



Learniverse

IT 497: Graduation Project Report Product Release-2

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Abstract:

Learniverse addresses the pressing issue of fragmented educational experiences by introducing a centralized platform that streamlines the management and integration of various learning tools. Developed using agile methodologies, this platform promotes iterative enhancement and continuously adapts to user feedback, ensuring it meets the evolving needs of its users effectively. Evaluations have shown that it significantly improves students' ability to manage educational resources, thereby enhancing their overall learning experience and boosting academic productivity. The key findings highlight that Learniverse not only facilitates better resource management but also fosters greater collaboration and supports more efficient study practices. Consequently, it stands out as a valuable asset in the arsenal of educational technology tools, offering a robust solution that elevates the educational landscape by making learning more integrated and accessible.

الملخص:

يقدم Learniverse حل لمشكلة تشتت الأدوات التعليمية والخدمات المساعدة للطلاب في عملية التعلم بين برامج وتطبيقات متعددة كل منها تقدم نوع محدد من الخدمات والأدوات المساعدة لعملية التعلم والاستذكار. يعالج Learniverse هذا الأمر في كونه منصة شاملة تجمع الأدوات المساعدة للطلاب في مكان واحد مما يسهل استخدامها ويعزز فعاليتها والتكامل فيما بينها. من أبرز الخدمات التي تقدمها المنصة إدارة المهام، تلخيص النصوص وإعداد الاختبارات باستخدام الذكاء الاصطناعي. تم تطوير هذه المنصة باستخدام المنهجية المرنة في تطوير البرمجيات “Agile” حيث تتميز هذه المنهجية بالمرنة في التغيير والتطوير التدريجي للمنتج مما يتيح للعميل رؤية وتقييم قيمة المشروع في وقت مبكر. كما تسهم في تحسين التواصل والتعاون بين الطرفين، مما يعزز جودة المنتج ورضا العميل والتكيف مع احتياجات المتغيرة. أظهرت التقييم نتائج إيجابية تدل على سهولة استخدام المنصة وقدرتها على تحسين التجربة التعليمية. كما تشير النتائج الرئيسية إلى أن Learniverse لا يساهم فقط في تحسين إدارة الوقت بل يعزز أيضًا من زيادة التعاون وبالتالي يبرز كأداة قيمة في مجموعة أدوات التقنيات التعليمية. يقدم Learniverse حلًا شاملاً جعل التعلم أكثر تكاملاً وأسهل في التشارك.

Keywords: Educational Platform; AI Features; collaboration; community; Agile Development; User Acceptance Testing



1. Introduction

Learniverse addresses the problem of fragmented educational experiences by creating a unified platform that simplifies the management and integration of learning tools for students. This platform helps students consolidate notes, track progress, and collaborate more effectively, enhancing their overall educational experience.

Designed to foster collaboration and improve study efficiency, Learniverse benefits students at all educational levels with features that facilitate resource management and learning. The development process employs agile methodologies, emphasizing iterative improvements and user feedback to meet evolving educational needs.

Our vision for Learniverse is to empower students globally by providing easy access to integrated educational tools, thereby boosting learning outcomes and productivity. The development journey from design to implementation aligns with this vision, ensuring that each feature enhances the user experience.

The software development is organized into stages including data collection to understand user needs, system design, prototype testing, and user acceptance testing. This ensures the platform is both effective and user-friendly.

This project offers a unique contribution to the educational technology market, enhancing both individual study and collaborative learning. The impact of Learniverse is substantial, providing significant benefits to the educational community worldwide by making learning resources more accessible.

This report is structured to sequentially discuss the system design, implementation, platform evaluation, and conclude with a summary of findings and future directions. Each section elaborates on the development phases of Learniverse, showcasing the technological advancements and practical implications of the platform.

2. Background

2.1. API

Learniverse provides various tools for its users. Some of these tools require connecting to an Application Programming Interface (API) to enhance their capabilities, such as Whereby meeting rooms and tinyMCE rich-text editor. APIs have revolutionized the way software applications communicate and interact with each other. They act as intermediaries, allowing different software components to exchange data and functionality seamlessly [1] (refer to Figure 1).

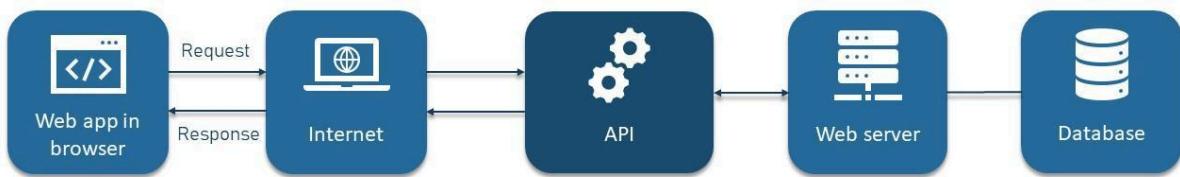


Figure 1: How APIS Work [2]

With the increasing utilization of web APIs, various protocols have been devised to establish defined rules. These rules encompass accepted data types, commands, and syntax, facilitating standardized information exchange [1]. One such protocol is SOAP (Simple Object Access Protocol), which employs XML to enable endpoints to transmit and receive data via SMTP (Simple Mail Transfer Protocol) and HTTP (Hypertext Transfer Protocol). SOAP APIs streamline the sharing of information between applications or software components operating in diverse environments or developed using different programming languages. [3]

Another protocol, XML-RPC (XML-Remote Procedure Call), relies on a specific XML format for data transfer. XML-RPC predates SOAP and is characterized by its simplicity and relatively low bandwidth usage. [4]

Similarly, JSON-RPC is a remote procedure call protocol that uses JSON (JavaScript Object Notation) instead of XML to transfer data. [5]



Additionally, REST (Representational State Transfer) is a collection of principles governing web API architecture. REST APIs, also known as RESTful APIs, adhere to specific architectural constraints outlined by REST. While it is feasible to construct RESTful APIs utilizing SOAP protocols, these two standards are typically perceived as competing specifications. [6]

When comparing the two most popular APIs, SOAP and REST, it is worth noting that they have distinct characteristics and are often seen as competing specifications. SOAP, built with XML, provides a structured and comprehensive approach to data exchange, enabling seamless communication between different software components and environments. On the other hand, REST, based on a set of architectural principles, offers a more lightweight and flexible approach, leveraging widespread web protocols like HTTP. While SOAP excels in providing a standardized and robust framework for interoperability, REST shines in its simplicity, scalability, and compatibility with modern web development practices. Ultimately, the choice between SOAP and REST depends on the specific requirements and preferences of the application or system being developed.

2.2. ChatGPT

Moving forward, APIs have played a pivotal role in connecting Artificial Intelligence (AI) models to various applications, enabling sophisticated and intelligent functionalities. Learniverse uses ChatGPT API to achieve some of its features, such as quiz and summarization generation. ChatGPT is an advanced language model developed by OpenAI. It is designed to generate human-like text responses based on given prompts.

ChatGPT operates on a transformer neural network architecture as illustrated in Figure 2, which has proven to be highly effective in natural language processing tasks. The model is trained on vast amounts of text data, allowing it to learn patterns, grammar, and context from diverse sources. This extensive training enables ChatGPT to generate coherent and contextually appropriate responses.

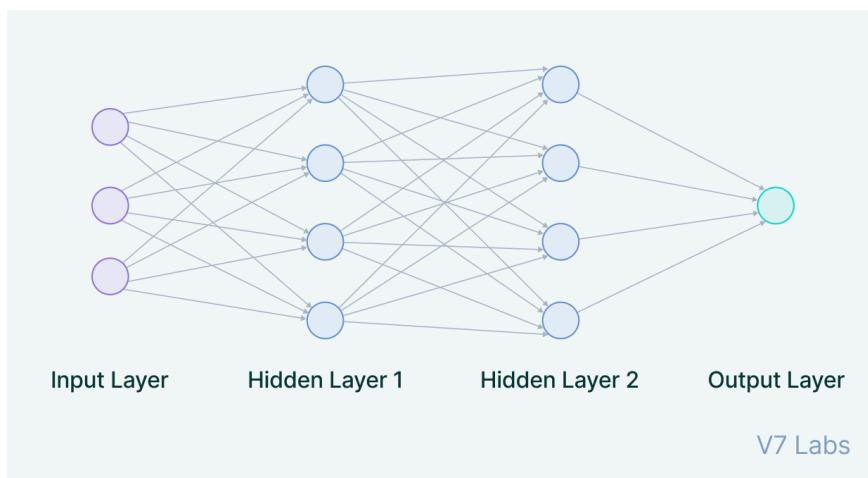


Figure 2: Neural Network Architecture

Prompt engineering is a pivotal aspect of utilizing ChatGPT effectively. A prompt serves as the initial input or instruction given to the model to generate a desired response. Crafting a well-designed prompt is crucial in obtaining accurate and relevant outputs. The prompt should provide clear instructions and context while being concise and unambiguous. It helps set the tone, style, and expectations for the generated text.

ChatGPT has its limitations. It can sometimes produce responses that sound plausible but are factually incorrect or nonsensical. The model may also be sensitive to slight rephrasing of prompts, leading to variations in the generated output.

OpenAI has made efforts to address these limitations and improve the safety and reliability of ChatGPT. They employ techniques such as reinforcement learning from human feedback and a moderation system to reduce harmful or inappropriate outputs.



3. Literature Review

We studied a wide range of competitors operating within our domain during our extensive research. Our objective was to conduct a comprehensive analysis of their features and offerings so that we could effectively compare them with the features available on our website. To display our findings efficiently, we will group them by tools in the following part.

1. Summarization

There are many summarization websites and applications that help learners in their journey such as PARAPHRASER[7] and Quillbot[8]. Some of these applications and websites offer a text box that allows the users to type their text or paste it as a text compactor [9]. On the other hand, some other websites and applications give users a choice to upload the files they want to summarize or paste the text on a text box. For instance, Quillbot, PARAPHRASER, Scribbr[10], summarizer[11], and summarizing tools[12]. Although these tools are good, our website provides similar features beside enabling the user to adjust their summarization to suit their needs.

2. Flashcards

Flashcards and quizzes are more popular methods to test if the learner understands what he wants to learn. There are many applications and websites existing to help learners test their information. There are many flashcard applications and websites such as Brainscape[13] and flashcards world[14]. Some of them provide a user choice to use prepared flashcards with different subjects or create their own flashcards such as Quizlet[15], Quizizz[16], Cram[17], and Chegg[18]. Furthermore, flashcards online provide many templates to make learning engaging. What's more, Shaguf bites[19] website provides a prime feature which is using AI to generate flashcards from texts or uploaded files.

3. Quizzes

Quizzes, on the other hand, have multiple applications and websites to create them such as Quizlet, Quizizz, Kahoot[20], Typeform[21], and Mintimeter[22]. Even though these applications and websites are considered good quizzes creation tools, Learnivers provide AI-generation Quizzes which simplify the process, making it more convenient, efficient, and significantly faster compared to manual creation. Users will



have easy access to a wide range of high-quality quizzes and flashcards, greatly enhancing their learning experience.

4. Note-taking and To-do Lists

Being organized and productive requires efficient note-taking and task management. Fortunately, there are several websites and applications available today that cater to these needs. Evernote[23], OneNote[24], Monday.com[25], Aha! Notebooks[26], Todoist[27], and TickTick[28] are some of the popular ones. All these are designed to facilitate note-taking, organize to-do lists, and organization of information. Some of them are shared allowing users to collaborate and share their notes or work with others, available on multiple platforms like desktop computers, smartphones, and tablets, allowing users to access and synchronize their notes across different devices, and provide tools to organize and categorize notes. Although these applications share some features, they differ in some aspects. For instance, Evernote supports various media types, including text, images, audio recordings, and attachments. Also, it offers powerful search capabilities.

OneNote for example has prime features, since it was developed by Microsoft Office it integrates with other Microsoft Office applications and offers cross-platform compatibility. Monday.com on the other hand, provides features such as task assignment, progress tracking, file sharing, and communication tools. It focused on team productivity and project management, providing a centralized platform for collaboration. Additionally, Aha! Notebooks provide product management and road mapping tools that help teams plan, prioritize, and communicate product strategies. It also offers integration with development tools, reporting and analytics capabilities, and customizable templates. Combining tasks, projects, comments, attachments, and notifications lets users streamline their personal and team productivity and work more effectively [29]. What's more is TickTick, which provides tools to capture ideas, organize to-do lists, and set up reminders about deadlines. Users can sort tasks based on time, tag, title, priority status, assignee's name, and other custom filters[30].

5. Time Management and Focus Techniques

In recent years, numerous time management applications and websites have been introduced, including Pommo [31], Forest [32], Be Focused [33], and Focus Keeper



[34]. These tools assist individuals in overcoming their addiction to their phones and effectively managing their time enjoyably and engagingly. Some include a task progress function that enables users to monitor the percentage of time spent on each project through a statistics graphic, allowing them to identify how much time they are spending on each task.

6. Calendars

Moreover, there are various applications and websites available to assist learners in enhancing their organization, productivity, and efficiency. One example is time management and calendar applications with reminder features. These calendars with reminders serve to remind users of their pending tasks. Wunderlist [35] and Evernote offer reminders without a built-in calendar. Notifications are sent as reminders when a task's due date approaches. To receive reminders for specific tasks, users should create reminders for those tasks. On the other hand, Fantastical [36] and Google Calendar [37] provide calendars to add tasks and crucial events, along with reminders for those tasks and events. By incorporating the ability to add events and set reminders, the calendar becomes an indispensable tool for effective time management and organization.

3.1 Competitive Product Analysis

There are several applications available today that provide valuable assistance to learners in various aspects of their academic journey. One such application is Quizlet, which helps students create flashcards and study guides for effective memorization and review. It offers interactive study modes, such as matching games and practice tests, that make learning engaging and enjoyable. When we talk about flashcards we can't forget to mention Shaguf Bites. It is a website that uses AI to transform the learner's documents into flashcards, which helps the learners to have a fun and simple learning experience.

Another application is Evernote, a multifaceted note-taking app that allows students to capture and organize their ideas, and lecture notes in one place. With features like synchronized access across multiple devices, searchable notes, and the ability to attach



files and images, Evernote enables students to stay organized and retrieve information quickly.

Another kind of application is Forest application, which combats distraction and improves focus, enhancing learners' time management and academic performance.

Quillbot on the other hand, is a writing assistant website that can help users enhance their writing skills and improve the quality of their written content by using AI. One of its notable features is the ability to rephrase sentences while maintaining their original meaning, which is useful for preventing plagiarism or finding alternative ways to express ideas. Additionally, Quillbot can summarize lengthy articles or documents into concise summaries, making it beneficial for learners who need to extract key information from academic texts quickly. It also offers a translation feature that allows users to translate text into different languages, which can be useful for language learners or when working with multilingual content.

Quizizz is an interactive quizzing application. It offers a range of features that make quizzes engaging, collaborative, and fun. One of the key features of Quizizz is its live game mode, where users can create quizzes, share them with other users, and participate in real time. In this mode, questions are displayed on a shared screen, and learners answer using their own devices. The competitive element adds excitement as learners strive to answer questions correctly and quickly. Quizizz also provides a library of pre-made quizzes on a wide range of subjects, which can save users time in creating their own quizzes.

Notion [38] is an all-in-one workspace application that allows users to organize and manage various aspects of their personal and professional lives. It provides the ability to create and organize different types of content in one place. Users can create pages and subpages to store and categorize information such as notes, tasks, and documents. Team members can be invited to collaborate on projects and pages, and real-time editing and commenting features promote seamless communication and teamwork. Notion also allows users to import data from external sources and media, such as images, videos, and



files, directly into their pages. It utilizes an AI-powered generator to translate, summarize, check spelling and grammar, and enhance writing, which greatly benefits learners.

