos, Presentation, Language, Speaking. Description: This is a fun social learning app that provides a safe space for students to showcase their ability and ideas by creating videos. These can also be shared for peer review and discussions. **How To Use :** [WATCH VIDEO 1](#) [WATCH VIDEO 2](#) [Tool Guide](#)
- Edpuzzle**: LANGUAGE GRADES : 6,7,8,9,10,11,12,13 CONCEPT : Understanding The Language. Description: It is a tool by which educators can take YouTube videos or upload their own videos & add customized questions for students to answer & then access student progress. It's engaging, flexible, and free. **How To Use :** [WATCH VIDEO 1](#) [WATCH VIDEO 2](#) [Tool Guide](#)

Figure 16 : EdTech that can be used with Language-based subject

When finding EdTech tools, consideration must be given to the grade-level they teach, subject and the concept. Keeping that in mind, an efficient filter system is to be implemented on the website. Using the search criteria, users can enter the subject, concept and grade-level and find the EdTech tool that they can use. However, the developed project does not meet this functionality. Only a basic search was developed where the user can enter the EdTech tool, subject or the concept to get the desired results. To achieve this functionality, with the help of the Django documentation logical operators were used. However, this was unsuccessful.

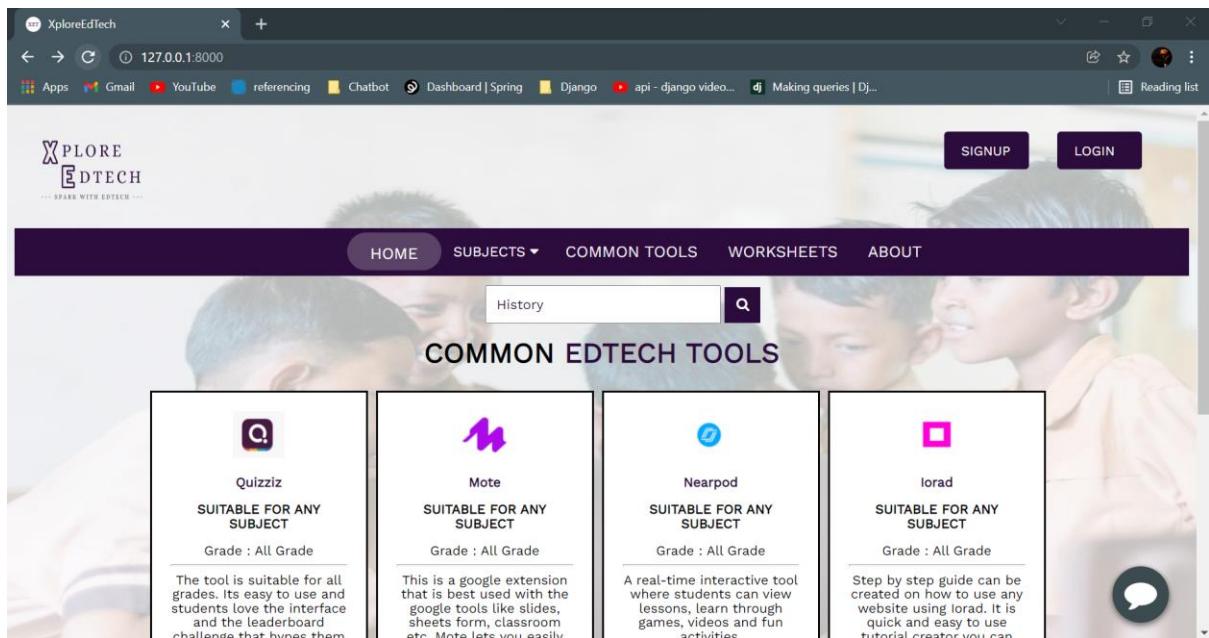


Figure 17 : From the Home Page a subject can be searched from the search bar

A screenshot of a search results page titled 'SEARCH RESULTS FOR History'. At the top, there's a search bar with the placeholder 'Concept... Eg : All' and a magnifying glass icon. Below the search bar, there are two search results cards. The first card is for 'National Geographic Kids' (suitable for all subjects, grade All Grade) and the second is for 'Google Earth' (suitable for grades 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, concept Visualize Places, Events, Cultures and more). Both cards provide a brief description of the tool and its applications in education. A speech bubble icon is visible in the bottom right corner of the page.

Figure 18 : Search results page

When adding EdTech tools to the database, admins are able to add the logo of the EdTech tools to be seen on the website. In addition, Users are able to upload worksheets as images or pdf for others to download by making a payment. For this the python imaging library ‘Pillow’ was installed to ensure that images of different formats could be opened, manipulated, and saved to the database from the front-end of the website.

For the users to upload worksheets, they must agree to the terms and conditions that pop up when the user selects ‘Click to upload’. Only if the user selects ‘Yes’ he/she will be able to upload the worksheet. Users are able to upload only one worksheet at a time.

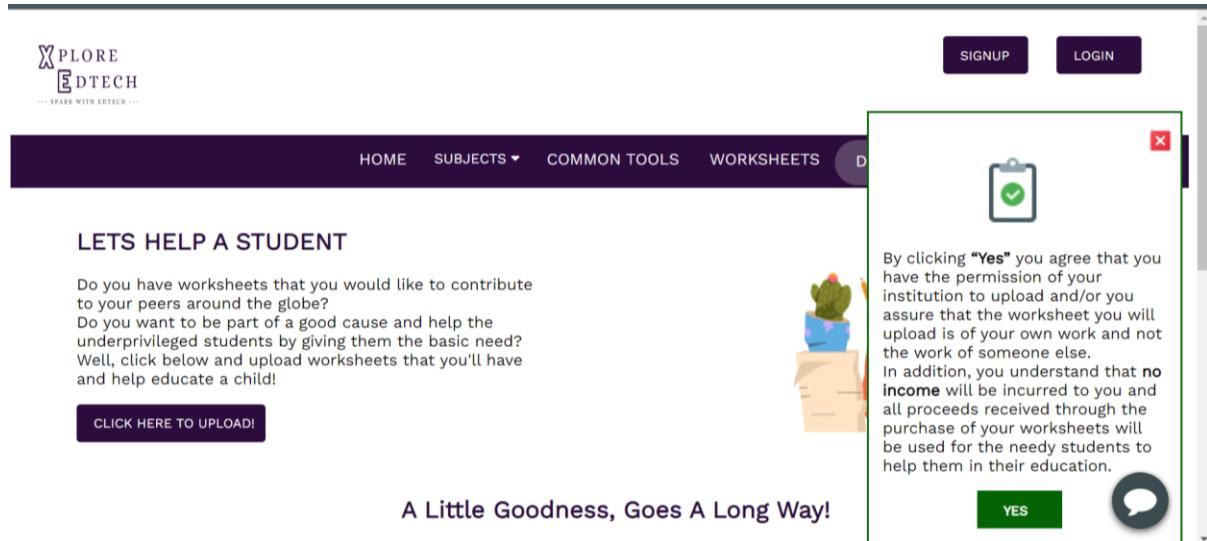


Figure 19 : Terms and condition pop-up

The screenshot shows the 'Upload Worksheets' section of the website. It includes a form with fields for 'YOUR NAME', 'SCHOOL', 'EMAIL', 'SUBJECT', 'CONCEPT', 'GRADE-LEVEL', and 'UPLOAD FILE'. There is also a file input field with the placeholder 'Choose file' and 'No file chosen', and a 'SUBMIT' button. The background features a cartoon illustration of a child sitting at a desk with a potted plant and a book.

Figure 20 : Upload Worksheets Section

The worksheets uploaded by the users are immediately available for purchase. Users can purchase each worksheet and the payment received will be donated to the organisations 'Xplore EdTech' are partnered with, who help students in need. By partnering with reputed non-profit organizations users trust will increase by which users will be able to purchase without any second thoughts. Evidence of the donations given will be uploaded in the form of pictures on the website to ensure that all users can view the beneficial work done by 'Xplore EdTech' with the help of their users.

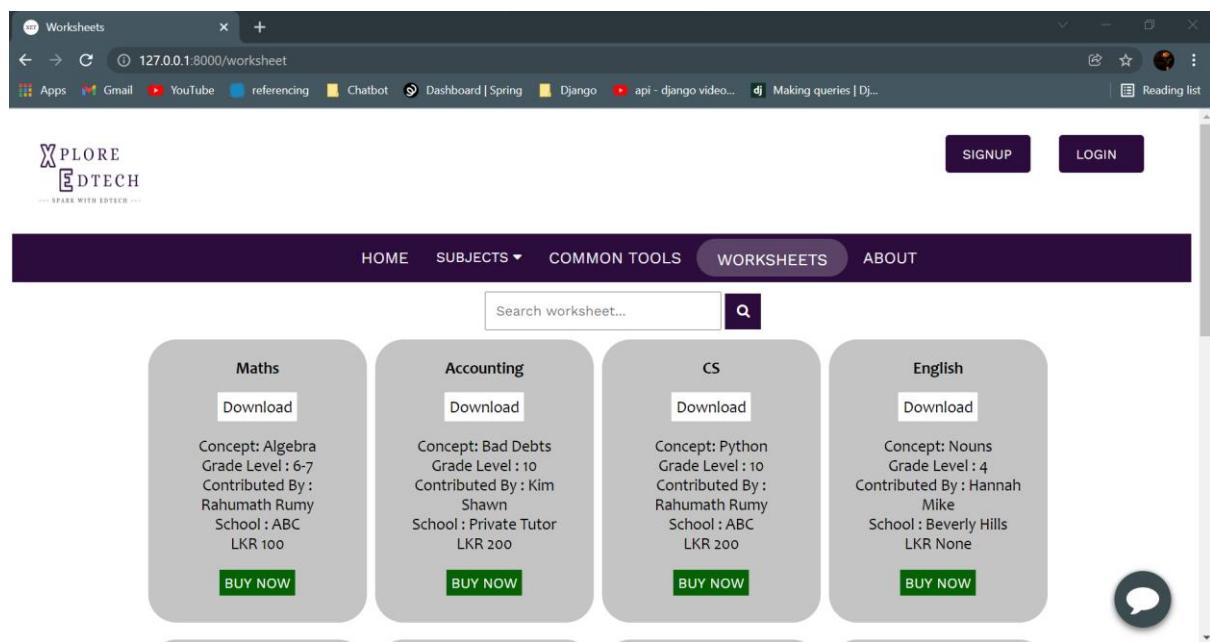


Figure 21 : Worksheet Page



Figure 22 : Pictures of the proof of the donations given uploaded on the site.