To summarize our findings, we have compiled the results in Table 1:

Table 1: Competitive Product Analysis

Features	Learniverse	Quizlet	Evernote	Foresight	QuillBot	Notion	Quizizz	Shaguf bites
Flashcards	✓	✓					✓	
Flashcards generation	✓							✓
Quizzes	✓	✓					✓	
Quizzes generation	✓							
Summarization	✓				✓	✓		
Enhance focus timer	✓			✓				
Study plans generator	✓							
To-do lists	✓		✓			✓		
GPA calculator	✓							
Taking notes	✓		✓			✓		
Meeting rooms	✓							



Features	Learniverse	Quizlet	Evernote	Foresight	QuillBot	Notion	Quizizz	Shaguf bites
Shared space	✓					✓		
Calendar with reminder	✓		✓					
Translator					✓	✓		
Student Community	✓							
Grammar checker					✓	✓		



4. System Design and Development

4.1. Methodology

Agile Approach to Software Development

Our software development process was structured around the Agile methodology[39], emphasizing flexibility, iterative progress, and continuous improvement. Agile methodology enabled us to adapt quickly to changes and deliver high-quality software efficiently. We adopted the Scrum framework, a subset of Agile, which helped us manage complex software development tasks more effectively.

Scrum Framework

Scrum is a framework that facilitates team collaboration on complex projects. It consists of three roles, five events, and three artifacts, commonly referred to as the "3-5-3 structure":

Roles:

1. **Product Owner:** Responsible for maximizing the value of the product resulting from the work of the development team. The Product Owner managed the product backlog and ensured that everyone knew the priorities.
2. **Scrum Master:** Ensured that the team lived by the values and practices of Scrum. The Scrum Master helped the team perform at their highest level and shielded the team from external interruptions.
3. **Development Team:** A group of developers who deliver the product. Our development team was cross-functional, meaning everyone had all the skills necessary to create a product increment.

Events:

1. **Sprint Planning:** We defined what could be delivered in the upcoming sprint and how that work would be achieved.
2. **Daily Scrum:** This was a 10-minute time-boxed event for the development team to synchronize activities and create a plan for the next 24 hours.
3. **Sprint Review:** At the end of each sprint, the team reviewed the increment with stakeholders to get feedback and adapt the product backlog if needed.



4. **Sprint Retrospective:** The team reflected on the sprint that was concluding to identify improvements that could be made in the next sprint.
 5. **The Sprint:** It was a time-boxed period (usually 4 weeks) during which a "Done", usable, and potentially releasable product increment was created.
- **Artifacts:**
 1. **Product Backlog:** An ordered list of everything that is needed in the product, maintained by the Product Owner.
 2. **Sprint Backlog:** Set of product backlog items selected for the Sprint, plus a plan for delivering the product increment and realizing the sprint goal.
 3. **Increment:** The sum of all the Product Backlog items completed during a Sprint and all previous Sprints.

In practice, our supervisor played a dual role as the product owner and the scrum master. As a team, we emphasized Agile principles, ensuring continuous communication and adaptability. Weekly meetings were held to provide updates and facilitate seamless changes as needed. Transparency in our work and progress was key, facilitated by the Scrum framework, allowing us to deliver functional components of the application regularly.

Tools

- **Jira:** We used Jira as our project management tool to track all user stories and sprints. It helped us maintain the product and sprint backlogs, organize the workflow, and visualize progress through various Scrum boards¹.
- **GitHub:** Our source code was managed in GitHub, which hosted our repositories and facilitated version control and collaboration. It was crucial for code review, managing pull requests, and tracking issues aligned with our sprints².

By integrating these tools into our Scrum framework, we were able to maintain a steady workflow, track our progress accurately, and ensure that all team members stayed aligned with the project goals and timelines. These practices and tools were essential in adhering to Agile principles and successfully completing our software development project.

¹ <https://2023-1st-gp12.atlassian.net/jira/software/projects/GP/boards/2>

² <https://github.com/juhhal/2023-GP1-12/tree/SharedSpace>



4.2. System Requirements

4.2.1. System Users

Learniverse aims to cater to a wide spectrum of users, from students of various educational levels to administrators ensuring the platform's smooth operation. Its design is tailored to be inclusive and efficient, ensuring that every user, from a novice high schooler to a tech-savvy administrator, finds value and ease in its use. As for the users of Learniverse they can be the following:

1. **Administrators:** have privileged access to the platform's database, ensuring smooth operations, content moderation, and the creation of a conducive learning environment. They also play a crucial role as the point of contact for addressing customer inquiries and resolving complaints.
2. **Students:**
 - High School Students: Those in the latter stages of secondary education preparing for university or other tertiary education.
 - Undergraduates: Students currently enrolled in bachelor's degree programs across various disciplines.
 - Postgraduates: Individuals pursuing master's, doctorates, or other advanced degrees, often requiring extensive research, collaboration, and resource management.
3. **Lifelong Learners:** Persons who may have completed formal education but are consistently engaged in courses, workshops, or self-directed learning endeavors.

Our users have different levels of experience, from beginners to experts in their studies. These experience levels shape how they use the "Learniverse" platform. We've grouped them into three categories:



- **Novices:** Users at the beginning of their academic journey or newly introduced to digital study aids and platforms.
- **Intermediate Learners:** Students with some exposure to online study tools and platforms but not experts.
- **Advanced Learners:** Users who are proficient in their academic subjects and familiar with various digital platforms to enhance their learning process.

In Learniverse, users exhibit varying degrees of technical expertise, which significantly influence their interactions with the platform. Our users can be grouped into four categories based on their technical familiarity. This categorization helps us tailor the platform's functionalities to meet their specific needs. The categories include:

1. **Beginners:** Users with limited digital tool experience, requiring intuitive interfaces for effective navigation.
2. **Moderate Users:** Familiar with standard digital tools and platforms, they can handle more complex functionalities but value guided user experiences.
3. **Tech-Savvy:** Users adept at navigating diverse platforms with ease, often looking for advanced features, customization options, and integrations.
4. **Administrative Experts:** Administrators who possess a strong grasp of both the educational and technical aspects of the platform. They often require advanced functionalities for moderation, user management, and content oversight.



4.2.2. Requirements Elicitation and Analysis

During the requirements elicitation phase for the "Learniverse" project, we utilized a two-pronged approach to gather valuable insights and data from potential users and stakeholders. This approach included the use of questionnaires and interviews as key methods for understanding user needs, challenges, and preferences.

The combination of these methods ensured a comprehensive understanding of the requirements and expectations of potential users, allowing us to shape the "Learniverse" platform to meet their specific needs effectively.

For Interviews, we conducted interviews with a diverse group of individuals, including high school students, undergraduates, and postgraduates (refer to Appendix A). These interviews provided qualitative insights into the unique needs and preferences of each user category.

From Aisha's interview, a high school student, we gathered insights crucial for our requirement elicitation. Her study process, including note review, flashcards, and highlighting, highlights preferred learning methods. Using Quizlet for flashcards underscores the need for user-friendly digital tools. Challenges she faces, like resource discovery and distractions, pinpoint areas for platform improvements. Desire for quizzes, summarization tools, reminders, and collaboration indicates feature priorities. Aisha's openness to new tools emphasizes user-friendliness. Her Zoom study experiences show a willingness to embrace collaboration. Aisha's insights inform our effort to create an effective, user-focused study tool.

From Bader's interview, an undergraduate student, we gain essential insights for our requirements. His study process, including revisiting lectures and note-taking, reflects his preferred methods. Use of Google Docs, Microsoft Teams, and Khan Academy emphasizes effective digital tools. Challenges with group projects and tool effectiveness point to areas for platform improvement. Desire for an integrated calendar, combined note-taking, discussions, and reminders highlights feature importance. Bader's Google Calendar use and openness to new tools stress user-friendliness and productivity.



enhancements. His collaborative experiences with Google Meet and Slack underscore our platform's need for collaborative capabilities. Bader's insights guide our effort to create an efficient, enjoyable study tool.

Noor, a postgraduate student, offers further insights for our requirements. Her research-focused study process involves reading journals and making annotations. She uses Google Scholar and Trello for research and task management. Challenges include citation management. Desired features are collaborative research tools and improved citation management. Noor uses digital planners and reminders for time management. She values collaboration using Zoom and Slack. Specific requests include peer review space and academic integrity alignment. Noor is open to new tools for a smoother research process.

We also did a Questionnaire which was online and distributed to a sample of participants, representing various educational backgrounds and levels of technical expertise. We got a total of 55 responses and this allowed us to gather quantitative data on study habits, tool familiarity, and feature preferences. Questionnaires are essential for requirement elicitation and understanding user needs and expectations for a product. Here are the result of the questionnaire made for "Learniverse" to gather insights (refer to Appendix B):

Based on our analysis, it was observed that the majority of participants, around (56.4%), who utilized learning applications and websites were undergraduate students, while (30.9%) were high school students. Notably, (30.9%) of the participants had prior experience with Notion, while (32.7%) had used Shaguf and Trello. These findings indicate a significant interest in the concept of learning applications and websites, suggesting that a considerable proportion of participants are familiar with these tools. Furthermore, our results indicate that (72.7%) of participants are familiar with using online study tools. The top three features that participants considered important and helpful in learning applications and websites were: summarization, with (63.6%) of participants recognizing its significance; quiz generator, which was seen as helpful by (50.8%) of participants; and a calendar with reminders, which (49.1%) of participants felt



would assist them in keeping track of important events without missing them. Interestingly, (80%) of participants expressed the belief that having time management tools, such as the pomodoro technique, would assist them in overcoming phone addiction and effectively managing their time, making the process enjoyable and engaging. Additionally, an overwhelming (94.6%) of participants preferred quizzes to be generated from slides rather than writing them manually, citing time-saving convenience and increased efficiency as the primary reasons for their preference.

Furthermore, users expressed concerns about existing platforms, including limitations in essential features (56.4%), usability issues (40%), and subscription costs (67.3%). Effective collaboration tools were also important to 34.5% of the participants. Users desire collaborative study sessions (27.3%), integrated flashcard creation (38.2%), and comprehensive study planning features (54.5%). Some suggest adding the Pomodoro technique (1.8%). Preferences for a built-in video conference tool varied (43.6% yes, 49.1% maybe, 7.3% no). A majority preferred deadline notifications (81.8%), while some were open to the idea (14.5%), and a few didn't prefer them (3.6%). Users also value community-building (50.9% yes, 34.5% maybe, 14.5% no). These findings guide "Learniverse" in addressing user concerns and enhancing the platform.

In addition to the insights gained from the questionnaire, users offered valuable suggestions for features they'd like to see in an ideal study platform. These include features such as progression tracking to encourage consistent study habits, the ability to mark watched or studied content as a reminder of their progress, and the incorporation of the Pomodoro technique for effective time management. These suggestions present opportunities for the platform to further enhance its capabilities in meeting diverse user needs and preferences, ensuring a more comprehensive and tailored learning experience.

4.2.3. User Interactions

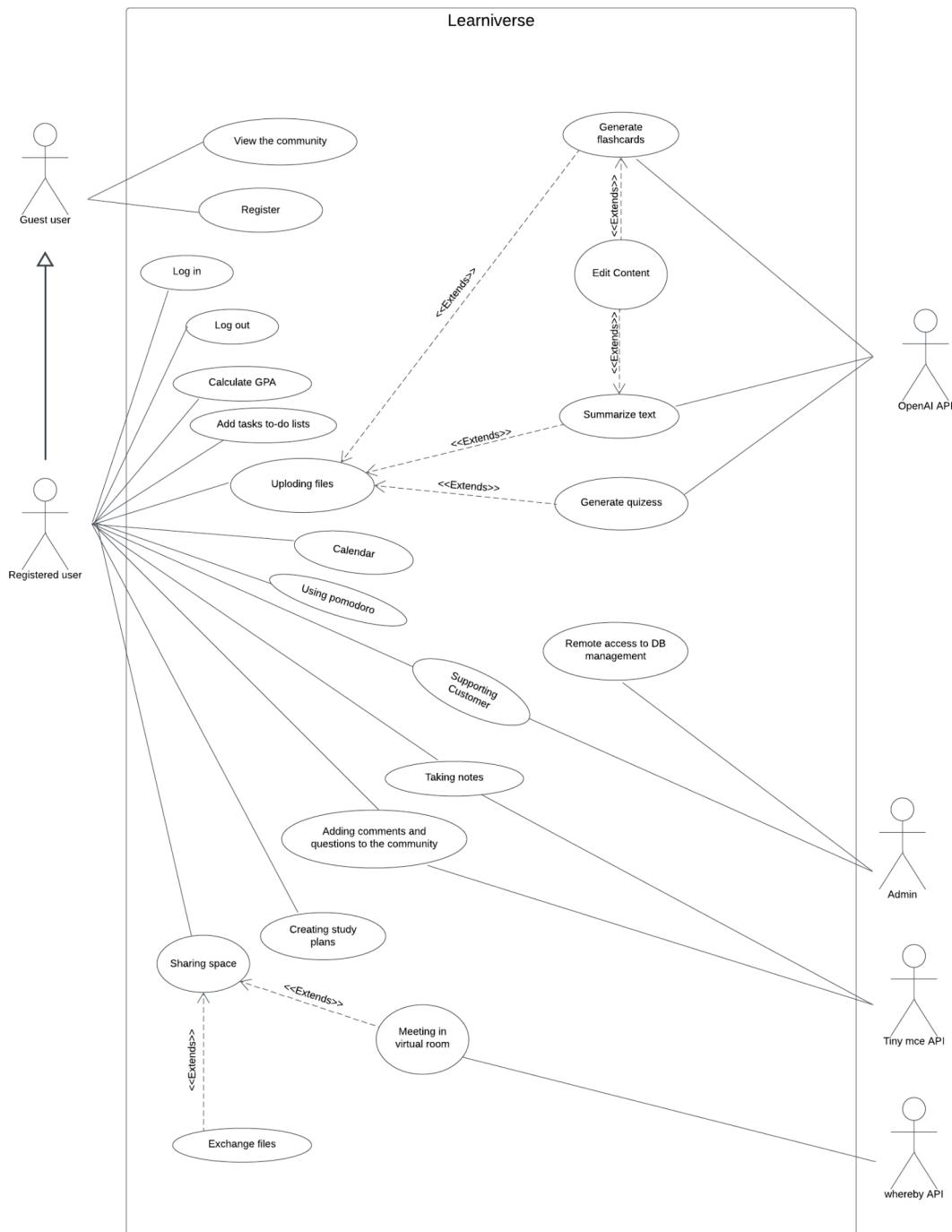


Figure 3: Learniverse Use Case Diagram

We assume the Registered user could only interact with other use cases after logging in.



4.2.4. Roadmap and Product Backlog

The Learniverse project's roadmap, running from September 2023 to April 2024, features a structured release plan aimed at enhancing the educational experience. The first major release in December includes features like flashcards, quizzes, shared spaces for collaboration, and summarization tools. The second release in April further expands functionality with the introduction of a customer support system and an admin dashboard for effective platform management. Each release cumulatively builds on the sprints' outcomes to progressively enrich user engagement and administrative capabilities.

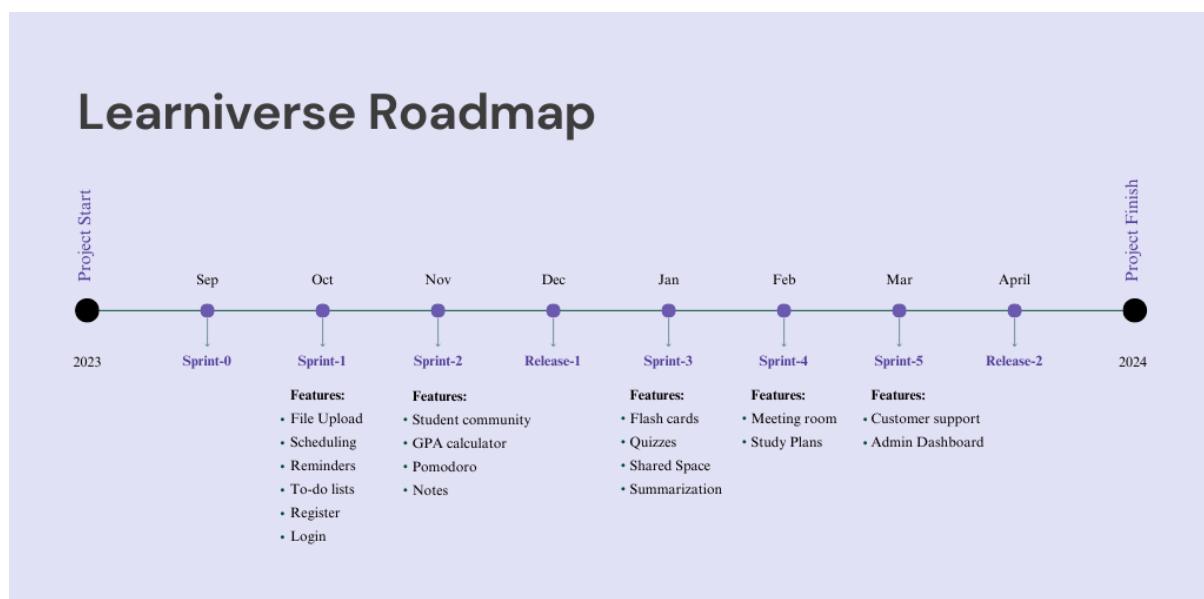


Figure 4: Learniverse Roadmap



Table 2 below shows the product backlog of release-1 and 2.

Table 2: Product Backlog

ID	PBIs (User Stories)	Size	Type (Feature, defect, technical work, knowledge acquisition)	Status (To do, in progress, or Done)	Acceptance Criteria (The conditions of satisfaction that must be met for that item to be accepted.)
1	As a learner, I want to be able to login so that I can access my own profile and its' data	1	Feature	Done	<p>As a learner, if I login with my username and password then my home page will be displayed</p> <p>As a learner, if I enter an incorrect username or password then a suitable warning message should be displayed.</p>
2	As a learner, I want to be able to register so that I can create and account and access all the website features	1	Feature	Done	<p>As a learner, if I accessed the website for the first time, then I should sign up by entering the required information (Username, First name, Last name, Email, and Password) and click sign up option.</p> <p>As a learner, if I enter valid information, unique username and strong password(at least 12 characters) in the sign-up page and click sign up option, then I am successfully registered and able to log in with my chosen credentials.</p> <p>As a learner, if I enter valid information but not a unique username and click sign up option, then an error message should appear to indicate that the username is taken .</p> <p>As a learner, if I enter valid information but a short, weak password and click the sign up option,then an error message should appear to indicate that the password is weak.</p> <p>As a learner, if I enter invalid information in the sign-up page and click sign up option, then an error message should appear to indicate that the information is invalid.</p>



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					<p>As a learner, if I leave an empty field in the sign-up page and click sign up option, then an error message should appear to indicate that there is an empty field.</p>
3	As a learner, I want to be able to reset my password so that I can access my account when I forget it	2	Feature	Done	<p>As a learner, if I click on reset password then I will be directed to a reset password form. The form should ask for my email. If the email is correct, it should send a rest link to it. Otherwise, it should display an appropriate message.</p> <p>After I receive and click on the reset link, it should redirect me to the reset password form, where I will be able to insert a new password. Then, I will be sent back to the login page and my password will be reset successfully</p>
4	As a learner, I want to be able to log out from my account so that my account remains secure and inaccessible to unauthorized users	1	Feature	Done	As a learner, if I log out then I will not have access to my profile data, and my current active session should be destroyed. Then, I will be sent back to the homepage (index page).
5	As a learner, I want to be able to upload my pdf files so that my files are in one place and I can use them for other features	2	Feature	Done	As a learner, if I click on upload file, the upload file field should appear. Once I choose a file to upload, I shall be able to see it in the website.
6	As a learner, I want to be able to delete my uploaded files so that I can remove unwanted file	1	Feature	Done	As a learner, if I delete an uploaded file, a confirmation message should appear. If i click on Confirm, the file will be deleted from my files. Otherwise, if I click on Cancel, it should not be deleted and still be there in my files.
7	As a learner, I want to be able to add events to my calendar so that I can track my deadlines	3	Feature	Done	As a learner, if I want to add an event, I need to select the day/days of the event, then a form should be displayed so that I can enter the event's information such as Title and Description. If I click on confirm, the event's title should appear in the calendar. Otherwise, the event should not be added.



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8	As a learner, I want to be able to edit calendar events so that I can change the event details	4	Feature	Done	As a learner, if I click on the Edit button of an event, a form should be displayed where I can edit the event's details. If I confirm the edit, the event should be displayed with updated information in my calendar. Otherwise, nothing will change.
9	As a learner, I want to be able to delete calendar events so that I can remove unwanted reminders	3	Feature	Done	As a learner, if I click on the Delete button of an event, then it will disappear from my calendar view and display a suitable message.
10	As a learner, I want to be able to have reminders for my events so that I make sure I don't miss deadlines	3	Feature	Done	As a learner, if I turn on a reminder of an event, then I will get an email notification to remind me of the event a day prior.
11	As a learner, I want to be able to add a task in my to-do list so that I can track all my tasks	2	Feature	Done	As a learner, if I click on Add a task in my to-do list, a form should be displayed where I can enter the task name and an optional due date. The form should not allow me to submit a task without its name. If I click on submit then the task will be displayed in my to-do list view.
12	As a learner, I want to be able to edit a task from my to-do list so that I can change my task details	3	Feature	Done	As a learner, if I click on the Edit button of a task in my to-do list, then a form should be displayed where I can edit the task's name and due date. If I click on submit, the task will be displayed accordingly in my to-do list view. Otherwise, if I click on Cancel, nothing will be changed.
13	As a learner, I want to be able to delete a task from my to-do list so that I can remove tasks when done or not needed	1	Feature	Done	As a learner, if I click on the Delete button of a task in my to-do list, then the task will disappear from my to-do list.
14	As a learner, I want to be able to calculate my GPA so that I can keep track of my grades	1	Feature	Done	As a learner, if I click on calculate GPA, a form should be displayed where I can enter my courses and their grades, and then I should choose the GPA scale (e.g., 4.0 or 5.0). When I submit the form, it should validate my input, and then my GPA will be calculated and displayed.
15	As a learner, I want to be able to add my gpa to	1	Feature	Done	As a learner, if I click on Add GPA, a form should be displayed where I choose the GPA target and enter the



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	my grades so that I can track my grades				year, courses, hours, and rate for each course. If I submit the form without input, it should be alerted as "Please input all required fields to save." Then, the new GPA will be displayed with my previous GPA.
16	As a learner, I want to be able to delete my gpa so that I can remove unwanted gpa	1	Feature	Done	As a learner, if I click on Delete GPA, a confirmation message should appear. once I hit Confirm, the GPA will disappear from my GPA page. Otherwise if i click on Cancel, it should not be deleted.
17	As a learner, I want to be able to create a note page so that I remember all my important notes	1	Feature	Done	As a learner, if I click on Add a Note, a form should be displayed where I can enter the note's title and content. If I submit the form without a title, it should be titled as "Untitled". Then, the new note page will be displayed with my previous notes.
18	As a learner, I want to be able to edit the note page so that I can edit the notes I want to change.	2	Feature	Done	As a learner, if I press the edit button of a note, then a form should be displayed where I can change the note's details as wanted. Once I submit the form, the note will change accordingly.
19	As a learner, I want to be able to delete a note page so that I can remove unwanted notes	1	Feature	Done	As a learner, if I click on Delete a note, a confirmation message should appear, once I hit Confirm, the note will disappear from my notes page. Otherwise if i click on Cancel, it should not be deleted.
20	As a learner, I want to be able to create folders so I can keep my notes organized.	3	Feature	Done	As a learner, if I click on Add folder, a form should be displayed where I can enter folder name. If I submit the form without a name, it should ask to write the name". Then, a new folder will be displayed.
21	As a learner, I want to be able to start a pomodoro timer so that i can focus while studying	2	Feature	Done	As a learner, if I click on start pomodoro timer, a form should be displayed where I can specify the timer duration, then it will start when I click on Start and ring when done.
22	As a learner, I want to be able to pause the Pomodoro timer when I'm done studying	2	Feature	Done	As a learner, if I click on Stop my Pomodoro timer, the timer should be stopped.



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23	As a learner, I want to be able to change the Pomodoro's session timer to fit my study schedule	3	Feature	Done	As a learner, if I click on the setting button then timers I can change the pomodoro/breaks timer as wanted and save it for future use.
24	As a learner, I want to be able to change the Pomodoro's background picture to focus more	2	Feature	Done	As a learner, if I click on the settings button and change the background picture then the background picture will immediately change and be saved for future use.
25	As a learner, I want to be able to play a background sound while studying so that I can focus better	2	Feature	Done	As a learner, if I click on the setting button and then click on the sounds button I can choose any sound that I like then a the background sound will immediately play
26	As a learner, I want to be able to change the background sound volume so that it doesn't distract me	1	Feature	Done	As a learner, if I click on the setting button and choose the sounds option then I can change the background sound volume as wanted
27	As a learner, I want to be able to display the pomodoro timer in full screen so that I don't get distracted and only focus on the study session	2	Feature	Done	As a learner, if I click on the full screen button then the screen will be full while hiding the header, footer, and sidebar
28	As a learner, I want to be able to add a new post in the community so that I can exchange knowledge with other people	2	Feature	Done	As a learner, if I click on Add new post to the community, a form should be displayed where I can enter the post's details such as title and content. The form should not be submitted without a title or content. Once I click on submit, it will be shown in the community page. Otherwise, if I click on Cancel, it should not be posted.
29	As a learner, I want to be able to edit my published posts in the community so that I can change their details	2	Feature	Done	As a learner, if I click on Edit post on my own post, a form should be displayed where I can enter the post's details. The form should not be submitted without a title or content. Once I click on submit, I should see my post with the updated details. If i click on Cancel, nothing should change.
30	As a learner, I want to be able to delete my posts	1	Feature	Done	As a learner, if I click on Delete post on my own post, a confirmation message should appear. If I confirm



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	so that I can remove unwanted posts.				my action, the post shall be deleted. Otherwise, the post should not be deleted.
31	As a learner, I want to be able to like or dislike posts so that I can express my opinion and engage with the content.	2	Feature	Done	As a learner, If I enjoy a post, I can like\dislike it by clicking the Like\Dislike button. If I click on the Like\Dislike button again, my previous like\dislike should disappear. The number of likes and dislikes on the post should update accordingly.
32	As a learner, I want to be able to report posts that contain inappropriate content, for a safer and more responsible online community.	2	Feature	Done	As a learner, If I find a post to be inappropriate, I can report it by clicking on the Report button. Then, a form should appear where I can type my complaint within 500 characters. If I submit the form with an empty complaint field, an error message should appear. Otherwise, the report shall be submitted.
33	As a learner, I want to be able to reply a post so that I can help other people	3	Feature	Done	As a learner, if I click on Reply to a post in the community, a form should be displayed where I can type my reply. Once I click on Post, it will be shown as a comment under that specific post. Otherwise, if I click on Cancel, it should not be posted.
34	As a learner, I want to be able to edit my comments in the community so that I can change their contents.	3	Feature	Done	As a learner, if I click on Edit comment on my own comments, the comment prefills on the textarea where I can enter the edited comment. The comment should not be submitted empty. Once I click on submit, I should see my comment updated.
35	As a learner, I want to be able to delete my comments so that I can remove my unwanted comments.	2	Feature	Done	As a learner, if I click on Delete comment on my own comments, a confirmation message should appear. If I confirm my action, the comment shall be deleted. Otherwise, the comment should not be deleted.
36	As a learner, I want to be able to receive emails when someone replies to my posts so that I can	2	Feature	Done	As a learner, if I add a post, and someone replies to my post, I receive an email so that I am informed that there is a new comment.



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	keep engaged with responders.				
37	As a learner, I want to be able to get generated flash cards of my uploaded material so that I can study it effectively.	4	Feature	Done	As a learner, if I click on Generate flashcards for a certain file locally, then a flippable flashcard related to the content of the file will be displayed.
38	As a learner, I want to be able to get generated flash cards of my already existing files so that I can study it effectively.	1	Feature	Done	As a learner, if I click on Generate flashcard of a certain file, then a list of my uploaded files will be displayed and after choosing the file a flippable flashcard related to the content of the file will be displayed.
39	As a learner, I want to be able to edit the generated flash cards' content so that I can customize them.	2	Feature	Done	As a learner, if I press the Edit button of a generated flashcard, then a form should be displayed where I can change the generated content as I want.
40	As a learner, I want to see the generated flashcards whenever I need so that I can study them when needed	2	Feature	Done	As a learner, if I press on the display button, then the flashcards will be displayed again and I can study their content again.
41	As a learner, I want to be able to delete a generated flashcard so that I can remove any bad flashcards.	2	Feature	Done	As a learner, if I press the delete button of a certain flashcard then it will be deleted.
42	As a learner, I want to export the flashcards so that I can have the generated content in my device.	1	Feature	Done	As a learner, if I press the export button then the generated content will be downloaded in my device as a PDF file.
43	As a learner, I want to be able to save a generated flashcard to my files page so that I can store the flashcard in my flashcards folder.	2	Feature	Done	As a learner, if I press the 'save to files' button then the generated flashcards will be saved as a PDF file in my files page specifically in the flashcards folder.
44	As a learner, I want to be able to get generated quizzes of my uploaded material so that I can test my understanding.	4	Feature	Done	As a learner, if I click on Generate a quiz for a certain file locally, then a quiz will be generated containing questions and maximum four choice answers that relate to the content of the file. Then I can try the quiz and



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					choose the answers. After I finish the quiz, my result of correctly answered questions should be displayed.
45	As a learner, I want to be able to get generated quizzes of my already existing files so that I can test my understanding.	4	Feature	Done	As a learner, if I click on Generate a quiz for a certain file, then a list of my uploaded files will be displayed and after choosing the file, then a quiz will be generated containing questions and maximum four choice answers that relate to the content of the file. Then I can try the quiz and choose the answers. After I finish the quiz, my result of correctly answered questions should be displayed.
46	As a learner, I want to see my quiz again and check the answers for it so that I can review it whenever I need.	3	Feature	Done	As a learner, if I press the display button then the quiz questions and my answers will be displayed with the correct answer.
47	As a learner, I want to be able to delete a generated quiz so that I can remove any bad quizzes.	2	Feature	Done	As a learner, if I press the delete button of a certain quiz then it will be deleted.
48	As a learner, I want to export my quiz so that I can have the generated content in my device.	2	Feature	Done	As a learner, if I press the export button then the generated quiz with my answers and the correct answers will be downloaded in my device as a PDF file.
49	As a learner, I want to be able to save a generated quiz to my files page so that I can store the quiz in my quizzes folder.	2	Feature	Done	As a learner, if I press the 'save to files' button then the generated quiz with my answers and the correct answers will be saved as a PDF file in



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					my files page specifically in the quizzes folder.
50	As a learner, I want to be able to get a generated summarization of my uploaded material so that I can use it effectively.	4	Feature	Done	As a learner, if I click on the Summarize button of a file, then a generated summary related to that file's content will be displayed in the page.
51	As a learner, I want to be able to get a generated summarization for a file from my files so that I can use it effectively.	3	Feature	Done	As a learner, if I click on the Summarize button from an existing file, then a list of my uploaded files will be displayed and after choosing the file, then a generated summary related to that file's content will be displayed in the page.
52	As a learner, I want to see my recent summaries so that I can use them if needed once again.	2	Feature	Done	As a learner, if I press on display then the original text and the summarized text will be displayed and I can edit it and use it however i want.
53	As a learner, I want to export a summarization so that I can have the generated content in my device.	2	Feature	Done	As a learner, if I press the export button then the generated summarization will be downloaded in my device as a PDF file.
54	As a learner, I want to be able to save a generated summarization to my files page so that I can store the summarization in my summaries folder.	2	Feature	Done	As a learner, if I press the 'save to files' button then the generated summarization will be saved as a PDF file in my files page specifically in the summaries folder.
55	As a learner, I want to be able to edit the generated summarization's content so that I can customize it.	2	Feature	Done	As a learner, if I press on the summarized text then I can edit it and rewrite as much as needed.
56	As a learner, I want to be able to copy the summarized text so that I	1	Feature	Done	As a learner, if I press on the copy button then the text will be saved in the clipboard.