For the payments to be made, the Stripe package was also installed to integrate the Stripe payment gateway. The Stripe API test keys were obtained from the Stripe dashboard after creating a stripe account. The test secret key and test publishable keys were added to the settings.py file in Django from the Stripe Dashboard. However, only the test mode is functioning to an extent and due to the time constraint further research could not be done to ensure that it works fully.

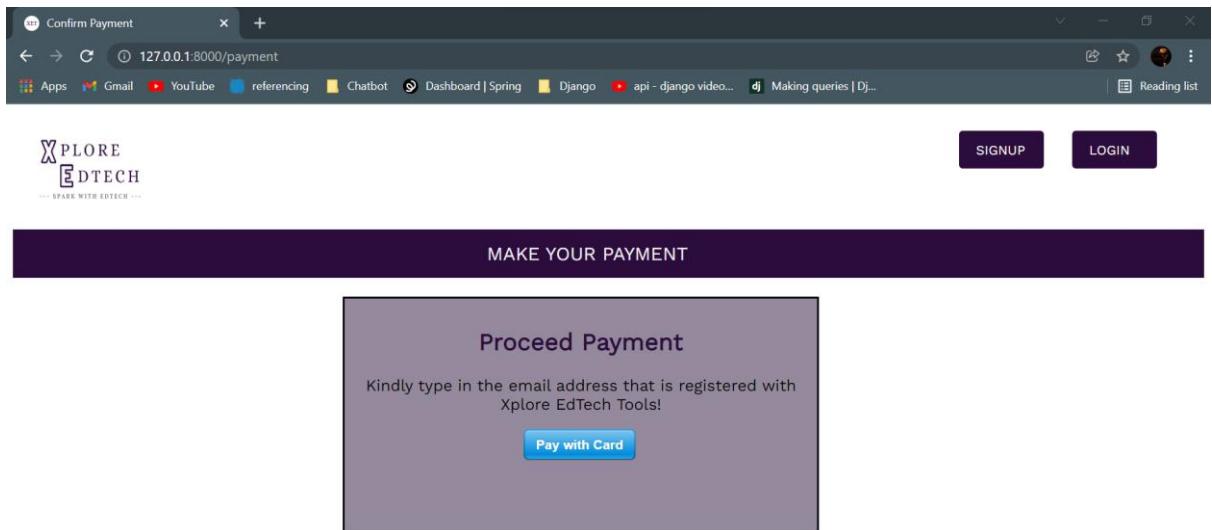


Figure 23 : Payment Page

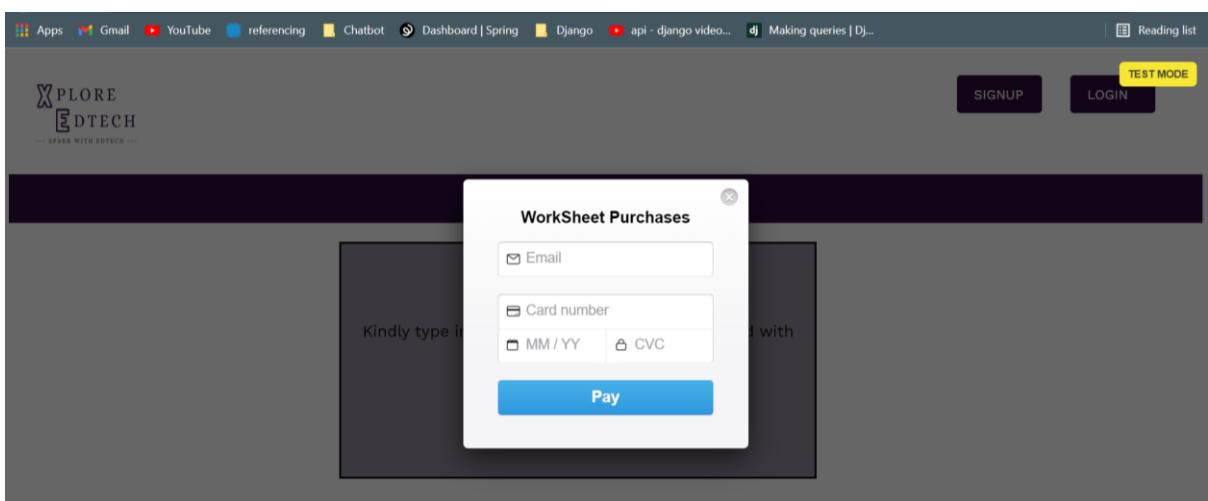


Figure 24 : Enter payment details page (Integrated with Stripe Payment Gateway)

When developing the project, during the purchase of worksheets, users were able to download the files even before purchasing. Thereafter the download option was disabled therefore the worksheet could not be viewed or downloaded. Hence, users are unable to view the file before they download. This component is essential as users should be able to know what the worksheet is all about. Sadly, this could not be achieved. Even after the payment is made in test mode, the user is unable to download the file. Therefore, an alternative solution that I had in mind was to make users upload the file and it will be saved in the database. Thereafter, the admin must review the data and save the first page of the file uploaded, as an image. And then upload the image to the website for the users to view. And after the payment is made the download option should be made available for the users to download. However due to the time constraint this alternative could not be achieved.

Content-based Filtering is a Machine Learning technique that uses similarities in features to make decisions. This technique is often used in recommendation systems, which are algorithms designed to advertise or recommend things to users based on knowledge accumulated about the user. This content-based filtering method will be used to find similar EdTech tools for the user based on the subjects the educator teaches from the users' profile page. This makes it easy for the educators to easily view the EdTech that best suits their areas of interest.

## CONTENT BASED FILTERING

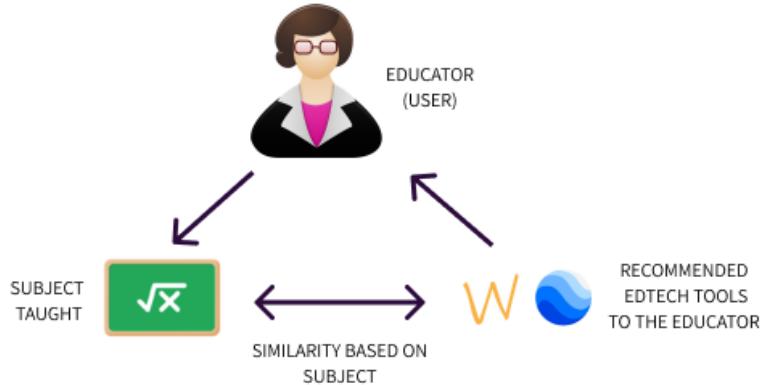


Figure 25 : Content Based Filtering for 'Xplore EdTech'

As Figure 25 shows (designed in Figma), the user will enter in the subject/s she teaches when registering and based on that, EdTech tools will be recommended to the user. As the image implies, the educator teaches Maths, and based on those tools like Whiteboard.fi and Google Earth will be recommended to the user. Jupyter notebook is the web application used to implement the recommendation engine. To connect the database to the Jupyter notebook, the package 'pymongo' had to be installed. This is the MongoDB python driver for MongoDB. Pandas also had to be imported as it helps analyse and manipulate data. Since I was unable to host the

database to the cloud the ‘MongoClient’ connection could not be made. And sadly, due to the lack of knowledge, this functionality could not be implemented in the developed website.

As per the survey conducted during the initial stage of the development, 55.6% of the users said a chatbot would be an effective integration to the website. Thus, Dialogflow was integrated with Kommunicate to achieve this functionality. The chatbot was built in Dialogflow, with a few training phrases added. Since there is a vast amount of data that must be added, a few samples were added to start with. If users want to know “What is EdTech”, the bot will identify similar phrases and reply to the user. With regards to the EdTech tools, users can ask the bot what EdTech tools best suit Maths and the bot will suggest a few tools for the user. Only Maths and Pre-school training phrases were added to Dialogflow by which users can get EdTech tools from the bot. Moreover, even questions related to the feelings of the user can be asked. For example, ‘There is too much work’ and ‘Students don’t listen to me’. Similar phrases will be identified, and the bot will respond with replies that make the user feel better.

After adding the training phrases and building the chatbot, a service account was created from Google Cloud Platform. After creating this cloud service google, the JSON file had to be created. After downloading the created JSON file, which is a private key, it must be uploaded to Kommunicate. This is a bot and human hybrid platform to create the chatbot. It provides a pre-built user interface for the chat widget and dashboard to be built and deployed. Once the JSON file is uploaded, the bot’s name, photo and chat widget can be customised. The bot was named ‘XET Assistant’ and the bot photo was uploaded from the device instead of selecting the default bots provided by Kommunicate. There is also an option where the bot can be handed off to a human if the bot is unable to identify the user query. However, for the website developed that option was disabled. Once the changes have been made, the JavaScript code was copied from Kommunicate and added to the Django files. Since only a few data was added to Dialogflow, we can add more data to it and create a new JSON file. Thereafter the JSON file can be updated in Kommunicate so that the XET assistant can now answer more queries of the user.

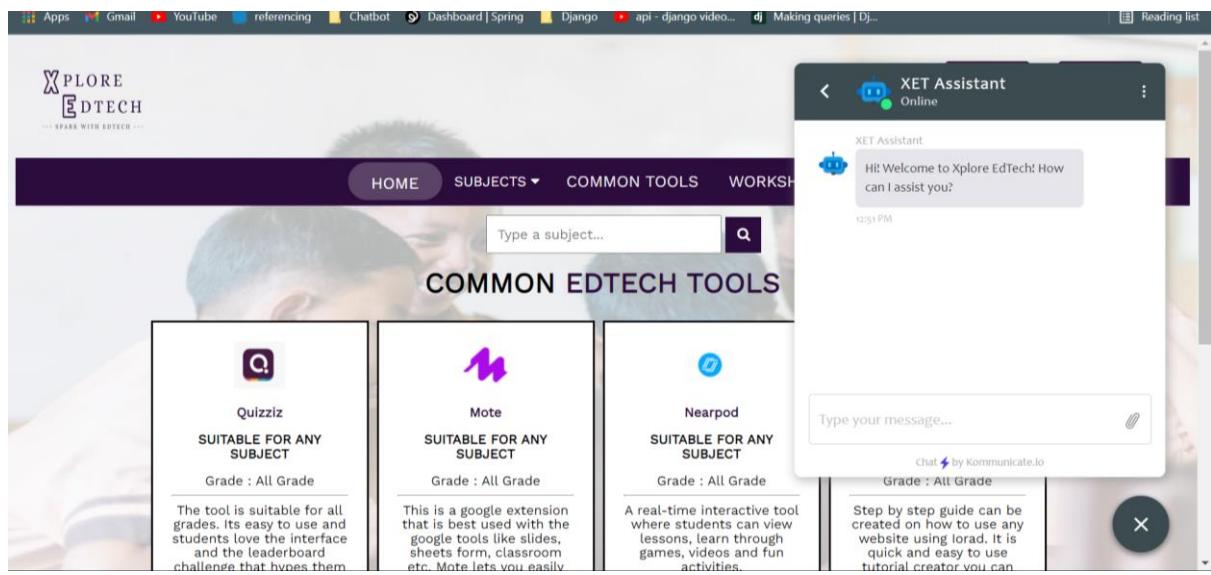


Figure 26 : Chatbot interface on the website.