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	can paste it in any place that I need.				
57	As a learner, I want to be able to create shared spaces so that I can invite my colleagues to them.	5	Feature	Done	<p>As a learner, if I click on Create a shared space, then a form should appear so that I can fill in the space name.</p> <p>I cannot submit the form without filling the space name.</p>
58	As a learner, I want to have a clear view of the spaces I have created, joined, and requested to join, so that I can easily keep track of my space activities.	2	Feature	Done	As a learner, when I navigate to the Shared Space page, I expect to see a comprehensive list of all the spaces I have created, joined, and requested to join. This list should enable me to easily track and manage my involvement in different spaces.
59	As a learner, I want to be able to invite other users to the space, so that I can collaborate and share the space with specific individuals.	2	Feature	Done	As a learner, when I click on the invite button, a unique Code should appear. Which another user could use to request joining the space.
60	As a learner, I want to be able to accept/reject users who want to join my created space, so that I can manage who is part of the space.	2	Feature	Done	<p>As a learner, if I'm in a shared space I created, I can view the current and pending members of this space. Each pending member should have accept/reject button.</p> <p>If I click on accept, the user should be admitted into my space, and get an email notification of the admission.</p> <p>If I click on reject, the user should be removed from the space's pending members.</p>



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61	As a learner, I want to be able to remove members from my shared space, so that I can manage who is part of the space.	2	Feature	Done	<p>As a learner, if I'm in a shared space I created and view the members tab, I can find the kick button of each member. Once I click on it, a confirmation message should appear. If I confirm my action, the member shall be removed from the space. Otherwise, the member should not be removed.</p>
62	As a learner, I want to have a chat feature that allows me to communicate with all members within the shared space, so that it will enable me to easily engage in discussions and exchange information with everyone in the space.	4	Feature	Done	<p>As a learner, when I access the shared space, I should have access to a chat feature.</p> <p>I should be able to view and participate in real-time conversations with all members of the space.</p> <p>Messages sent in the chat should be time stamped to indicate when they were posted.</p> <p>The chat should have a scrollable feature, allowing me to view past messages if the conversation extends beyond the visible area.</p> <p>If new chat messages are posted while I am actively viewing the chat, they should be automatically displayed without requiring a manual refresh.</p>
63	As a learner, I want to be able to share files with my colleagues in the shared space so that we can exchange files simultaneously.	5	Feature	Done	<p>As a learner, if I'm in a shared space and click on upload a file, I will be prompted to choose and upload a file (either from 'my files' page, or my own device), then all users inside the space can see that file.</p>



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64	As a learner, I want to be able to delete the files I shared in the Space, so that I can remove any unwanted files.	3	Feature	Done	<p>As a learner, if I'm a member in a shared space and click on the delete button of a file I own, a confirmation message should appear. If I confirm my action, the file shall be deleted. Otherwise, the file should not be deleted.</p> <p>As a learner, if I'm an Admin in a shared space and click on the delete button of any file, a confirmation message should appear. If I confirm my action, the file shall be deleted. Otherwise, the file should not be deleted.</p>
65	As a learner, I want to be able to save the files in the shared space to 'my files', so that I can have a copy of them.	4	Feature	Done	As a learner, if I'm in a shared space and click on the save file icon, the file should be saved to my files page.
66	As a learner, I want to be able to add tasks to the shared space, so that I can effectively manage and organize the work within the space.	3	Feature	Done	<p>As a learner, when I am in the shared space, I should have the ability to add tasks.</p> <p>The task creation form should include fields for the task name and description.</p> <p>The due date field should be optional, allowing me to specify a deadline for the task if desired.</p> <p>Each task should have an assignment status that can be assigned or unassigned.</p> <p>When I assign a task to someone, the assigned individual should receive an email notification</p>



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					informing them of their new task assignment.
67	As a learner, I want to be able to leave a space, so that I no longer become a part of it.	2	Feature	Done	<p>As a learner, if I'm a member in a shared space, I can leave it by clicking on the Leave space button. Once I click on it, a confirmation message should appear. If I confirm my action, I will no longer be a part of this space. Otherwise, nothing should change.</p> <p>As a learner, if I'm an Admin in a shared space, I can delete it by clicking on the Delete space button. Once I click on it, a confirmation message should appear. If I confirm my action, the space should no longer exist. Otherwise, nothing should change.</p>
68	As a learner, I want to be able to join the virtual meeting room for a space, so that I can exchange information and share ideas with everyone in the space.	2	Feature	Done	<p>As a learner, if I click on join space virtual meeting room, a new tab should be opened with the space virtual meeting room where I can participate in the virtual meeting room.</p> <p>As a learner, if I'm an Admin in a shared space, I can invite other users to a space virtual meeting room by clicking on the Invite button. Once I click on it, I have two options to send the invitation either Send Email or Copy meeting room link. If I write the users email or choose their usernames from the search and click Send Email , an email will be sent to them with the space virtual meeting</p>



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					room link. Otherwise, I can send the copied space virtual meeting room link to users.
69	As a learner, I want to be able to leave the virtual meeting room for a space, so that I am no longer a part of it.	1	Feature	Done	<p>As a learner, if I'm in a space virtual meeting room, I can leave the space virtual meeting room by clicking on the leave button. Once I click on it I become no longer part of that virtual meeting room.</p> <p>As a learner, if I'm an Admin in a shared space, I can either leave a space virtual meeting room, by clicking on the Leave room button. Once I click on it, I become no longer part of that virtual meeting room. Or I can end the meeting for all, by clicking on the End meeting for all button. Once I click on it, the virtual meeting room will end for all.</p>
70	As a learner, I want to be able to start a public virtual meeting room so that I can exchange information and share ideas with other learners.	3	Feature	Done	<p>As a learner, if I click on start/join public meeting room, a new tab should be opened with the virtual meeting room so that I can use it to invite other users to it.</p> <p>As a learner, if I'm a host for a public meeting room, I can invite other users to the virtual meeting room by clicking on the Invite button. Once I click on it, I have two options to send the invitation either Send Email or Copy meeting room link. If I write the users email or choose their usernames from the search and click Send Email , an email will be sent to them with the</p>



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					virtual meeting room link. Otherwise, I can send the copied virtual meeting room link to users.
71	As a learner, I want to be able to join a public virtual meeting room so that I can participate with others and share information.	3	Feature	Done	As a learner, if I click on start/join public meeting room, a new tab should be opened with the virtual meeting room so that I can participate with others and share information.
72	As a learner, I want to be able to leave a public virtual meeting room so that I am no longer a part of it.	1	Feature	Done	As a learner, if I'm in a public virtual meeting room, I can leave the virtual meeting room by clicking on the leave button. Once I click on it I become no longer part of that virtual meeting room. As a learner, if I'm a host of a public virtual meeting room, I can either leave the virtual meeting room, by clicking on the Leave room button. Once I click on it, I become no longer part of that virtual meeting room. Or I can end the meeting for all, by clicking on the End meeting for all button. Once I click on it, the virtual meeting room will end for all.
73	As a learner, I want to be able to create a study plan so that I can organize and achieve learning goals.	3	Feature	Done	As a learner, if I click on create a study plan, a form should be displayed where I can enter the name, plan duration, and materials I wish to study. Then, the plan should be generated and displayed on my screen in a calendar format.



ID	PBIs (User Stories)	Size	Type (Feature, defect, technical work, knowledge acquisition)	Status (To do, in progress, or Done)	Acceptance Criteria (The conditions of satisfaction that must be met for that item to be accepted.)
74	As a learner, I want to be able to view all my created study plans, so that I can easily access and manage my personalized learning journeys.	3	Feature	Done	<p>As a learner, when I access the study planner page, I should see a list of all the study plans that I have created.</p> <p>Each study plan in the list should include relevant information such as the plan name, and creation date.</p> <p>Each plan should have action buttons such as view and delete.</p>
75	As a learner, I want to be able to view a specific study plan, so that I can engage with it.	3	Feature	Done	As a learner, if I click the view action button of a specific plan, the plan calendar should appear alongside a regenerate button and a save button.
76	As a learner, I want to be able to save a created plan to my own calendar, so that I can view the study sessions alongside my other events.	3	Feature	Done	As a learner, if I click the Save to Calendar button of a specific plan, the plan's study sessions should be therefore added to my calendar in the workspace. Then, the button should be deactivated, so that I cannot add another replica of the plan to my calendar.
77	As a learner, I want to be able delete my created study plans so that I can remove any unnecessary plan.	3	Feature	Done	As a learner, if I click on the delete action button of a plan, a confirmation message should appear. If I confirm my action, the plan should no longer exist. Otherwise, nothing should change.
78	As a learner I want to regenerate a study plan so that it can fit my calendar and study material better.	3	Feature	Done	As a learner, if I press on the regenerate button then the old plan will be removed from my screen and the new plan will be displayed instead.
79	As a learner, I want to edit my study plan so that it fits my schedule better.	2	Feature	Done	As a learner, if I press on a specific event in my plan then I can edit it and then save it to my calendar.
80	As a learner, I want to be able to request customer support so that	2	Feature	Done	As a learner, if I have an issue with the website then I can report it to customer support by clicking the Help button. Then, a form should be



ID	PBIs (User Stories)	Size	Type (Feature, defect, technical work, knowledge acquisition)	Status (To do, in progress, or Done)	Acceptance Criteria (The conditions of satisfaction that must be met for that item to be accepted.)
	I can seek assistance and resolve any issues.				displayed where I enter the complaint's content. Once I click on submit, it will be sent to the customer support service. Otherwise, if I click on Cancel, it should not be sent.
81	As an administrator, I want to be able to login to the website so I can manage it.	2	Feature	Done	As an administrator, if I login with my username and password then my home page will display the dashboard.
82	As an administrator, I want to be able to access the database so that I can manage the website's data.	1	Feature	Done	As an administrator, if I open the dashboard page then I can see an overview on the database.
83	As an administrator, I want to be able to have access to the post reports so that I can ensure that all posts are appropriate.	2	Feature	Done	As an administrator, if the report was inappropriate I should be able to delete them by clicking on the delete button. Once I click on it, the post and its reports will be deleted.
84	As an administrator, I want to be able to delete inappropriate posts so that the community remains constructive, and aligned with the guidelines.	1	Feature	Done	As an administrator, if I access the customer post report. I can delete inappropriate posts or just delete the report if it's appropriate so I can remove it from the list.
85	As an administrator, I want to be able to have access to the customer support process so that I can ensure that customers are satisfied.	1	Feature	Done	As an administrator, if I access the customer complaints then I can read their complaints and contact them by their registered email to help them resolve the issue. Once the issue is resolved, I can mark it as Resolved.
86	As an administrator, I want to be able to log out from my account, so that I can prevent any unauthorized access to my account.	1	Feature	Done	As an administrator, if I'm done with my work and log out from the website, then I will not have access to the website data and my session will be destroyed.
Non-functional Requirements					
87	As a user, I want to understand the whole interface in less than 1 minute	1	Feature	Done	As a user, if I'm using a website then I can understand all icons and buttons in less than a minute



ID	PBIs (User Stories)	Size	Type (Feature, defect, technical work, knowledge acquisition)	Status (To do, in progress, or Done)	Acceptance Criteria (The conditions of satisfaction that must be met for that item to be accepted.)
88	As a user, I want my input to be sanitized so that my data stay safe	1	Feature	Done	As a user, If I fill any input box then my input will be automatically sanitized
89	As a user, I want the website to be available 99% of the time I'm trying to access it so that I can study and be productive any time of the day	1	Feature	Done	As a user, if I want to access the website at any time then the website should be available and works perfectly all the time
90	As a user, I want the website main pages to display within at most 10 seconds, so that I can use the website as quickly as possible.	2	Feature	Done	As a user, If I'm in a main page in the website then the page items should be displayed within 10 seconds.
91	As a user, I want the website to be compatible with all my devices and screen sizes	4	Feature	in progress	As a user, if I use the website in my mobile or laptop then the interface should adjust to the screen



4.3. System Design

4.3.1. Architectural Diagram

Our system follows a client-server architecture model. This architecture consists of interconnected components working together to enable efficient communication, data management, and functionality delivery. The system is decomposed into Cloudways server, MongoDB database, end-user clients, administrators, and connected APIs.

The client-server architecture offers several advantages for our website. It provides clear separation of concerns, scalability, and flexibility. Multiple clients can connect to the server concurrently, ensuring efficient handling of user requests. The server can be horizontally scaled to accommodate increased load, ensuring optimal performance and availability [40]. The architecture simplifies maintenance and updates, as modifications to the server can be made without impacting clients. Additionally, the use of APIs, such as Whereby and tinyMCE, enables easy integration with other systems or services for future development.

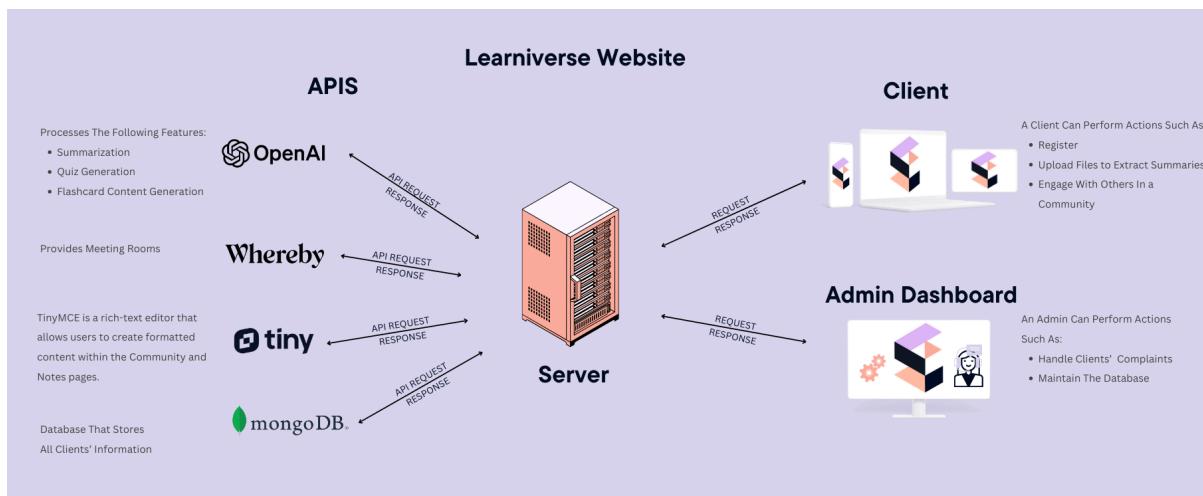


Figure 5: Learniverse Architecture

4.3.2. Class Diagram

The figure 6 shows the functionality of Learniverse system, and how it decomposed and illustrates the working parts.

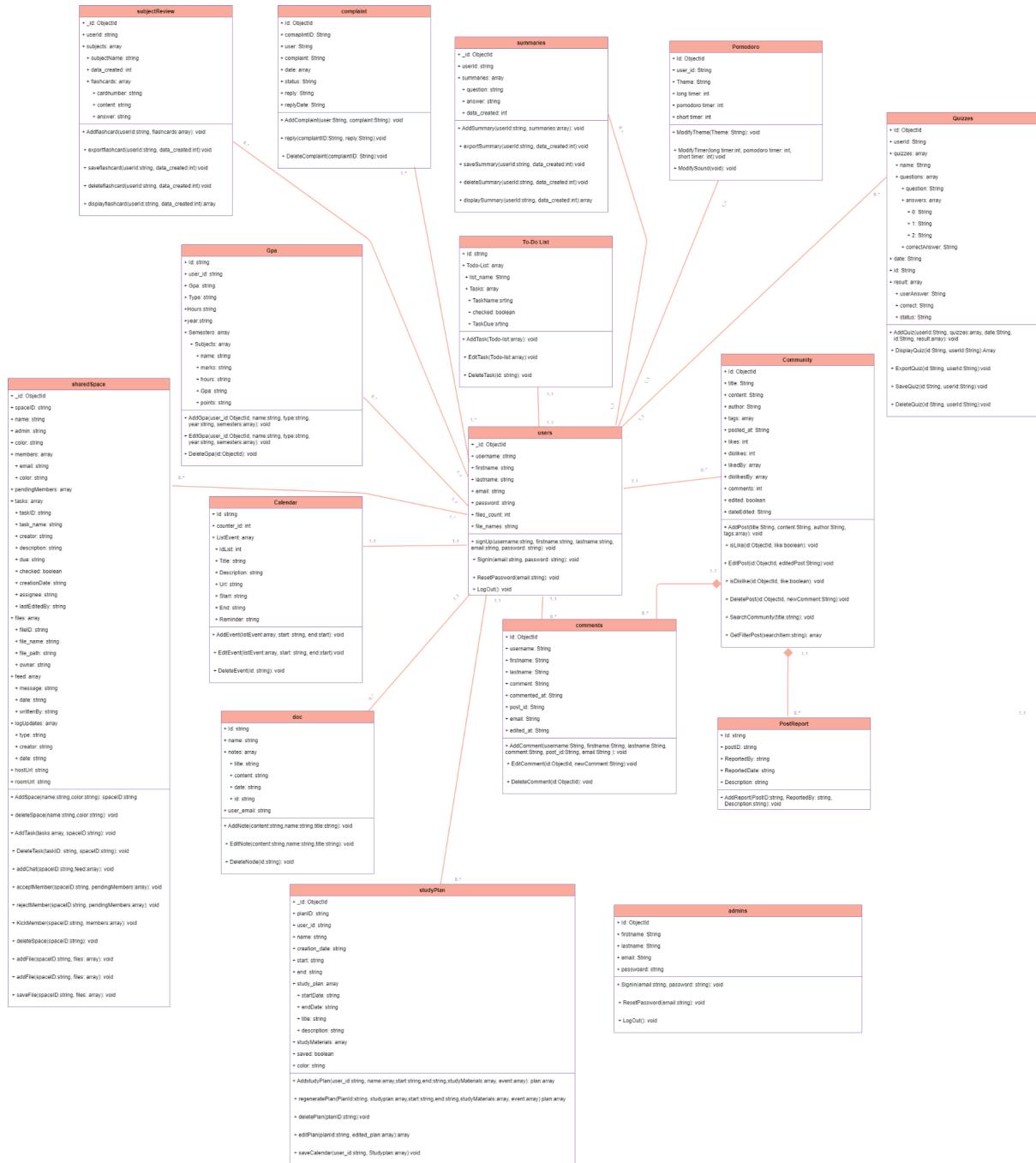


Figure 6: Learnivers Class Diagram



4.3.3. Component Level Design

In this section, we will show three major components' design of our website. We will present the Files component as a pseudocode, then the Calendar, Community components along with the Summarization component as activity diagrams.

The Files Pseudocode:

```
1 BEGIN
2   IF PAGE IS LOADED
3     BEGIN
4       DISPLAY FORM FOR FILE UPLOAD
5       BEGIN FORM
6         SET ACTION TO AJAX CALL TO uploadFile.php
7         SET ENCTYPE AS MULTIPART/FORM-DATA
8         SET METHOD AS POST
9         CREATE INPUT TAG WITH TYPE='FILE', NAME='file[]'
10        CREATE INPUT TAG WITH TYPE='SUBMIT'
11      END FORM
12
13      BEGIN SCRIPT
14        ON FILE INPUT CHANGE
15          CAPTURE DATA FROM FORM
16          BEGIN AJAX
17            SET URL TO 'uploadFile.php'
18            SET DATA TO CAPTURED DATA
19            SET METHOD TO POST
20            HANDLE SUCCESS: UPDATE FILE LIST OR REFRESH
21          END AJAX
22        END SCRIPT
23      END PAGE LOAD
24    END
25
26    BEGIN
27      ON SELECTING A FOLDER
28        SEND FOLDER NAME TO getFiles.php VIA AJAX
```



```
29      HANDLE RESPONSE: DISPLAY FILES WITH INTERACTION OPTIONS
30  END
31 BEGIN
32  VALIDATE POST REQUEST FOR FOLDER NAME AND DIRECTORY
33 IF VALID
34  CONSTRUCT PATH TO THE FOLDER
35  GET LIST OF FILES
36    FOR EACH FILE
37      BEGIN
38          CHECK FILE TYPE AND EXCLUDE UNWANTED FILES
39          DISPLAY FILE WITH OPTIONS:
40              LINK TO OPEN
41              BUTTON TO DELETE (CALL deleteFile.php VIA AJAX)
42                  BUTTON FOR SUMMARIZE (CALL summarizeFile.php WITH FILE AS
PARAMETER VIA AJAX)
43                  BUTTON FOR QUIZZES (CALL quizzesFile.php WITH FILE AS
PARAMETER VIA AJAX)
44                  BUTTON FOR FLASHCARDS (CALL flashcardsFile.php WITH FILE AS
PARAMETER VIA AJAX)
45          ATTACH EVENT LISTENERS TO BUTTONS:
46              ON 'DELETE' BUTTON CLICK
47                  SEND DELETE REQUEST TO deleteFile.php WITH FILE NAME
48                  ON SUCCESS, REMOVE FILE FROM LIST
49          ON 'SUMMARIZE' BUTTON CLICK
50                  SEND FILE NAME TO summarizeFile.php AND EXECUTE SUMMARY
51          ON 'QUIZZES' BUTTON CLICK
52                  SEND FILE NAME TO quizzesFile.php AND PREPARE QUIZZES
53          ON 'FLASHCARDS' BUTTON CLICK
54                  SEND FILE NAME TO flashcardsFile.php AND GENERATE
FLASHCARDS
55      END FOR EACH FILE
56 ELSE
57      RETURN ERROR MESSAGE 'INVALID FOLDER OR REQUEST'
58 END
```



The pseudocode outlines a web-based file management system where users can upload files and interact with them through a UI. Upon page load, a form allows file uploads, which are handled via an AJAX call to 'uploadFile.php'. Users can select files to open, delete, summarize, or create quizzes and flashcards, with each action triggered by AJAX calls to specific PHP scripts. The system validates folder selections, lists files excluding unwanted types, and dynamically updates the UI based on user interactions. Errors in folder or directory requests result in displayed error messages.

Calendar Activity diagram:

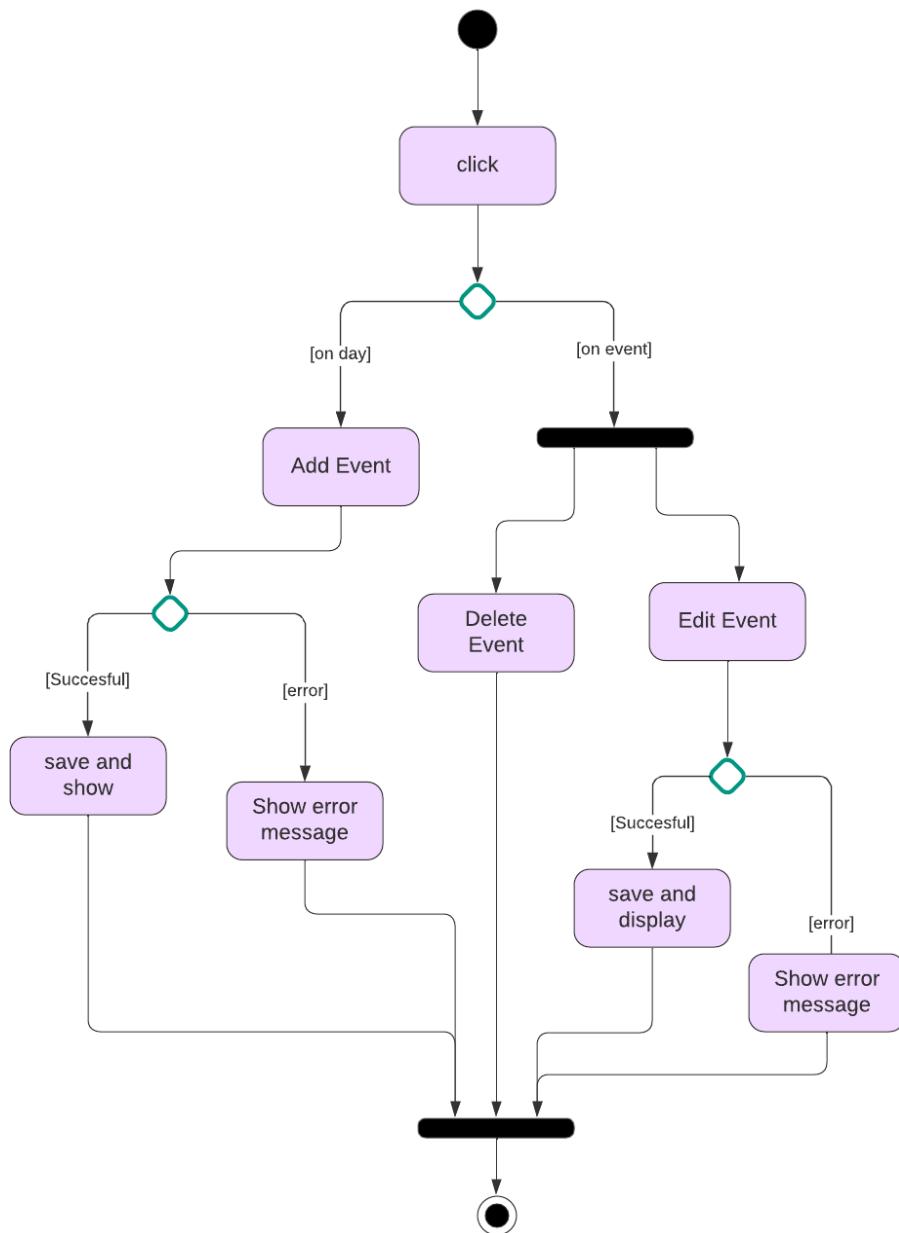


Figure 7: Calendar Activity Diagram

The calendar's activity diagram in Figure 7 shows that the first interaction with the calendar can be done by clicking either the day or an existing event:

- If the users click on the day, they can start filling the event data and save it and display it after showing an appropriate message.

- if the users click on an already existing event, then they can choose to delete or edit the event. If they choose to edit the event, then they can modify the event's content and save the changes. If changes are made, then it will be saved and displayed; otherwise an error message will be displayed. On the other hand, if the users choose to delete the event, then the event will be deleted and removed from the screen.

Community Activity Diagrams:

Upon opening the community page, users are presented with several features, including the ability to search, view published content, and create posts. To show how these features work, we will use Activity Diagrams to visualize each one of them (Figures 8-11).

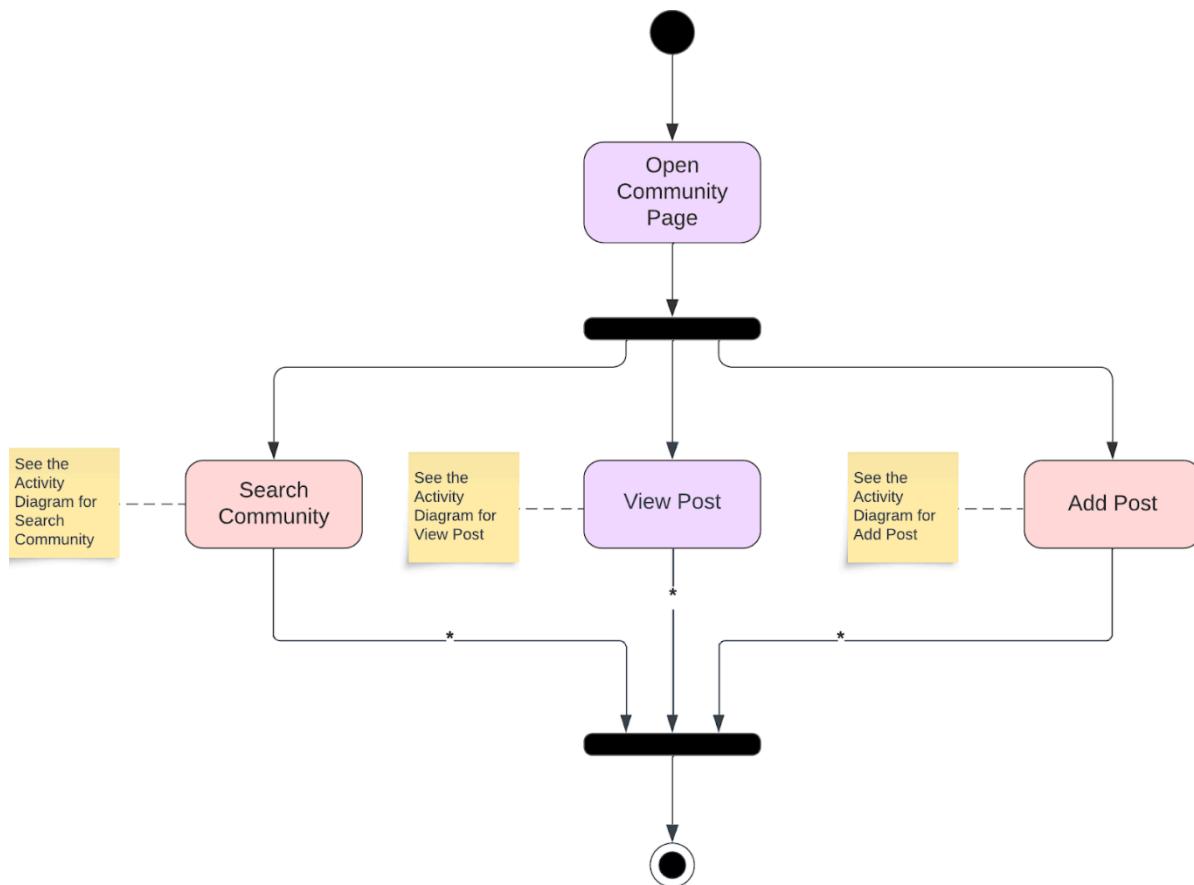


Figure 8: A partial view of Community Activity Graph. Note that the asterisks (*) are used as a placeholder for the remaining parts of the diagram (shown below).

1. Search Community Activity Diagram

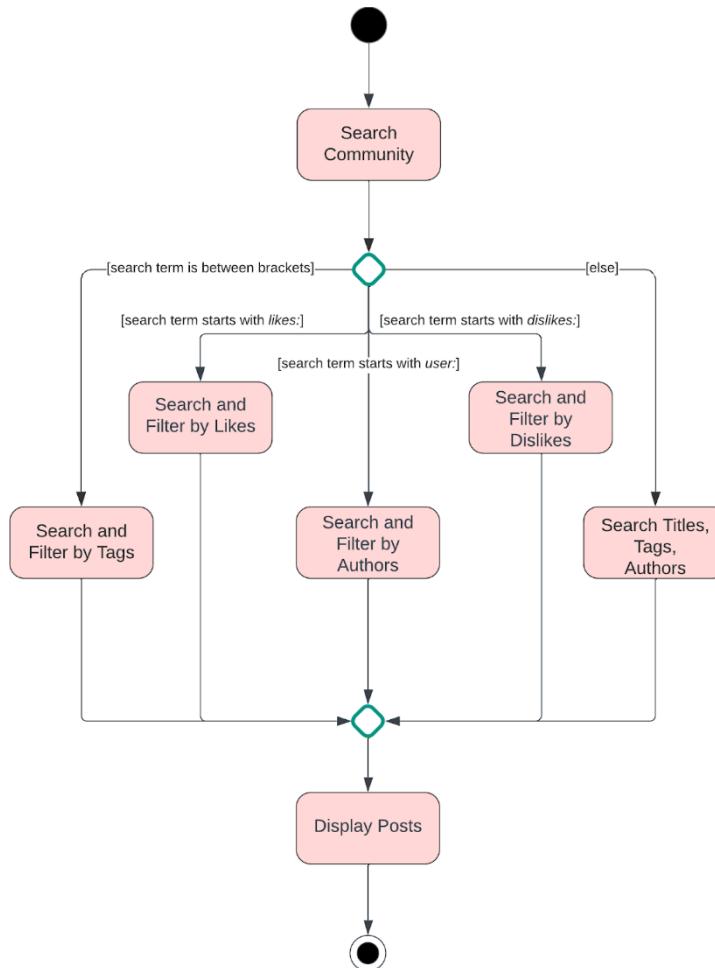


Figure 9: Search Community Activity Diagram

Figure 9 shows that the user can search the community. The search can be branched into the following:

- If the search term is contained within brackets, it searches and filters by tags.
- If the search term starts with likes: or dislikes:, it filters by likes or dislikes.
- If the search term starts with user:, it filters by authors.
- If none of the specific prefixes are detected, it searches titles, tags, and authors at once.