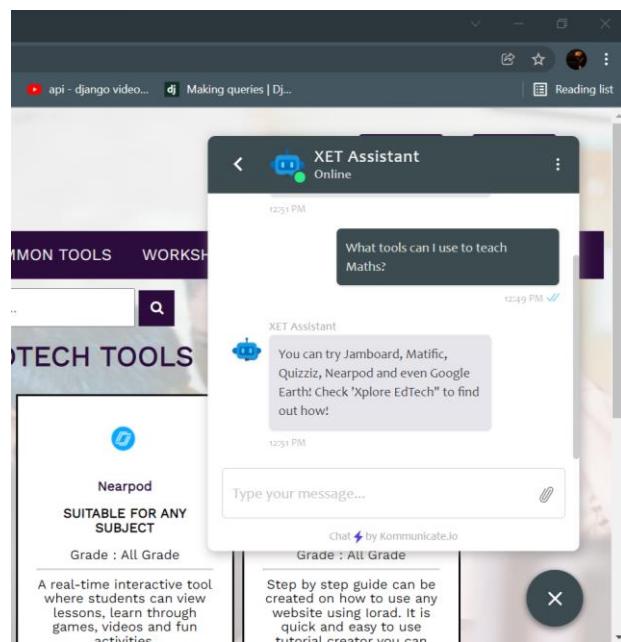


Figure 27 : Chatbot answering the query of the user.

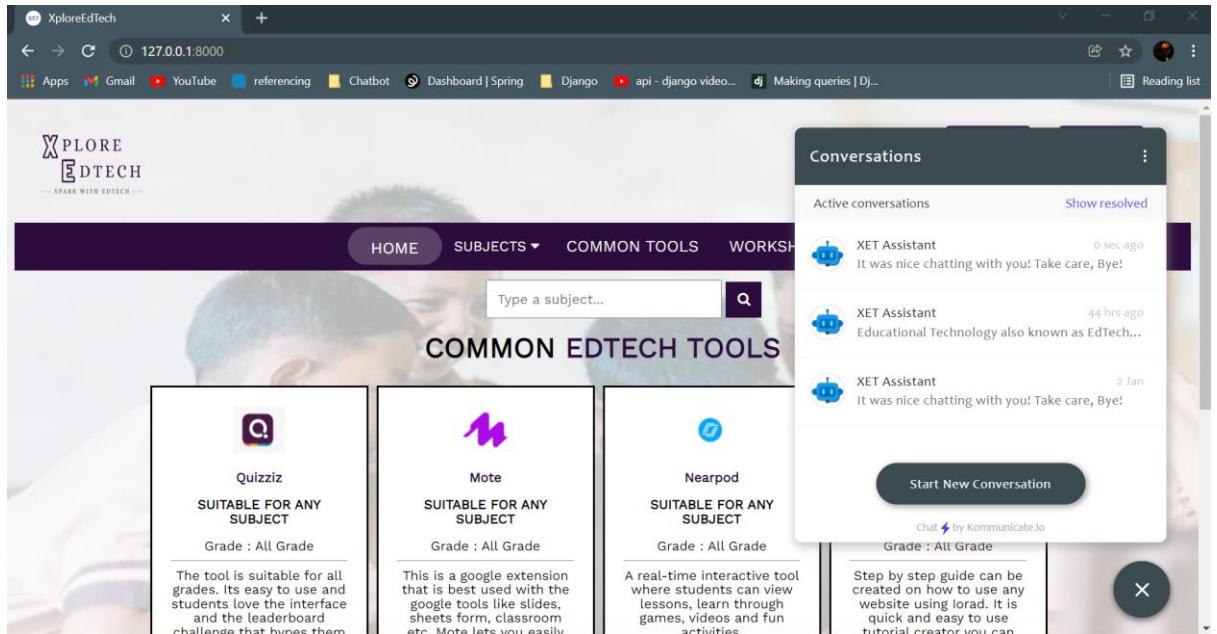


Figure 28 : Past conversations of the user

As shown in the above screenshot, the previous conversations remain in the chatbot until it is resolved. The conversations can be resolved from the Kommunicate platform. Even though it is resolved, by clicking 'Show resolved' the resolved chats can be displayed. This is useful as the users can always check on the EdTech tools if mentioned in the conversations or other details.

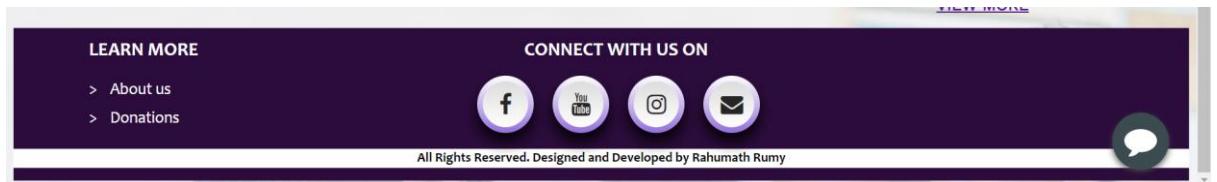


Figure 29 : The footer of the website

The social media icons in the footer have animations when hovered. And the user will be redirected to the respective social media website when clicked. The 'About Us' and 'Donations' will redirect the user to the respective pages.

To manage and track the changes made in the software code, a version control system had to be implemented. Thus, GitHub was used to commit the files. This was quite useful, as the previous codes could be obtained in case any bugs occurred, and the older version was needed.

To deploy the front-end of the application Heroku was used. Heroku was chosen as the hosting platform as it is free. The Heroku CLI was installed to deploy the application. Various packages like Gunicorn which is a web server gateway had to be installed along with whitenoise, Django-

heroku and python-decouple. The Procfile was created in the root directory of the app, and the command required to start the app from Heroku is entered in here. WSGI - Web Server Gateway Interface is used to forward requests to web applications or frameworks written in python. Requirements, Runtime and the Procfile also had to be created in the Django application in text files. Initially when these files were created and committed errors occurred. To resolve the errors, it was important to ensure that while creating the ‘Requirements.txt’, it had all packages imported and installed and the ‘runtime.txt’ file had the latest version of Python and ‘Procfile’ was named correctly with no extension (.txt) added to it. All these files had to be placed in the root of the directory. Once the latest files have been committed to git, the Heroku login command will be executed and an app is created in Heroku named, xplore-edtech. Once the git files are deployed in Heroku, the app will be successfully deployed.

According to the Heroku log file, the error “Procfile declares types -> (none)” occurred. Once this was resolved and deployed yet again ‘Application Error’ arise. The ‘heroku logs’ command was executed and the error “at=error code=H10 desc="App crashed"" arised. With various research on the issue, I was unable to find the solution thus the deployment was unsuccessful.

```
remote: -----> Python app detected
remote: -----> Using Python version specified in runtime.txt
remote: !     Python has released a security update! Please consider upgrading to python-3.10.1
remote:     Learn More: https://devcenter.heroku.com/articles/python-runtimes
remote: -----> No change in requirements detected, installing from cache
remote: -----> Using cached install of python-3.10.0
remote: -----> Installing pip 21.3.1, setuptools 57.5.0 and wheel 0.37.0
remote: -----> Installing SQLite3
remote: -----> Installing requirements with pip
remote: -----> Skipping Django collectstatic since the env var DISABLE_COLLECTSTATIC is set.
remote: -----> Discovering process types
remote:     Procfile declares types -> (none)
remote:
remote: -----> Compressing...
remote:     Done: 104M
remote: -----> Launching...
remote:     Released v18
remote:     https://xplore-edtech.herokuapp.com/ deployed to Heroku
remote:
remote: Verifying deploy... done.
To https://git.heroku.com/xplore-edtech.git
  b1be6d9..ccale79  master -> master
```

Figure 30 : Procfile error

```

Total 3 (delta 2), reused 0 (delta 0), pack-reused 0
remote: Compressing source files... done.
remote: Building source:
remote:
remote: -----> Building on the Heroku-20 stack
remote: -----> Using buildpack: heroku/python
remote: -----> Python app detected
remote: -----> Using Python version specified in runtime.txt
remote: !     Python has released a security update! Please consider upgrading to python-3.10.1
remote:     Learn More: https://devcenter.heroku.com/articles/python-runtimes
remote: -----> No change in requirements detected, installing from cache
remote: -----> Using cached install of python-3.10.0
remote: -----> Installing pip 21.3.1, setuptools 57.5.0 and wheel 0.37.0
remote: -----> Installing SQLite3
remote: -----> Installing requirements with pip
remote: -----> Skipping Django collectstatic since the env var DISABLE_COLLECTSTATIC is set.
remote: -----> Discovering process types
remote:     Procfile declares types -> heroku, web
remote:
remote: -----> Compressing...
remote:     Done: 104M
remote: -----> Launching...
remote:     Released v17
remote:     https://xplore-edtech.herokuapp.com/ deployed to Heroku
remote:
remote: Verifying deploy... done.
To https://git.heroku.com/xplore-edtech.git