Then, after the search and any applicable filters are applied, the related posts are displayed.

2. View Post Activity Diagram

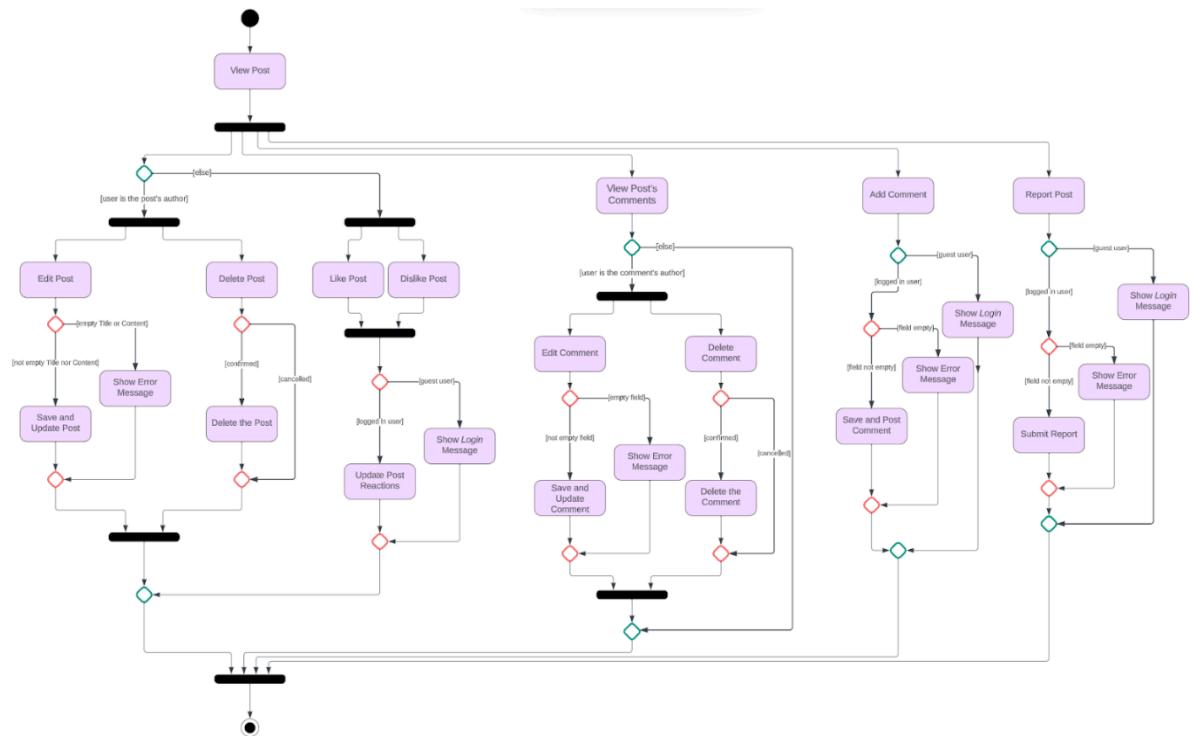


Figure 10: View Post Activity Diagram

Figure 10 depicts the user’s interaction with a published post. The user starts by viewing the post. If they are the author of that post, they can choose to edit or delete it. Editing requires non-empty title and content fields, while deletion requires confirmation.

For non-author users, they can like or dislike the post. However, guest users are prompted to log in to like or dislike a post.

All users can view the post's comments. Additionally, logged-in users can add comments and report posts, both requiring non-empty fields to submit, while guest users are prompted to log in to do so. If the user is a certain comment's author, they can edit or delete that comment. Editing requires a non-empty field, while deletion requires confirmation. Failing to follow the non-empty field condition displays an error message to the user.

3. Add Post Activity Diagram

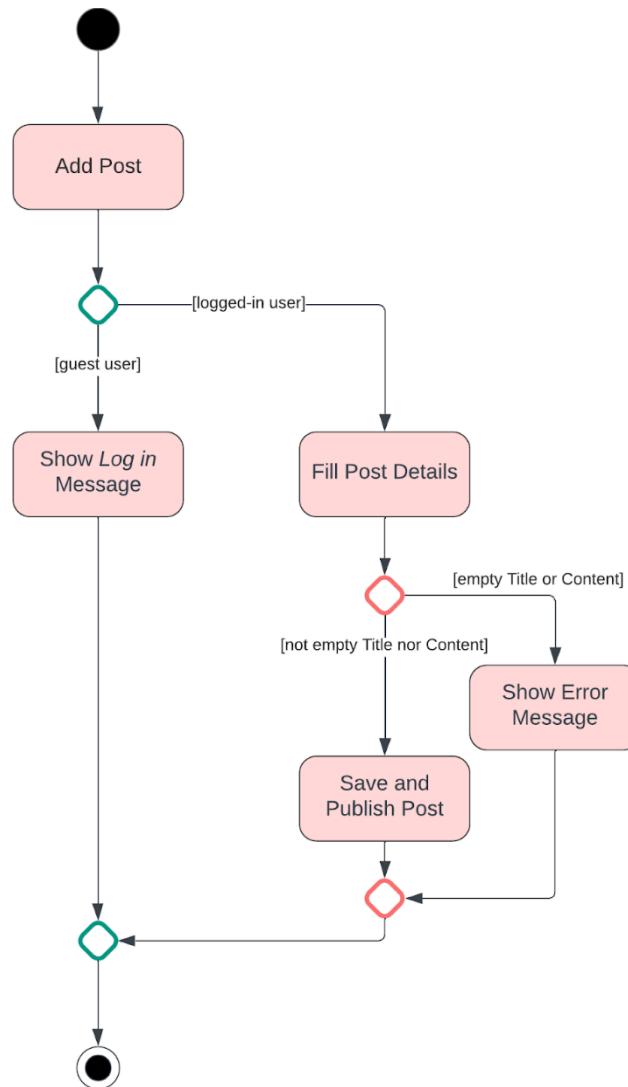


Figure 11: Add Post Activity Diagram

In this Figure 11 activity, the user can add a new post. If the user is a guest (not logged in), they are shown a *Login* message, which tells them to log in if they want to continue. If the user is already logged in, they must fill in the post details (title, content, and tags optionally). If they try to submit with an empty post title or content, an error message is shown. Otherwise, if the details are filled correctly, the post is saved and published to the Community.

Summarization Component Design:

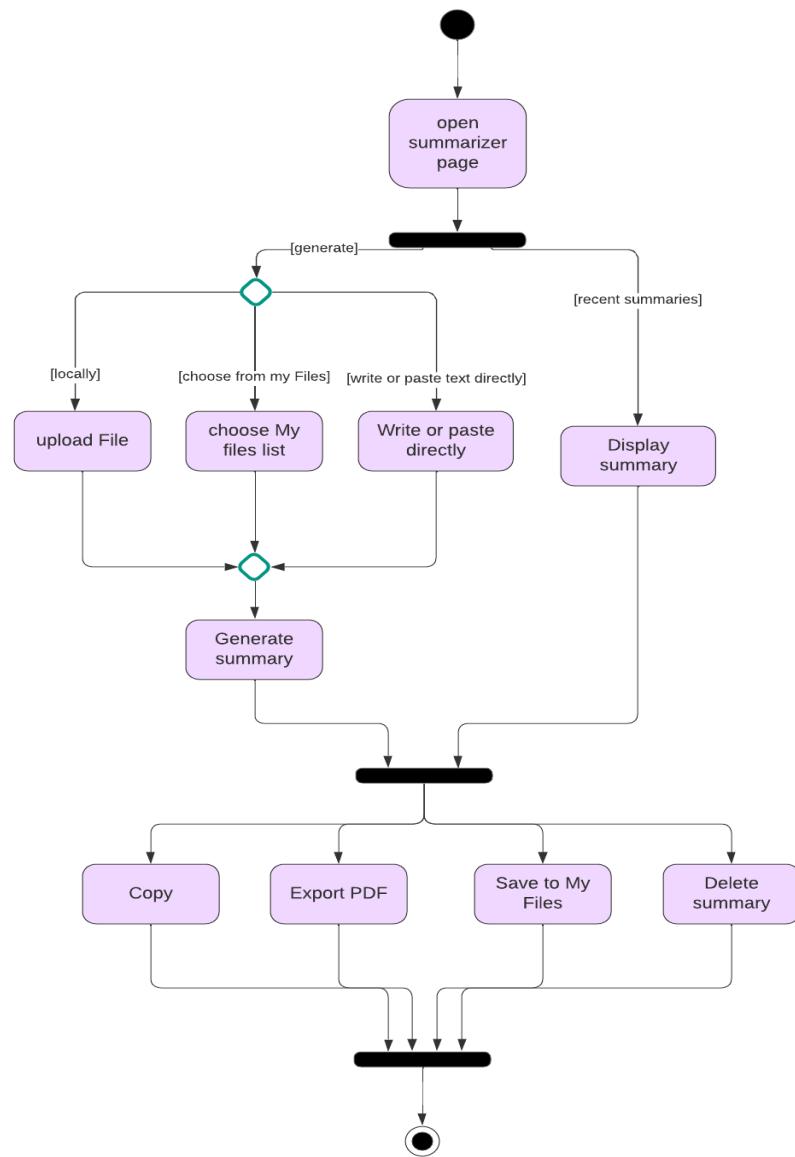


Figure 12: Summarization Activity Diagram

In the summarization activity diagram, illustrated in figure 12, the user begins by accessing the summarization page. They are presented with options to input text either by uploading a file locally, selecting a previously stored file from their list, or directly writing or pasting text. After submitting the text, the user initiates the summary generation process. The generated summary is then displayed on the screen. Following this, the user can perform various actions with the summary: copying it to the clipboard, exporting it as a PDF, saving it to their file storage, or deleting the summary if desired.

These options provide flexibility in managing and utilizing the summarized content effectively.

4.4. Data Design

4.4.1. Data Models

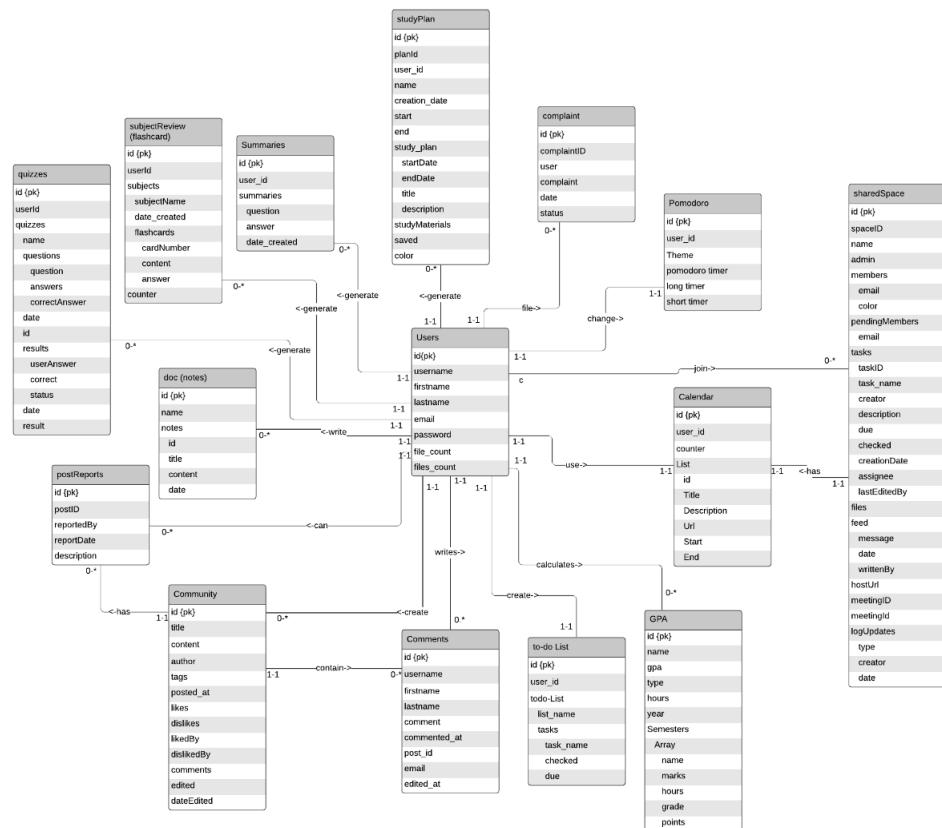


Figure 13: ER Model

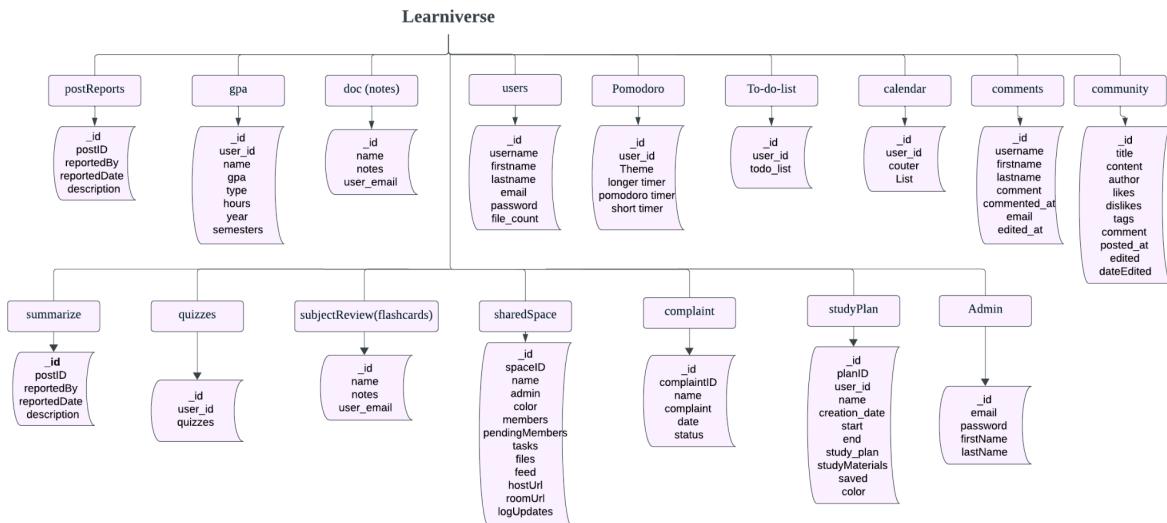


Figure 14: Non-Relational Model

In the non-relational model, there are several entities each with its corresponding attributes. The entities include "postReports", "gpa", "doc", "users", "Pomodoro", "To-do-list", "calendar", "comments", "community", "summaries", "quizzes", "subjectReview", "sharedSpace", "complaint", and "studyPlan". Each entity has its unique identifier, which is denoted by the "_id" attribute. The relationships between these entities are defined in table 3 below.