```

Figure 31 : Procfile error resolved

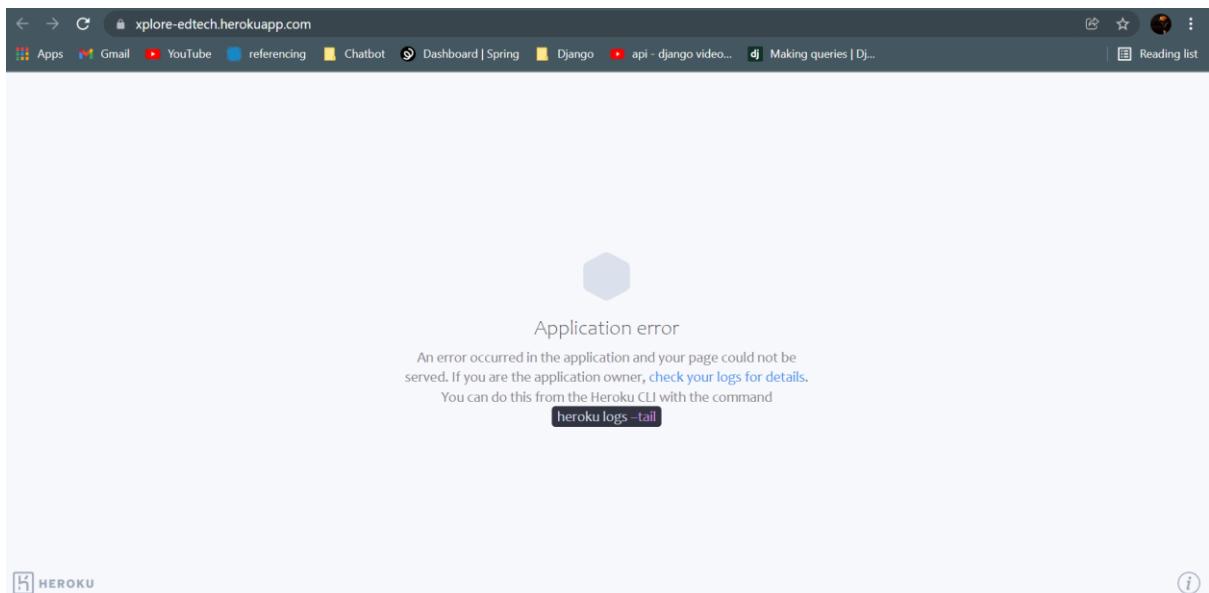


Figure 32 : Heroku Deployment Error

When developing all the pages, the correct view name has to be mentioned in the URLs page. Having incorrect views name which was typed in the views.py page would cause errors and not render to the respective web page. One of the best parts of developing in Django is that the errors are clearly mentioned and thus can identify where the error is and what has gone wrong.

Overall, besides the bugs that occurred during the development stages of the project there were a few personal issues that came upon that led to the incompleteness of the website. As an educator, I had to spend most of the time in front of the screen to prepare lesson plans and the required resources to conduct the virtual sessions online. And thus, during the latter end of the day, sometimes headaches occur by which the development process had to be paused. In addition, in the mid of December my maternal grandmother passed away and 11 days later her sister departed. Due to the disconsolate atmosphere, the development of the project had to be paused once again.

## 5. Results

The following test cases that were conducted for the developed project.

Test ID	Test Scenario	Test Case ID	Test Case	Test Data	Expected Result	Actual Result	Status
T01	Signup with Google	T01-SG1	Sign-in using Google	rahumath.rumy98@gmail.com	Update database	As expected	Pass
		T01-SG2	Go to profile page after sign in with Google	rahumath.rumy98@gmail.com	Redirected to profile page	Error Occurred	Fail

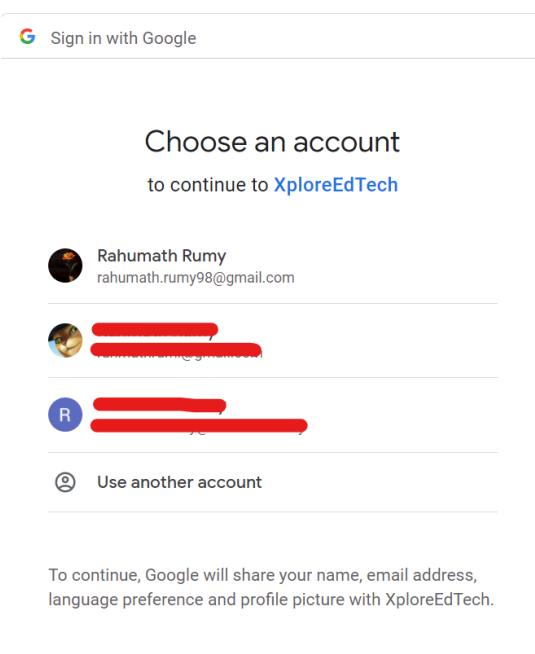


Figure 33 : Sign in with Google Account



Figure 34 : Sign in with Google updated in Database (T01-SG1)

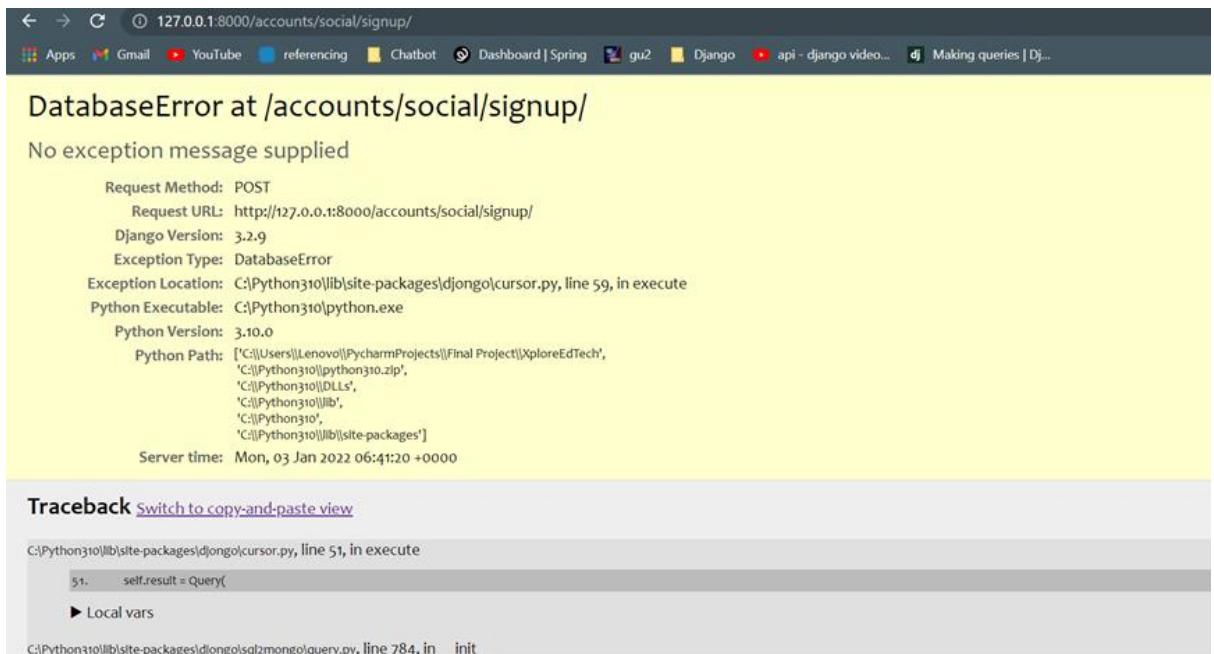


Figure 35 : Sign in with Google not redirecting to user profile page (T01-SG2)

Test ID	Test Scenario	Test Case ID	Test Case	Test Data	Expected Result	Actual Result	Status
T02	SignUp	T02-S1	Type in the username that already exists	rah9820	The Email or Username already exists	As expected	Pass
		T02-S2	Type in the email that already exists	<a href="mailto:rahmathrumi@gmail.com">rahmathrumi@gmail.com</a>	The Email or Username	As expected	Pass

					already exists		
		T02-S3	Enter an invalid email address	Rah	Please include an '@' in the email address. 'rah' is missing an '@'	As expected	Pass
		T02-S4	Confirm Password	password - asdfg confirm password - 12345	The Passwords Do Not Match!	As expected	Pass
		T02-S5	Enter all valid data to the fields	All valid data in the fields. Username - testacc	Updated to the database. Displays 'testacc , Welcome! Your Account has been created successfully!'. Redirects to profile page.	As expected	Pass
		T02-S6	Passwords encrypted in the database	Entered password 'test123' is encrypted	Encrypted in the database.	As expected	Pass
		T02-S7	Once signed up, the profile page should contain all the user details	After signup, user details to be displayed	User details should be displayed on profile page	No user details are being displayed	Fail
		T02-S8	Sign in using the Google sign in account	rahumath.ru my98@gmail.com	The Email or Username already exists	Creates a new user account	Fail
		T02-S9	After sign in, user databases updated	-	Database updated	As expected	Pass

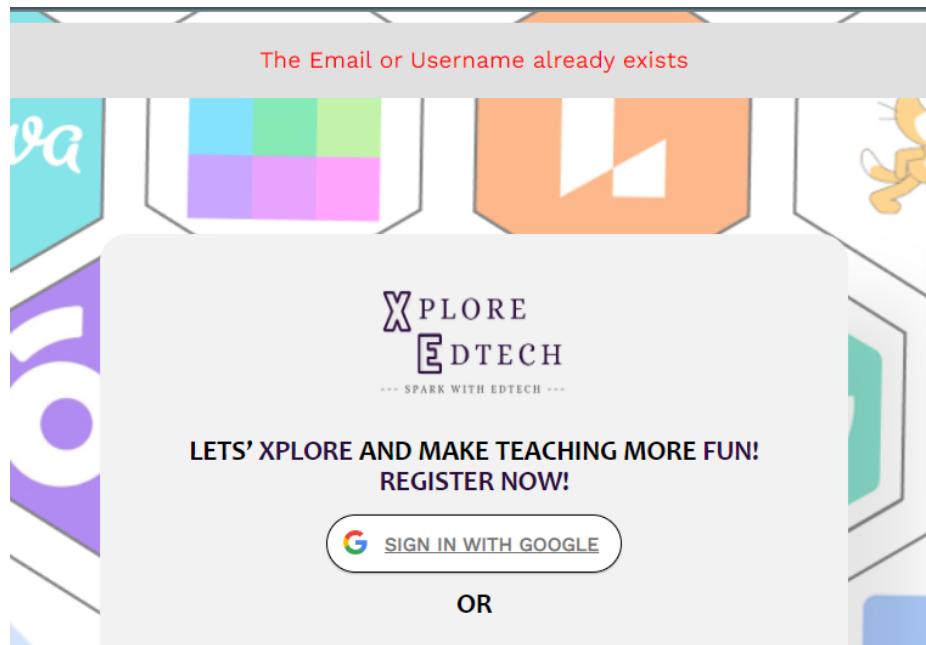


Figure 36 : Error message - user types in an email or username that already exists

The screenshot shows the 'EDUCATOR DASHBOARD' interface. At the top right, there are 'Hey, !' and 'LOGOUT' buttons. The main area contains two sections: 'Edit Profile' on the left and 'Do You Want To Change Your Password?' and 'Delete Your Account?' on the right. The 'Edit Profile' section has four input fields: 'Name of institute/school...', 'What Subject/s Do You Teach?', 'What Grade Level Do You Teach?', and 'What Is The Role You Play? Eg: Educator, Subject ()'. The 'Do You Want To Change Your Password?' section has a 'CLICK HERE' button. The 'Delete Your Account?' section contains the text 'Deleting your account is permanent. All content from this account will not be recoverable.' Below the dashboard is a horizontal navigation bar with icons for Home, Courses, Classes, and Profile.

Figure 38 : Once signed in the profile page does not contain user details

```

    [
      {
        "_id": {
          "$oid": "61d29408fdae8b24dfe19c55"
        },
        "id": 95,
        "password": "pbkdf2_sha256$260000$lycyZWAAgXS20TkKBHpaWh$YBXDK8e9eGwPvFsjjME/E6yofEUMDkw8fa1XMGTFDT8=",
        "last_login": {
          "$date": "2022-01-03T07:20:12.133Z"
        },
        "is_superuser": false,
        "username": "testacc",
        "first_name": "",
        "last_name": "",
        "email": "testacc@gmail.com",
        "is_staff": false,
        "is_active": true,
        "date_joined": {
          "$date": "2022-01-03T06:13:28.037Z"
        }
      }
    ]
  
```

Figure 39 : User details updated in the database and password is encrypted

Test ID	Test Scenario	Test Case ID	Test Case	Test Data	Expected Result	Actual Result	Status
T03	Login with Google	T03-LG1	Login with Google	select - rahumath.rumy@gmail.com	User redirected to Profile Page	Error Occurred	<b>Fail</b>
		T03-LG2	Login with Google - Database Update (last login)	select - rahumath.rumy@gmail.com	Database updated with last login date	As expected	<b>Pass</b>

#### DatabaseError at /accounts/google/login/callback/

No exception message supplied

```

Request: GET
Method:
Request: http://127.0.0.1:8000/accounts/google/login/callback/?state=TdtAwZe2DP4k&code=4%2F0Ax4XfWhdKPgvlggMdAlYuW1qNQ95as3h21akh4nCIA2NoNMyVVuQHpm7jF-
URL: IDWTxCS1w&scope=email+profile+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fuserinfo.email+https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fuserinfo.profile+openid&authus
Django: 3.2.9
Version:
Exception: DatabaseError
Type:
Exception: C:\Python310\lib\site-packages\django\cursor.py, line 59, in execute
Location:
Python: C:\Python310\python.exe
Executable:
Python: 3.10.0
Version:
Python: ['C:\\Users\\Lenovo\\PycharmProjects\\Final Project\\XploreEdTech',
Path: 'C:\\Python310\\python310.zip',
'C:\\Python310\\DLLs',
'C:\\Python310\\lib',
'C:\\Python310\\lib\\site-packages']
Server: Mon, 03 Jan 2022 06:55:19 +0000
time:
  
```

Figure 40 : Error message that occurs when the once user logs in with Google

```

_id: ObjectId("61d29a8ffdae8b24dfe19c59")
id: 8
user_id: 96
provider: "google"
uid: "107312075748025406452"
last_login: 2022-01-03T06:55:19.612+00:00
date_joined: 2022-01-03T06:41:19.938+00:00
extra_data: {"id": "107312075748025406452", "email": "rahumath.rumy98@gmail.com", ...}

```

Figure 41 : Last login time updated when logged in with Google

Test ID	Test Scenario	Test Case ID	Test Case	Test Data	Expected Result	Actual Result	Status
T04	Login	T04-L1	Enter valid username and invalid password	Username - testacc Password - sample	The username or password entered is incorrect! Please try again!	The username or password entered is incorrect! Please try again!	Pass
		T04-L2	Enter invalid username and valid password	Username - sample Password - test123	The username or password entered is incorrect! Please try again!	The username or password entered is incorrect! Please try again!	Pass
		T04-L3	Forgot password? link	Click the 'Forgot password?' link	Redirected to a page where the user has to enter their email	As expected	Pass
		T04-L4	Enter email in 'Forgot Password' page	Email - rahumath.ru	Password Change link sent to the	Error Occurred	Fail

				my98@gmail.com	user via email		
		T04-L5	Enter valid username and valid password	Username - testacc Password - test123	User redirected to the profile page.	As expected	Pass
		T04-L6	Once logged in, the profile page should contain all the user details	After login, user details to be displayed	User details should be displayed on profile page	As expected	Pass
		T04-L7	User logged out once 'logout' is clicked	Click 'Logout'	User account should be logged out	As expected	Pass

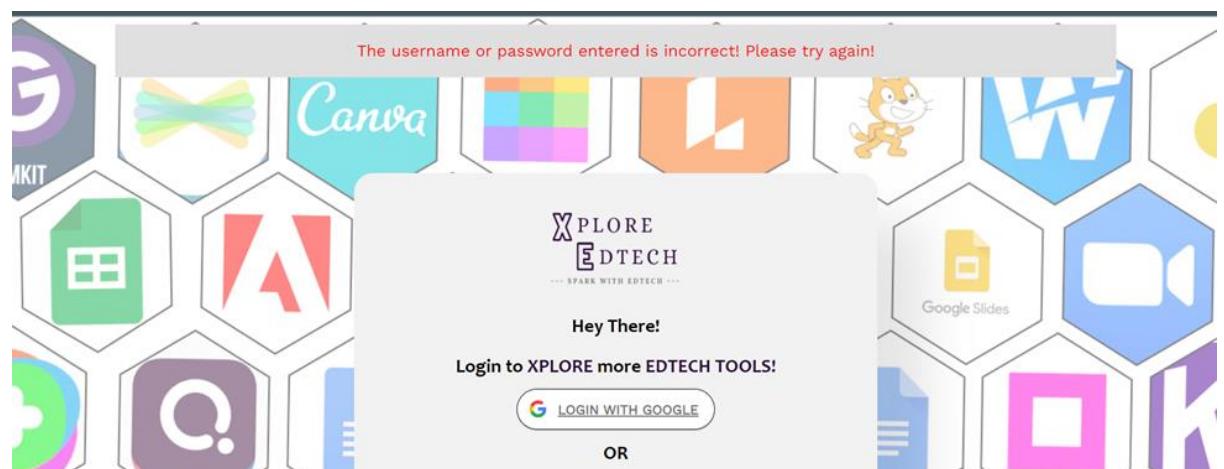


Figure 42 : Error message when the user logs in using incorrect username or password

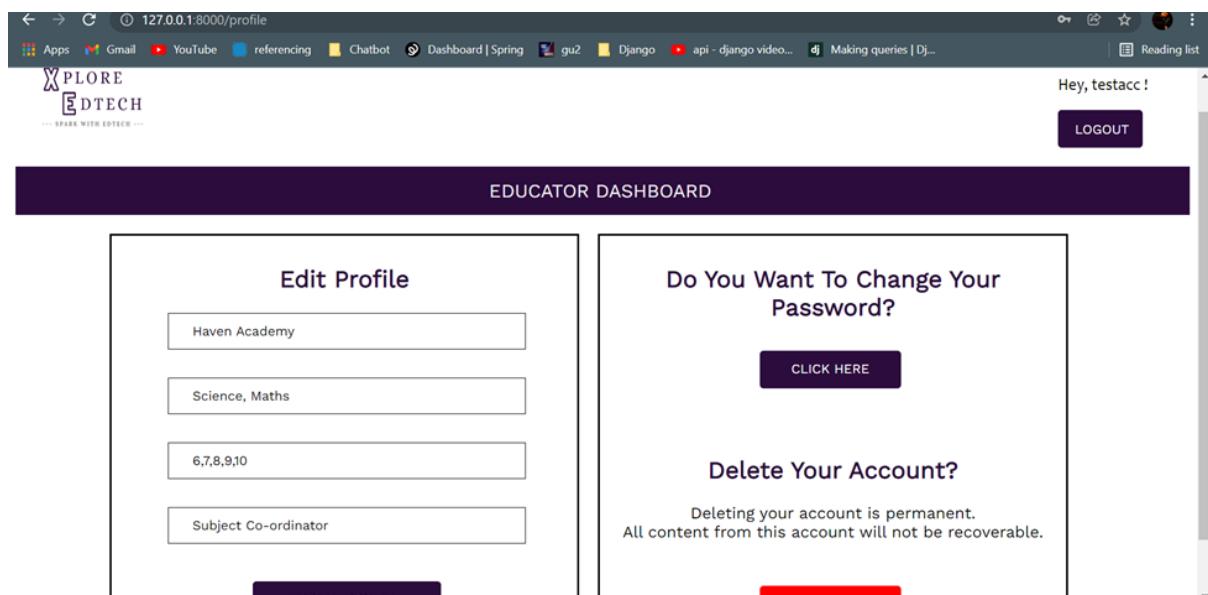


Figure 43 : User details appear on profile page once user logs in to the account

Test ID	Test Scenario	Test Case ID	Test Case	Test Data	Expected Result	Actual Result	Status
T05	Profile Page	T05-P1	Check whether all fields are included in profile page as designed	-	The profile should consist of a field to enter school, subjects taught, role and grade-level.	As expected	Pass
		T05-P2	Check if all fields are edited once clicked 'Update Profile'	Edit the subject in text box (2nd field) to Science	An alert will be displayed 'Your profile has been updated'	As expected	Pass
		T05-P3	Check if the edited details are displayed on the screen	Edited field displayed on the screen	Profile page is displayed with edited results	No fields are displayed on screen	Fail
		T05-P4	Check if the edited details are updated on the database	-	Database should be updated	As expected	Pass
		T05-P5	Verify if 'Change'	Click 'Change'	User should be	As expected	Pass