Table 3: Entity Relationships

Entity 1	Entity 2	Relationship
users	gpa	Referencing
users	postReports	Referencing embedded
users	doc (notes)	Referencing
users	community	Referencing
users	comment	Embedded
users	calendar	Referencing
users	To-do list	Referencing
users	pomodoro	Referencing

Entity 1	Entity 2	Relationship
postReports	community	Referencing
comment	community	Referencing
users	summaries	Referencing
users	quizzes	Referencing
users	subjectReview(flashcards)	Referencing
users	sharedSpace	Referencing
calendar	sharedSpace	Referencing
users	complaint	Referencing

4.5. Interface Design

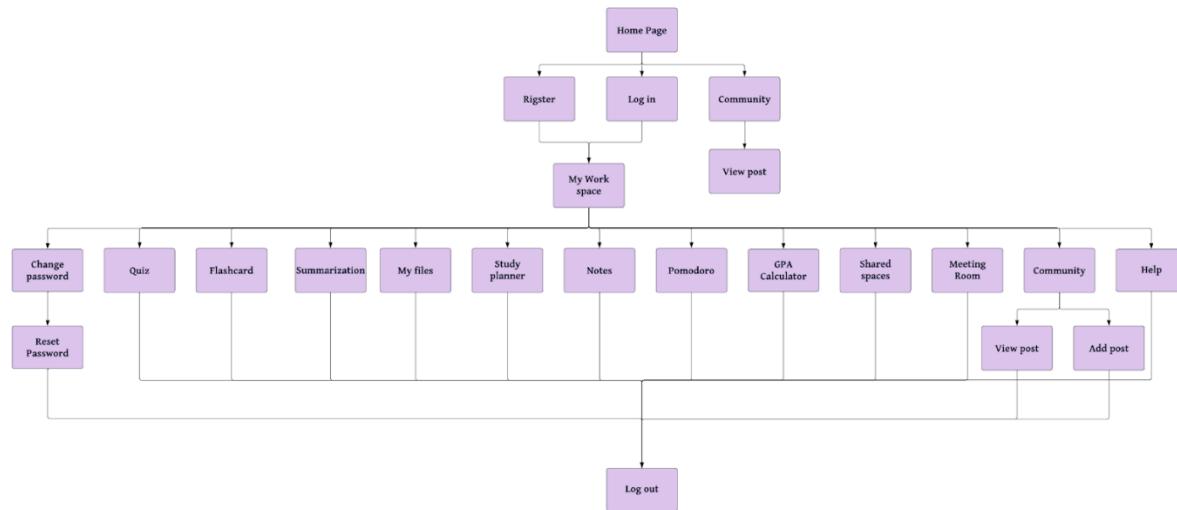


Figure 15: Navigation Diagram

As shown in figure 15, the navigation diagram of Learniverse illustrates the structure and flow of the interface. It highlights different pages in our system that offer users different features and functionalities. The links and paths in this figure provided on each page



allow users to navigate seamlessly through Learniverse website and interact with the content efficiently. This way, users can achieve their objectives with ease.

Learniverse website's user interfaces are designed based on established design rules[41] that prioritize creating a user-friendly experience and enhancing usability. These design rules ensure that the interface is intuitive, visually appealing, and highly functional. By adhering to these principles, Learniverse aims to deliver a seamless and enjoyable user experience. The following guidelines inform the design process:

1. Recognition rather than Recall: Emphasize familiar elements and patterns that users can quickly recognize and understand, minimizing the need for them to remember information.
2. Match between System and the Real World: Align the interface with users' real-world experiences, using language, icons, and interactions that are familiar and intuitive. For example, using the "bin" icon for delete tasks, posts, comments, etc.
3. Offer informative feedback: Provide meaningful feedback to users to keep them informed and engaged.
4. Consistency and Standards: Maintain consistency in design elements, layout, and interactions throughout the website. For example, the same color and identical terminology.
5. Design dialog to yield closure: Ensure user interactions have clear beginnings, middles, and ends, guiding users through a sequence of steps.
6. Aesthetic and Minimalist Design: Reducing the number of visual elements in a design to help provide more intuitive and smooth user experiences.

By adhering to these guidelines, Learniverse provided a user interface that is not only visually appealing but also intuitive, efficient, and enjoyable, ultimately enhancing the overall user experience.



The screenshot shows the Learniverse interface. At the top, there are navigation links: Learniverse, Home, Community, and My Workspace. A user profile icon for 'jomanah' is on the right. Below the navigation is a calendar for May 2024. The days of the week are labeled Sun through Sat. Specific dates are highlighted: May 12 and 13 are yellow, and May 19 and 20 are orange. To the right of the calendar is a 'My To-Do List' section. It features a pink background with a hot air balloon illustration and the text 'Poof!'. It says 'Your to-do list is a clean slate, ready for you to conquer new horizons.' and includes a '+ Add Task' button.

Figure 16: My WorkSpace Page

The screenshot shows the Learniverse 'Document Summarization' page. The title 'Document Summarization' is at the top, followed by the sub-instruction 'Summarize content to extract key points and insights.' Below this are three buttons: 'Choose Files To Upload' (purple), 'My uploaded files' (pink), and 'Summarize' (purple). The main area has two text boxes: 'Original Text' on the left and 'Summarized Text' on the right. There are also download icons above each text box.

Figure 17: Summarization Page

Figures 16 and 17 showcase sample screenshots from Learniverse, demonstrating how its design adheres to established principles. This design approach aims to create an appealing, user-friendly, and enjoyable experience, thereby enhancing users' overall satisfaction.



4.6. Implementation

In this section, we outline our system's implementation, starting with choosing the right technologies for our website.

Sprint 1:

Our first task was to integrate MongoDB. This involved downloading and connecting the MongoDB driver with PHP, a process that proved challenging due to version mismatches, confusing installation instructions, and lack of php/MongoDB resources. Here's a code snippet showing how we connected MongoDB:

```
1 // C// Require the MongoDB library
2 require_once __DIR__ . '/vendor/autoload.php';
3
4 // Create a MongoDB client
5 $connection = new MongoDB\Client("mongodb+srv://learniversewebsite:032AZJHFD1OQWsPA@cluster0.biqlid.mongodb.net/test?retryWrites=true&w=majority");
6
7 // Select the database and collection
8 $database = $connection->Learniverse;
9 $Usercollection = $database->users;ode here
```

Figure 18: MongoDB Connection

Next, we focused on implementing the calendar feature using the FullCalendar package. This task was challenging, mainly because FullCalendar is typically used with SQL databases and relies on incremental IDs, and its documentation was unclear. We also integrated sweet alerts for user interactions, adding to the complexity. Here's a snippet of the FullCalendar implementation:



```
1 document.addEventListener('DOMContentLoaded', function() {
2     var calendarEl = document.getElementById('calendar');
3
4     calendar = new FullCalendar.Calendar(calendarEl, {
5         headerToolbar: {
6             left: 'prev,next today',
7             center: 'title',
8             right: 'dayGridMonth,timeGridWeek,timeGridDay'
9         },
10        views: {
11            dayGridMonth: { // name of view
12                titleFormat: {
13                    year: 'numeric',
14                    month: 'long',
15                }
16                // other view-specific options here
17            }
18        },
19        initialView: 'dayGridMonth',
20        editable: true,
21        height: 650,
22        events: 'fetchEvents.php',
23
24        selectable: true,
25        select: async function(start, end, allDay) {
26            const {
27                value: formValues
28            } = await Swal.fire({
29                title: 'Add Event',
30                confirmButtonText: 'Submit',
31                showCloseButton: true,
32                showCancelButton: true,
33                html: '<input id="swalEvtTitle" class="swal2-input" placeholder="Enter title">' +
34                '<textarea id="swalEvtDesc" class="swal2-input" placeholder="Enter description"></textarea>' +
35                '<div class="rem">Email Reminder &nbsp;<label class="switch"><input id="swalEvtReminder" type="checkbox"></label></div>',
36
37                focusConfirm: false,
38                preConfirm: () => {
39                    return [
40                        document.getElementById('swalEvtTitle').value,
41                        document.getElementById('swalEvtDesc').value,
42                        document.getElementById('swalEvtReminder').checked
43                    ]
44                }
45            });
46        }
47    });
48});
```

Figure 19: FullCalendar code snippet

the calendar also was designed to send scheduled Email reminders the day before the event and while it's not possible to schedule using php or javascript we had to use one of our laptop's terminal to trigger the reminders php file using cron:

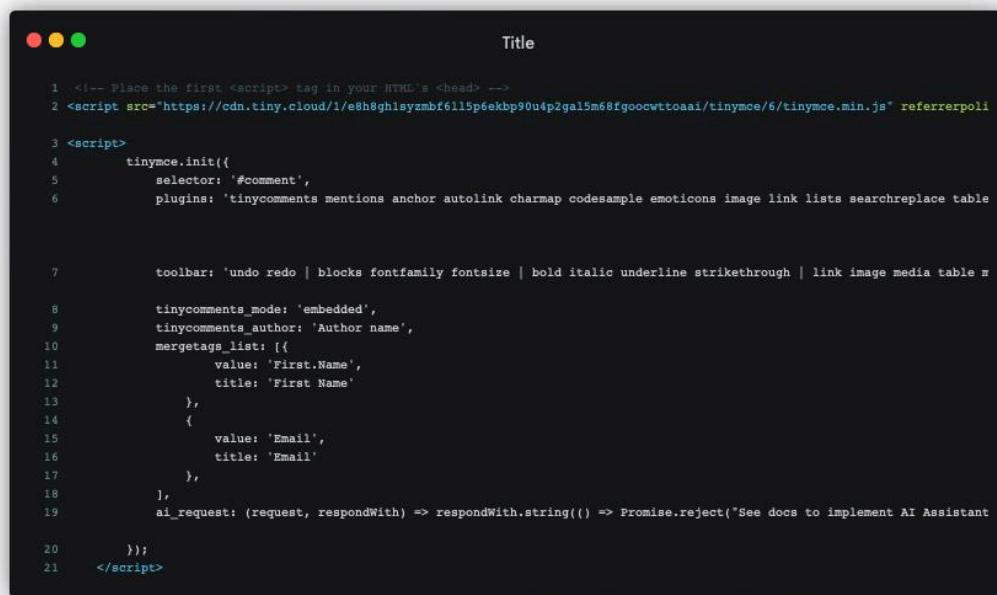
```
1 crontab -e
2 0 0 * * * /opt/Homebrew/bin/php /usr/local/bin/IntegratedLearnivere/reminder.php
```

Figure 20: Crontab command in terminal



Sprint 2:

In our second sprint, while building the community section and the notes feature. For both, we used the TinyMCE Text Editor API, which lets users create posts and notes. Integrating this API:



```
1 <!-- Place the first <script> tag in your HTML's <head> -->
2 <script src="https://cdn.tiny.cloud/1/e8h8ghlsyzmbf6115p6ekbp90u4p2gal5m68fgocewttoaai/tinymce/6/tinymce.min.js" referrerpolicy="no-referrer">
3 <script>
4     tinymce.init({
5         selector: '#comment',
6         plugins: 'tinycomments mentions anchor autolink charmap codesample emoticons image link lists searchreplace table'
7
8         toolbar: 'undo redo | blocks fontfamily fontsize | bold italic underline strikethrough | link image media table '
9
10        tinycomments_mode: 'embedded',
11        tinycomments_author: 'Author name',
12        mergertags_list: [
13            {
14                value: 'First.Name',
15                title: 'First Name'
16            },
17            {
18                value: 'Email',
19                title: 'Email'
19            },
20        ],
21        ai_request: (request, respondWith) => respondWith.string() => Promise.reject("See docs to implement AI Assistant")
22    });
21 </script>
```

Figure 21:TinyMCE API Connection

While connecting to the TinyMCE API was straightforward, we encountered challenges within the notes feature. Specifically, saving the content of notes with their formatting and creating organized note folders proved to be complex tasks:



```
● ● ●

$('#addNoteForm').submit(function(e) {
    e.preventDefault();
    if ($('#title').val() === '' || tinymce.get('mytextarea').getContent() === '') {
        alert('Please fill in all fields');
        return;
    }
    $.ajax({
        url: "addNote.php",
        method: "POST",
        data: {
            title: $('#title').val(),
            content: tinymce.get('mytextarea').getContent(),
            folder: '<?php echo $_GET['folder']; ?>',
        },
        success: function(res) {
            const data = JSON.parse(res);
            const noteId = data.noteId;
            alert('Note added successfully');
            window.location.href = `notes.php?folder=<?php echo $_GET['folder']; ?>&noteId=${noteId}&mode=view`;
        }
    });
});
```

Figure 22: Add Note JS Function



```
<?php
session_start();

$manager = new MongoDB\Driver\Manager(
    "mongodb+srv://learniversewebsite:032AZJHFD1QQWsPA@cluster0.biql1cd.mongodb.net/"
);

$query = new MongoDB\Driver\Query(['email' => $_SESSION['email']]);
$cursor = $manager->executeQuery('Learniverse.users', $query);
$result_array = $cursor->toArray();
$userData = json_decode(json_encode($result_array[0]), true);

$foldersObject = $userData['folders'];

$title = $_POST['title'];
$content = $_POST['content'];
$folder = empty($_POST['folder']) ? 'Notes' : $_POST['folder'];
$userEmail = $_SESSION['email'];
$date = date('Y-m-d H:i:s');

if (!isset($foldersObject[$folder])) {
    $foldersObject[$folder] = ['notes' => []];
}

$newNote = [
    'title' => $title,
    'content' => $content,
    'date' => $date,
    'folder' => $folder,
    'userEmail' => $userEmail,
    'id' => uniqid()
];

$foldersObject[$folder]['notes'][] = $newNote;

$bulk = new MongoDB\Driver\BulkWrite;

$bulk->update(
    ['email' => $_SESSION['email']],
    ['$addToSet' => ['folders.' . $folder . '.notes' => $newNote]],
    ['multi' => false, 'upsert' => false]
);

$result = $manager->executeBulkWrite('Learniverse.users', $bulk);

if ($result->getModifiedCount() > 0) {
    $response = array(
        'success' => true,
        'message' => 'Note added successfully',
        'noteId' => $newNote['id']
    );
    echo json_encode($response);
    exit();
} else {
    echo json_encode(['success' => false, 'message' => 'Failed to add note']);
}

?>
```

Figure 23: Add Note php Code



Sprint 3:

Implementing sprint 3 was more challenging than any other sprint having to create generative content using openAI, constrained by API key limitations and a restricted token allowance, and connecting all features to the users files page to make it easier and improve our user experience. But the biggest challenge was prompt engineering which took us multiple tries to ensure that we get the correct data in the correct format:

```
1 [
2   {"role": "system", "content": "You are a summarizer designed to output JSON with all the summary written "
3     "inside this key (summary) and never return an empty response."},
4   {"role": "user", "content": text}
5 ]
```

Figure 24:Summarization prompt

During the implementation of the Shared Space feature, several issues arose that required attention and resolution. One of the challenging aspects was ensuring the smooth integration of various functionalities within the feature. Coordinating the creation of shared spaces, invitation management, chat functionality, file sharing, and task management required careful consideration.

One significant challenge was implementing access control and permission settings. It was crucial to differentiate between learners who created the shared space (admins) and those who joined as members. Admins needed additional functionalities such as managing membership, deleting files, and deleting the space itself. Figure 25 illustrates an example of one admin-specific functionality, which is the member join notification.



Shared Space Admin Notification Snippet

```
1  <!-- Tab links -->
2 <div class="tabs">
3   <button class="tablinks" onclick="openTab(event, 'Feed')"><i class="fa-solid fa-comments" title="chat"></i></button>
4   <button class="tablinks" onclick="openTab(event, 'Tasks')"><i class="fa-solid fa-list-check" title="tasks"></i></button>
5   <button class="tablinks" onclick="openTab(event, 'Files')"><i class="fa-solid fa-file" title="files"></i></button>
6   <button class="tablinks" onclick="openTab(event, 'Meeting-room')"><i class="fa-solid fa-chalkboard-user" title="meeting room"></i>
7   </button>
8   <button class="tablinks" onclick="openTab(event, 'Members')"><i class="fa-solid fa-user-large" title="members"></i>
9     <?php if ($space->admin === $_SESSION['email'] && ($pmemberCount) > 0) echo "<span class='pendingNotif'></span>"; ?>
10  </button>
11 </div>
```

Figure 25: Shared Space Admin-Specific functionality (line 8)

Furthermore, managing file uploads and ensuring the security and integrity of shared files presented its own set of challenges. Implementing file storage, access controls, and synchronization across multiple users required careful planning and thorough testing. Saving a file from the shared space to the user's own files (My Files page) required duplicating the file as implemented in Figure 26.