			Password' functionality works	Password'	redirected to 'change password' page		
		T05-P6	Change Password	Old Password - test123 New Password - usertestacc123 Confirm New Password - usertestacc123	Redirect to page and message displayed 'You password has been updated'	As expected	Pass
		T05-P7	Change Password updated in the database	-	Database has to be updated with new encrypted password	As expected	Pass
		T05-P8	Change password by entering invalid password	Old Password - testacc456	Your old password was entered incorrectly. Please enter it again.	As expected	Pass
		T05-P9	Password validation	New Password - 123456	Display message 'This password is too common' and 'This password is entirely numeric.'	As expected	Pass
		T05-P10	Password validation	New Password - helloworld	Display message 'This password is too common'	As expected	Pass
		T05-P11	Password validation	New Password - helloworld123 Confirm Password - hello123world	Display message 'The 2 password fields did not match'	As expected	Pass
		T05-P12	Verify the 'Close' button functionality for the password change.	Click on the 'Close' button	The password change will be closed and redirected to profile page	As expected	Pass

		T05-P13	Verify if 'Delete Account' functionality works	Click 'Delete Account'	A pop-up message should be displayed 'Are you sure you want to delete your account'	Shows user profile page when clicked	<b>Fail</b>
		T05-P14	Verify Logout functionality	Click 'Logout'	User should be redirected to Home page	As expected	<b>Pass</b>
		T05-P15	Verify is logout time is updated in database	-	User logout must be updated in database	As expected	<b>Pass</b>

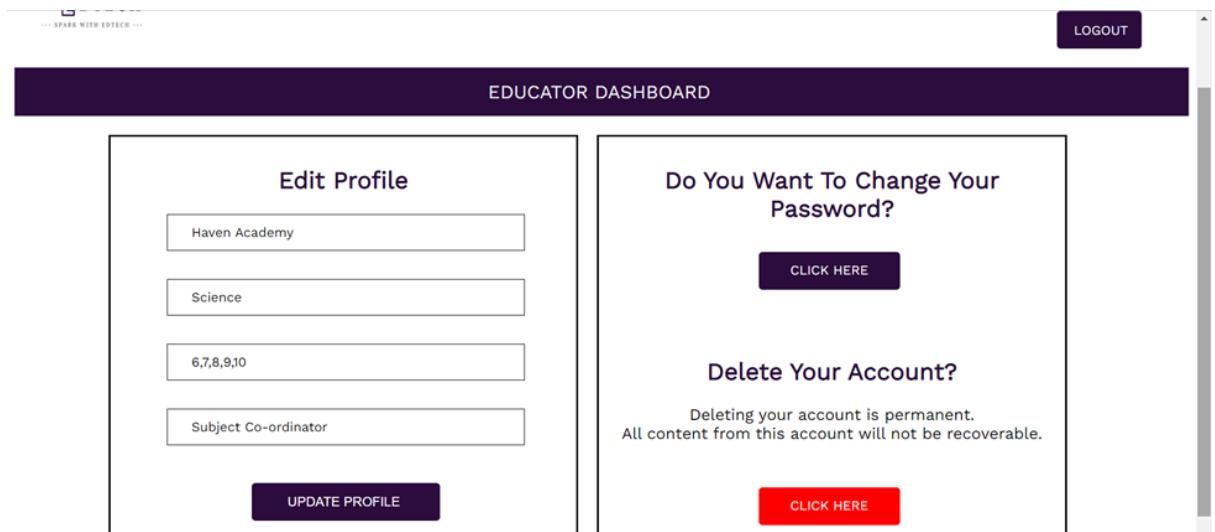


Figure 44 : Edit profile of Subject by deleting Maths and having only Science. (2nd field)

```
* {
  "_id": {
    "$oid": "61d29408fdae8b24dfe19c56"
  },
  "profileId": { },
  "user_id": 95,
  "school": "Haven Academy",
  "grade_level": "6,7,8,9,10",
  "profession": "Subject Co-ordinator",
  "subjects": "Science",
  "profile_pic": "",
  "added_on": {
    "$date": "2022-01-03T06:13:28.508Z"
  },
  "update_on": {
    "$date": "2022-01-03T07:36:45.301Z"
  }
}
```

Figure 45 : Edited profile has been updated in the database

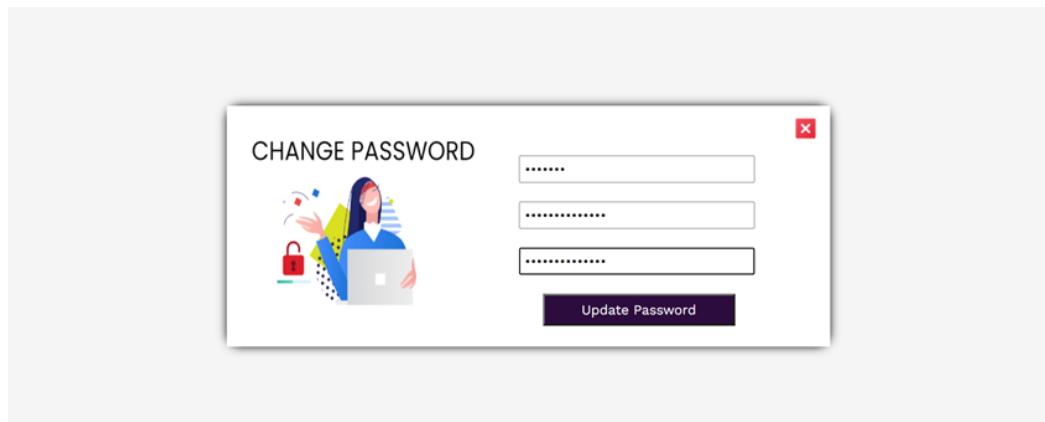


Figure 46 : User is redirected to Change Password page

Your old password was entered incorrectly.  
Please enter it again.

The two password fields didn't match.

**Update Password**

Figure 47 : Error message when user enters password that doesn't match and when the user enters the old password incorrectly

Test ID	Test Scenario	Test Case ID	Test Case	Test Data	Expected Result	Actual Result	Status
T07	Verify search results functions - EdTech	T07-SR1	Verify the search function in the home page based on 'Subject' in Home Page	Search for 'Geography'	EdTech tools that can be taught with 'Geography' must be displayed	As expected	Pass
		T07-SR2	Verify the search function in each Subject Page based on 'Concept' in Maths Page	Search for 'Geometry' in Maths	EdTech tools that can be taught with the concept 'Geometry' must be displayed	As expected	Pass
		T07-SR3	Verify the search function in the Common Tools page based on EdTech tool	Search for 'Padlet'	EdTech tool Padlet must be displayed	As expected	Pass
		T07-SR4	Type a search criterion that does not exist in all search functions	Search for 'xyz'	The message 'Sorry there are no results, Try something else...' must be displayed	As expected	Pass
		T07-SR5	Search based on concept, subject and grade-level	-	The search results containing the concept, subject and grade-level typed for must be displayed	Not developed	Fail

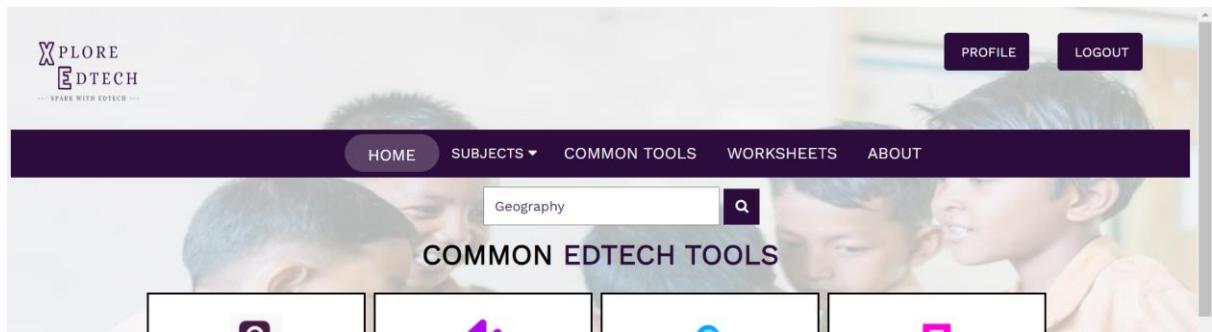


Figure 48 : Search for Geography in the Home page search bar

## SEARCH RESULTS FOR Geography

A screenshot of a search results page for 'Geography'. At the top is a search bar with the placeholder 'Concept... Eg : All' and a magnifying glass icon. Below the search bar are two search results cards.

**National Geographic Kids**  
GRADES : 2,3,4,5,6,7,8  
CONCEPT : Animals, Entertainment, Historical & Current Events, Cultures  
  
This is a treasure trove of educational information. Educators can use the games, videos, and other resources to teach kids about animals science, and related topics.

**Google Earth**  
GRADES : 4,5,6,7,8,9,10,11,12,13  
CONCEPT : Visualize Places, Events, Cultures and more...  
  
Google Earth and maps in classrooms can help visualize abstract concepts across a global canvas, allowing students to learn all about the lives

Figure 49 : Search results displayed

A screenshot of a search results page for 'Concept Geometry' on a 'MATHS' page. At the top is a navigation bar with links for HOME, MATHS (selected), COMMON TOOLS, WORKSHEETS, and ABOUT. Below the navigation bar is a search bar with the placeholder 'Geometry' and a magnifying glass icon. Below the search bar are four search results cards.

**W**  
**matific**

Figure 50 : Search for Concept Geometry in Maths Page

A screenshot of a search results page for 'Geometry'. At the top is a navigation bar with links for HOME, SUBJECTS (selected), SEARCH RESULTS (highlighted in blue), WORKSHEETS, and ABOUT. Below the navigation bar is a search bar with the placeholder 'Concept... Eg : All' and a magnifying glass icon. Below the search bar are two search results cards.

**Google Earth**  
GRADES : 5,6,7,8,9,10  
CONCEPT : Measurement, Geometry, Estimation, Algebra, Pythagoras Theorem  
  
Mathematics is much more than a set of problems in a textbook. In the virtual world of Google Earth, concepts and challenges

**Jamboard**  
GRADES : 4,5,6,7  
CONCEPT : Multiplication, Addition, Graphs, Dimension, Fraction, Rounding numbers, Place Values, Geometry, Number Lines, Problem Solving  
  
An interactive Google tool that can be easily shared among students and make

Figure 51 : Search results displayed

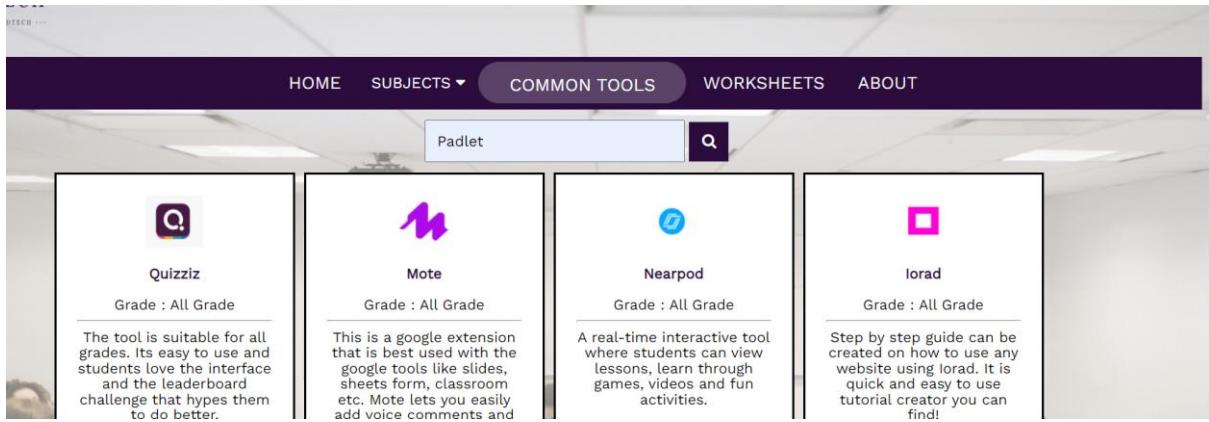


Figure 52 : Search for EdTech tool 'Padlet' in Common Tools Page

The screenshot shows the 'SEARCH RESULTS' page of the EdTech website. At the top, there is a navigation bar with links for HOME, SUBJECTS, SEARCH RESULTS (which is the active tab), WORKSHEETS, and ABOUT. Below the navigation bar, a search bar contains the word 'Concept... Eg : All'. The search results are displayed in one card:

- Padlet**: SUITABLE FOR ANY SUBJECT, GRADES : All Grade, CONCEPT : All

Figure 53 : Search results displayed

The screenshot shows the 'SEARCH RESULTS' page of the EdTech website. At the top, there is a navigation bar with links for HOME, SUBJECTS, SEARCH RESULTS (which is the active tab), WORKSHEETS, and ABOUT. Below the navigation bar, a search bar contains the word 'Concept... Eg : All'. The search results are displayed with the message: "Sorry there are no results, Try something else..."

Figure 54 : Search results displayed when user types in a word that does not match the search criteria

Test ID	Test Scenario	Test Case ID	Test Case	Test Data	Expected Result	Actual Result	Status
T08	Subjects & Common - EdTech	T08-SET1	Verify that each subject page redirects to its respective page	Click each subject page - Maths	Math link must be redirected to the Maths page	As expected	Pass
		T08-SET2	Verify that each subject page displays only the EdTech tool relevant for the subject	Check each subject page - Maths	The Maths page must have EdTech relevant to Maths	As expected	Pass
		T08-SET3	Verify that the Common Tools page has EdTech tools that are common only	Check the Common Tools page	The common tools page must have EdTech tools which are common	As expected	Pass
		T08-SET4	Verify that the EdTech updated in the database are being displayed on the front end	Enter test data of EdTech 'Test' for subject Maths	The test data must be displayed on the Maths page	As expected	Pass

Add tech tool

Subject:	Maths
Tool:	test
Logo:	Choose file clip-online-education.png
Grade level:	test
Concept:	test
Desc:	Sample Desc
Link1:	link1
Link2:	link2
Link3:	link3

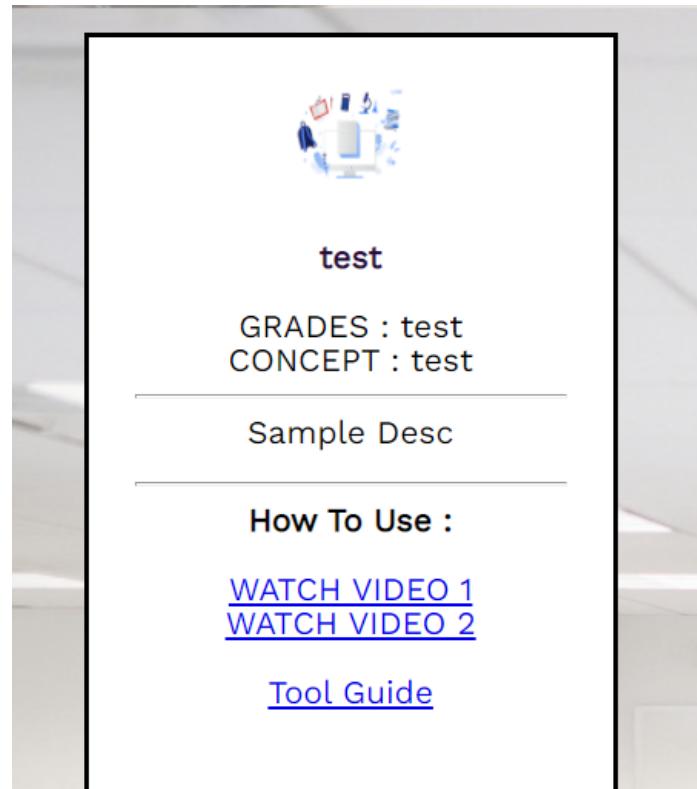


Figure 55 : Add in a EdTech tool from the admin dashboard

Figure 56 : EdTech tool appears in front-end

<b>Test ID</b>	<b>Test Scenario</b>	<b>Test Case ID</b>	<b>Test Case</b>	<b>Test Data</b>	<b>Expected Result</b>	<b>Actual Result</b>	<b>Status</b>
T09	Upload Worksheet	T09-UP1	Verify that the terms and condition pop-up occurs when user selects 'Click here to upload'	Click 'Click here to upload'	The terms and condition short pop up has to appear	As expected	Pass
		T09-UP2	Verify that only when User selects 'Yes' user is able to upload files	Select 'Yes'	Able to see options to upload file	As expected	Pass
		T09-UP3	When user selects the close button	Click the close button	Stays in the same page	As expected	Pass
		T09-UP4	Enter an invalid email address during the upload	rah	Please include an '@' in the email address 'rah' is missing an '@'	Uploads the file	Fail
		T09-UP5	Leave out a few fields	Subject - No data entered	Please fill in this field' must be displayed	As expected	Pass
		T09-UP6	Enter all valid fields - data must be entered in the database	All valid data entered - Test	Message 'Worksheets Uploaded' must be displayed	As expected	Pass
		T09-UP7	Once worksheet uploaded, must be displayed on Worksheet Page	-	Worksheet Page must have new worksheet named Test	As expected	Pass

YOUR NAME

SCHOOL

EMAIL

SUBJECT

CONCEPT

GRADE-LEVEL

UPLOAD FILE

test

test school

test@gmail.com

test subject

test

test

Choose file worksheet example.docx

SUBMIT

Figure 57 : Upload worksheet section

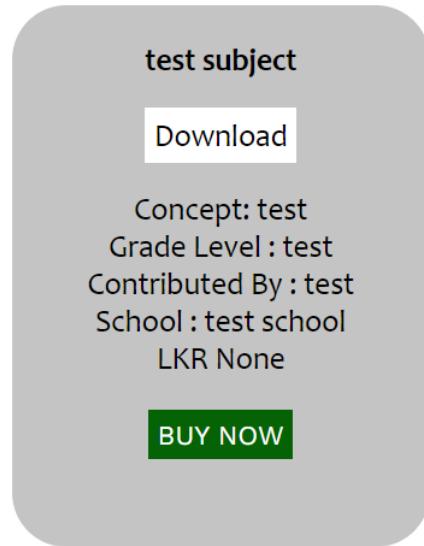


Figure 58 : Uploaded worksheet appearing on the front end of the website

Test ID	Test Scenario	Test Case ID	Test Case	Test Data	Expected Result	Actual Result	Status
T10	Worksheet Page	T10-WKS1	Search worksheet based on subject	Search for 'Maths'	All worksheets with the subject as 'Maths' must be displayed.	As expected	Pass
		T10-WKS2	Search worksheet with invalid data	Search for 'Photo'	The message 'Sorry there are no results, Try something else...' must be	As expected	Pass

					displayed		
		T10-WKS3	Verify if the file can be downloaded	Click 'Download'	Should not be able to download	As expected	Pass
		T10-WKS4	Verify if can only view the file and not download	Click Download	Should be able to view the file only	Does not work	Fail
Payment		T10-WKS3	Redirect to payment page when 'Buy' is clicked	Click 'Buy'	Redirected to the Payment page	As expected	Pass
		T10-WKS4	Verify that once 'Pay with Card' is clicked user is redirected to Stripe Gateway	Click 'Pay with Card'	Stripe gateway pops up	As expected	Pass
		T10-WKS5	Enter valid details	Click Pay	Payment Successful has to be displayed	Error Occurred	Fail
			Enter invalid card number	4949 4949 4949 49494	The text field should be highlighted in red	As expected	Pass
			Enter invalid CVC	10/22	The text field should be highlighted in red	As expected	Pass

Figure 59 : Search worksheets for Maths

## SEARCH RESULTS FOR Maths

The image shows three search results for Maths worksheets, each presented in a rounded rectangular box with a grey background and a thin black border. Each result includes a title, a 'Download' button, a brief description, and a 'BUY NOW' button.

- Maths**  
**Download**  
Concept: Rounding Numbers  
Grade Level : 6  
Contributed By : Tiana  
School : XYZ School  
LKR 140  
**BUY NOW**
- Maths**  
**Download**  
Concept: Algebra  
Grade Level : 6-7  
Contributed By : Rahmath  
School : ABC  
LKR 100  
**BUY NOW**
- Maths**  
**Download**  
Concept: Transformations  
Grade Level : 9-10  
Contributed By : Tana  
Marshall  
School : Beacon School  
LKR 170  
**BUY NOW**



Figure 60 : Search results displayed on Maths worksheets

## MAKE YOUR PAYMENT

### Proceed Payment

Kindly type in the email address that is registered with Xplore EdTech Tools!

**Pay with Card**

Figure 61 : Stripe payment gateway button displayed on screen

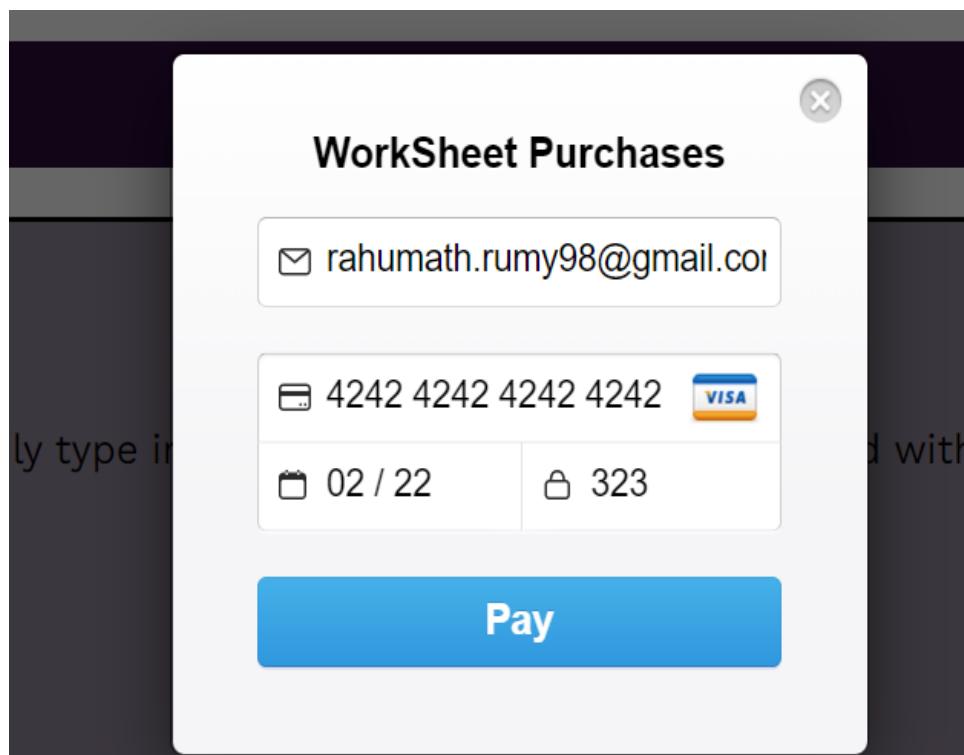


Figure 62 : Stripe Payment Gateway

## 6. Conclusions

To conclude, the developed project hopes to make things easier for educators by giving them access to EdTech tools that best suit their teaching. Being an educator myself, I have examined the educators around me and noticed them searching for EdTech tools that best suit the subject and the grade-level they teach to make their teaching fun and interactive. At the same time, I have also observed that a few educators, including myself, find it difficult to use a few EdTech tools that we find as we do not know how to cooperate or use it with the subject they teach. During the virtual schooling phase, it was also noticed how students got distracted and demotivated learning online and became less interactive and engaged during the lesson.

Even though 'Xplore EdTech' is directed mainly towards the educators, it indirectly helps the students as well. These tools are to be used for the students to make their lesson fun and interactive. When I educate students without the usage of EdTech tools, I have noticed the interest and engagement is less compared to with the usage of EdTech tools. And I believe that this website can impact students as it helps bring about a change in a student's life who has lost interest in education. In addition, through the purchase of worksheets, the payment received will be donated to organisations that help underprivileged children in their education.

Finding the right EdTech tools can be a challenging task as different subjects are catered differently based on the grade-level. Thus, with 'Xplore EdTech', educators can easily find the right tool for their students as the website has all the tools with guidance on how to use and the grade-level to whom it best suits. There is a view based on the research that students tend to be less interactive during their lessons online and thus leads to learning loss. Therefore, it is strongly believed that if an educator selects at least 2 EdTech tools and uses them to educate their students, they will see a positive change in them. As a result, Xplore EdTech not only benefits educators but indirectly helps the students as well. Using EdTech tools in the classroom helps students learn with fun and keeps them engaged rather than teaching in the traditional method implemented in classrooms.

During the development of the project, I have learnt new areas of technologies. Since a;; technologies implemented were something new, the various bugs that I came across were hard to resolve. There came a point in changing my framework from Django to React.js due to the inability of resolving the error. However, with the help of Stack Overflow, documentations, and YouTube videos I was able to resolve most of the issues as a whole and develop the project to the best that I could. And one of the main things that I had to learn and practice during the development was the importance of patience and starting things with a fresh mind when coding. Having developed this project, I believe it will greatly help me in my career as a software developer.

## **7. Recommendations**

1. There is a large community of educators in the globe, no matter the country or religion or race the pedagogy remains the same. Thus, to connect these educators, in the future a chatting option would be a recommendation for the website. With Xplore EdTech educators not only can explore for EdTech tools but also explore and find other educators that share the similar interest as them. The educators can chat and share their experience and knowledge on teaching patterns and styles and how they overcome issues and challenges they face in the classroom.
2. As the development of the current website, it is the admin and its team that studies and finds EdTech tools that can be used. In the future, users also can recommend tools that can be used and share videos that they have for the other users to view. For example: CS First being a tool to enhance the coding skills of students can be used to integrate with Maths as well. Personal videos on how it can be done can be shared so that the others are aware.
3. Review and rating systems - users should be able to rate and review an EdTech tool so that the users are able to identify which EdTech is better than the other. Also, the collaborative-based filtering technique can be implemented as well.
4. To include articles from educational bodies on the website that might prove to be useful for educators.

## **8. Reference List**

- Anon, 2020. 15 Best Website Animation Techniques for Your Web Design [viewed 01/01/2022] 09 Sept. Available From: <https://fireart.studio/blog/10-best-website-animation-techniques-for-your-web-design/>
- Anon, June 25, 2020. How Important Is Technology in Education? Benefits, Challenges, and Impact on Students [viewed 31/12/2021]  
Available From : <https://soeonline.american.edu/blog/technology-in-education>
- Buckle J, n.d. A Comprehensive Guide to 21st Century Skills [viewed 31/12/2021]  
Available From : <https://www.panoramaed.com/blog/comprehensive-guide-21st-century-skills>
- De La Rosa S, Sept 9 2020. Student engagement remains a challenge in distance learning [viewed 31/12/2021] Available From <https://www.k12dive.com/news/student-engagement-remains-a-challenge-in-distance-learning/584793/>
- Jared R. Chapman & Peter J. Rich, 2018. Does educational gamification improve students' motivation? If so, which game elements work best?, *Journal of Education for Business*, 93:7, 314
- Megha Sood, 2021. Amid Covid pandemic, online gaming addiction among kids a concern, say experts [viewed 27/12/2021]. Hindustan Times, , 14 Sept Available From:  
<https://www.hindustantimes.com/cities/mumbai-news/amid-covid-pandemic-online-gaming-addiction-among-kids-a-concern-say-experts-101631626715814.html>
- Nadia Fazlulhaq, 2021. 70% of Lanka's students have no access to online study. The Sunday Times, 7 Feb. Available From: <https://www.sundaytimes.lk/210207/news/70-of-lankas-students-have-no-access-to-online-study-431769.html>
- UNICEF, 2020. Two thirds of the world's school-age children have no internet access at home, new UNICEF-ITU report says [viewed 29/12/2021] 30 Nov. Available From:  
<https://www.unicef.org/press-releases/two-thirds-worlds-school-age-children-have-no-internet-access-home-new-unicef-itu>

## 9. Bibliography

Anon, 2018. Why are Catchy Slogans important in Marketing? [viewed on 29/12/2021] 16 April. Available From : <http://cybergraff.com/blog/2018/04/16/why-are-catchy-slogans-important-in-marketing/>

Ajitsaria Abinav (n.d). Build a Recommendation Engine With Collaborative Filtering [viewed 02/01/2022]. Available From : <https://realpython.com/build-recommendation-engine-collaborative-filtering/>

Espresso Team (n.d) What is content-based Filtering? [viewed 02/01/2021] Available From: <https://www.educative.io/edpresso/what-is-content-based-filtering>

Jani J, 2020. 6 reasons to consider using a chatbot on your website [viewed 31/12/2021] 05 May. Available From: <https://blog.neongoldfish.com/6-reasons-to-consider-using-a-chatbot-on-your-website>

Sharma S, 2021. A Comprehensive Guide to Python Application Servers [viewed 03/01/22]. 21 July. Available From: <https://python.plainenglish.io/python-application-servers-f8d41a091e92>

Greenhow C, 2020. Ask the Expert: Online learning vs. classroom learning [viewed 29/12/2021] 04 June Available From : <https://msutoday.msu.edu/news/2020/ask-the-expert-online-learning-vs-classroom-learning>

## 10. Appendices

- Appendix A: Chatbot

As the developed website is limited with few data. The chatbot currently developed responds to a few questions as per the keywords and statements entered into the Dialogflow agent, 'XploreEdTech'. Users may try the questions below to get results.

1. What is **EdTech**?
2. What are the tools that can be used with **Maths**?
3. To teach **pre-schoolers**, what EdTech tool can be used?
4. There is **so much work** being an educator!
5. My **students** don't listen to me.

The above are 5 sample questions that can be tested to get results. Highlighted in the sample questions are the keywords the bot identifies and based on the keywords identified in the user query the outputs are given.

- Appendix B: Access the Files

1. To run the application, first download Python to your device and open the files in a text-editor (Visual Studio Code, Pycharm or IntelliJ Idea)
2. Open the terminal and run the command 'pip install Django'.
3. Once done, run the following commands
  - a. 'cd XploreEdTech'
  - b. Pip install djongo
  - c. 'python manage.py migrate'
  - d. 'python manage.py makemigrations'
  - e. 'python manage.py runserver'.

4. Click on the link and run the server in your local machine.

The commands ‘python manage.py migrate’, and ‘python manage.py makemigrations’ are executed so that the models are updated in the database.

#### ADMIN INTERFACE

To access the backend files from the Django admin dashboard, enter the below credentials.

Username - Admin

Password - admin123

The above account is of a super user and has full control to access the backend files in Django.

- **Appendix C: Links to all files**

[Front-End Hosted Link](#)

[GitHub Repository Link](#)

[Figma - UI Designs](#)

[Figma - Other Diagrams](#)

[Test Cases](#)