Shared Space File Saving Method Snippet

```
1 function saveToMyFiles(fileID, fileName) {
2   // Send AJAX request to the server
3   $.ajax({
4     url: 'duplicate_file.php',
5     type: 'POST',
6     data: {
7       fileID: fileID,
8       fileName: fileName
9     },
10    success: function(response) {
11      var response = JSON.parse(response);
12      if (response.status === "success") {
13        // File duplicated successfully
14        Swal.fire("Success!", response.message, "success").then(() => {});
15      } else {
16        // Failed to duplicate file
17        Swal.fire("Error!", response.message, "error");
18      }
19    },
20    error: function() {
21      Swal.fire("Error!", "Failed to duplicate the file.", "error");
22    }
23  });
24}
```

Figure 26: File Saving Method in the Shared Space



Sprint 4:

The key to implementing the study plan feature was to connect the generated plans to the user's calendar while allowing the user to regenerate them when needed to support flexibility

The screenshot shows a code editor window with a dark theme. At the top, there are three colored circular icons (red, yellow, green) followed by the word "Title". The main area contains the following PHP code:

```
1 if ($result) {
2     $plan_data = json_decode($result->choices[0]->message->content, true);
3     $jsonData = $plan_data['study_plan'];
4     $studyObjects = [];
5     $studyPlanEvent = new MongoDB\Driver\BulkWrite;
6
7     foreach ($jsonData as $study) {
8         $studyObject = new stdClass();
9         $studyObject->startDate = $study['date'];
10        $studyObject->endDate = date('Y-m-d', strtotime($study['date'] . ' + 1 day'));
11        $studyObject->title = $study['title'];
12        $studyObject->description = $study['description'];
13
14        $studyObjects[] = $studyObject;
15    }
16
17    $color = sprintf('#%06X', mt_rand(0, 0xFFFFFF)); //generate random study plan color
18    $updateStudyPlan = new MongoDB\Driver\BulkWrite;
19    $filter = ['planID' => $planID];
20    $updateStudyPlan->update(
21        $filter,
22        ['$set' => [
23            'study_plan' => $studyObjects, 'color' => $color, 'saved' => false
24        ]]
25    );
26}
```

Figure 27: Write the openAI results to the calendar events



The primary implementation for the meeting room feature involved creating virtual meeting rooms for both private spaces and public use in Figure 28.

```
● ● ● Create Room

1 $api_key = "secret_Key";
2   $ch = curl_init();
3   curl_setopt($ch, CURLOPT_URL, 'https://api.whereby.dev/v1/meetings');
4   curl_setopt($ch, CURLOPT_RETURNTRANSFER, 1);
5   curl_setopt($ch, CURLOPT_POST, 1);
6   curl_setopt(
7     $ch,
8     CURLOPT_POSTFIELDS,
9     [
10    "endDate": "2099-02-18T14:23:00+03:00",
11    "roomMode": "group",
12    "fields": ["hostRoomUrl"]
13  ]);
14
15 $headers = [
16   'Authorization: Bearer ' . $api_key,
17   'Content-Type: application/json'
18 ];
19
20 curl_setopt($ch, CURLOPT_HTTPHEADER, $headers);
21 $response = curl_exec($ch);
22 $httpcode = curl_getinfo($ch, CURLINFO_HTTP_CODE);
23
24 curl_close($ch);
25 if ($httpcode !== 201) {
26   $error = [
27     "message" => "error",
28     "error" => [
29       "code" => $httpcode
30     ]
31   ];
32   echo json_encode($error);
33 } else {
34   $dataURL = json_decode($response);
35   $roomUrl = $dataURL->{'roomUrl'};
36   $hostURL = $dataURL->{'hostRoomUrl'};
37
38   $roomData = [
39     "message" => "success",
40     "roomUrl" => $roomUrl,
41     "hostRoomUrl" => $hostURL
42   ];
43   echo json_encode($roomData);
44 }
45
46
```

Figure 28: Create Meeting room



Sprint 5:

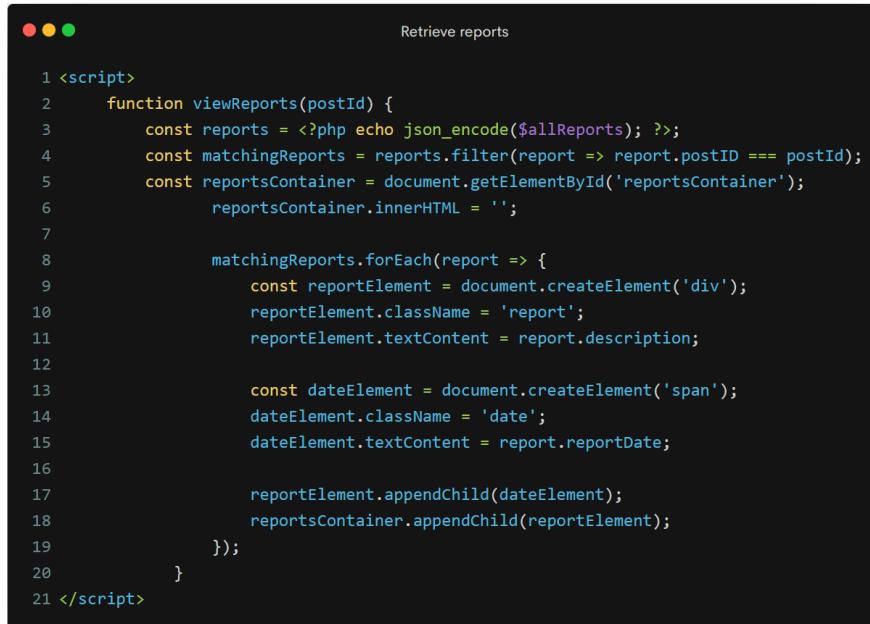
The key to implementing the dashboard overview feature was to connect the chart from 'charts.mongodb' to the page and ensure that it's updated regularly to provide accurate information in Figure 29.



```
1 <div id="Dashboard" class="tabcontent">
2   <iframe style="background: #FFFFFF; border: none; border-radius: 2px; box-shadow: 0 2px 10px 0 rgba(70, 76, 79, .2); width="680" height="440" src="https://charts.mongodb.com/charts-project-0-zztmo/embed/charts? id=662eb7bb-b67a-489a-8917-55d2db819e9f&maxDataAge=60&theme=light&autoRefresh=true"></iframe>
3   <iframe style="background: #FFFFFF; border: none; border-radius: 2px; box-shadow: 0 2px 10px 0 rgba(70, 76, 79, .2); width="680" height="440" src="https://charts.mongodb.com/charts-project-0-zztmo/embed/charts? id=663c920c-50e1-4911-876f-91b0ef0fec97&maxDataAge=60&theme=light&autoRefresh=true"></iframe>
4   <iframe style="background: #FFFFFF; border: none; border-radius: 2px; box-shadow: 0 2px 10px 0 rgba(70, 76, 79, .2); width="680" height="440" src="https://charts.mongodb.com/charts-project-0-zztmo/embed/charts? id=66407a86-8094-4fae-8d96-4fed98930e00&maxDataAge=60&theme=light&autoRefresh=true"></iframe>
5   <iframe style="background: #FFFFFF; border: none; border-radius: 2px; box-shadow: 0 2px 10px 0 rgba(70, 76, 79, .2); width="680" height="440" src="https://charts.mongodb.com/charts-project-0-zztmo/embed/charts? id=664784e8-e471-4d12-8f92-7428a348bf99&maxDataAge=60&theme=light&autoRefresh=true"></iframe>
6 </div>
```

Figure 29: Dashboard Charts

Another important aspect of implementing the post reports feature is how to retrieve the reports according to the posts in Figure 30.



```
1 <script>
2   function viewReports(postId) {
3     const reports = <?php echo json_encode($allReports); ?>;
4     const matchingReports = reports.filter(report => report.postID === postId);
5     const reportsContainer = document.getElementById('reportsContainer');
6     reportsContainer.innerHTML = '';
7
8     matchingReports.forEach(report => {
9       const reportElement = document.createElement('div');
10      reportElement.className = 'report';
11      reportElement.textContent = report.description;
12
13      const dateElement = document.createElement('span');
14      dateElement.className = 'date';
15      dateElement.textContent = report.reportDate;
16
17      reportElement.appendChild(dateElement);
18      reportsContainer.appendChild(reportElement);
19    });
20  }
21 </script>
```

Figure 30: Retrieve reports



5. System Evaluation

In this section, we present the comprehensive evaluation of Learniverse, focusing on two critical components: User Acceptance Testing (UAT) and Non-Functional Requirements (NFR) assessment. These evaluations are essential to ensure the system meets both the functional and non-functional expectations of stakeholders. They provide a holistic view of the system's readiness for deployment, highlighting strengths and identifying areas for improvement to ensure a successful implementation.

5.1. User Acceptance Testing (UAT)

User Acceptance Testing (UAT) is crucial as it ensures that the software meets user expectations, identifies potential issues before deployment, and validates the system's readiness for production. It helps enhance user satisfaction, reduces post-release defects, and increases overall software quality. It involves rigorous testing by the users to identify any discrepancies, ensuring that all features work correctly and the system is user-friendly and efficient.

In this section, we will discuss the results of the UAT conducted with real users of Learniverse. We will first identify the demographics of participants, then we will analyze the results gathered from the questionnaire that concluded the testing.

5.1.1. Demographics of Participants

The 22 participants primarily consisted of undergraduate students, who made up 45.5% of the total. High school students accounted for 27.3%, while postgraduate students and lifelong learners each represented 13.6% of the respondents. This diverse demographic distribution indicates that Learniverse is attracting a wide range of users across different educational stages. Figure 31 illustrates the participants' demographics.

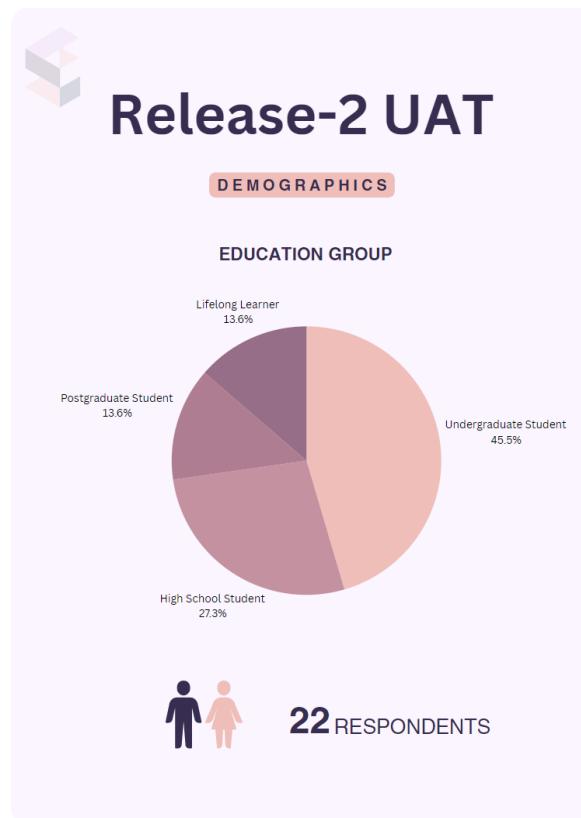


Figure 31: UAT participants demographics

5.1.2. Questionnaire Results

We have conducted a detailed analysis of the feedback received from the UAT forms, recorded in Appendix C, for the Learniverse website. Next, we will first discuss this analysis, categorizing the feedback according to each feature. Finally, we will discuss in general users feedback and satisfaction.

- Calendar

The calendar feature received highly positive feedback, with 72.7% of respondents rating it 5 out of 5 as easy to navigate and use, while the rest rated it a 4 out of 5. Additionally, 95.5% of users reported no difficulties in adding events and setting reminders, and the same percentage found that the events were displayed accurately and clearly. This indicates that the calendar feature is both user-friendly and reliable.

- To-Do List

Regarding the to-do list, 100% of users were able to add, edit, and delete tasks without any issues. The feature also provided clear deadlines, allowing users to track their



progress effectively. This high level of functionality suggests that the to-do list is a well-designed tool for managing tasks.

- **File Upload and Access**

While 95.5% of users could upload files without any issues, 4.5% experienced occasional difficulties, particularly with larger files. However, once uploaded, 95.5% of users found it easy to locate and access their files. This indicates that while the file upload process is generally efficient, there is room for improvement in handling larger files.

- **Flashcards**

The experience with generating flashcards from files was mixed; 90.9% of users successfully used this feature, while 95.5% found the manual creation process clearer. Overall, 86.3% of users felt that the process of creating or generating flashcards was clear, suggesting that while the functionality is appreciated, the user interface could be improved for generating flashcards from files.

- **Summaries**

Users responded very positively to the summary generation feature, with all respondents finding it easy to generate summaries. Additionally, 68.2% reported that the summaries were 5 out of 5 accurate and reliable while the rest deemed it a 4 out of 5, and all respondents considered this feature useful for condensing information. This feedback highlights the effectiveness and utility of the summarization tool.

- **Study Plans**

The study plan feature also received high marks, with all users able to generate study plans based on their uploaded files. Furthermore, 90.8% found the study planner effective in helping them organize their study sessions, indicating that this tool is both practical and beneficial for users.

- **Note-Taking**

In terms of note-taking, all users were able to create, edit, and delete notes effectively, with 100% satisfaction with the provided formatting options. Additionally, one comment we received during the testing session was to enhance the interface, especially how the buttons looked, to improve usability.

- **Pomodoro**

The Pomodoro timer was well-received, with all users finding it tracked intervals accurately and allowed for customization of work and break durations. Moreover, all of



them found this feature helpful for managing their study or work sessions, underscoring its effectiveness in promoting productivity.

- **GPA Calculator**

The GPA calculator functioned effectively for 95.5% of users, who reported being able to input grades and calculate their GPA accurately with clear instructions. Additionally, all users were able to track their GPA over multiple semesters, suggesting that the calculator is a reliable tool for academic tracking.

- **Collaboration (Shared Space, Meeting Room, Community)**

The shared spaces feature was found useful for collaboration by 95.5% of users, and the same percentage had a positive experience using the meeting room for online meetings. Furthermore, all users found it easy to post new questions, start discussions, and share knowledge within the community, highlighting the collaborative and interactive nature of these features. Users were also able to flag any inappropriate post they encountered.

User Suggestions and Feedback

Users provided valuable and constructive suggestions, including integrating tasks from shared space calendars into personal calendars and adding progress indicators for file uploads and lengthy processes. They also recommended allowing users to input their current GPA instead of calculating it from scratch. Additionally, users expressed interest in Pomodoro statistics for motivation, a paid tutoring option for academic support, and additional features for lifelong learners.

Overall Satisfaction

Overall, 95.3% of users rated their satisfaction highly, and 100% indicated they would recommend Learniverse to others. This high level of satisfaction and advocacy demonstrates the high value users place on Learniverse.

Conclusion

The feedback for Learniverse is predominantly positive, with users expressing high satisfaction across various features. Areas for improvement include enhancing the flashcard generation process, adding progress indicators, and incorporating user suggestions such as better integration of shared and personal calendars and providing



more support for lifelong learners. The positive feedback and high satisfaction ratings suggest that Learniverse is a successful and appreciated tool among its users.

Admin analysis result

Based on the feedback from the admin testing form, recorded in Appendix C, we have conducted a thorough analysis of the Learniverse website's admin section. The analysis indicates that the system is generally functioning well for admins.

All respondents agreed that they were able to use the website, and it was helpful for them in 5 out of 6 aspects, including the ability to access the dashboard, view customer complaints, contact customers, and mark issues as resolved. This is a positive indication that the admin users can effectively utilize the key features of the website administration. The only potential issue identified was that 20% of users reported difficulty accessing the customer complaints section. We have followed up with the users to understand the reason for this difficulty, and it was found to be a mistake in choosing the answer.

Overall, the analysis indicates that the Learniverse website's admin section is functioning well, with admins able to effectively utilize the majority of the features.

5.2. Quality Attributes (NFR testing)

The following table 4 presents the results of Non-Functional Requirements (NFR) testing, where we assessed critical aspects such as learnability, availability, and performance. This testing is essential as it ensures that the software not only meets functional requirements but also delivers a high level of quality, performance, and user satisfaction.

Table 4: NFR Testing Results

User story	Quality Attribute	Measure	Results
As a user, I want to understand the whole interface in less than 1 minute	Learnability: How quickly can a new user understand and navigate the main interface?	Compute the time it takes the user to understand the interface and guess the main functions of the page.	- Test scenario: 7 offline users were tasked to give a brief description on the page main features after taking a quick look. - Completion: 7 out of 7 users completed the



			test.- Time results: Minimum time: 4 seconds, Maximum time: 30 seconds, Average time: 7 seconds.
As a user, I want the website to be available 99% of the time I'm trying to access it so that I can study and be productive any time of the day	Availability: How often is the website accessible during the testing period?	Measure the percentage of time the website is accessible during the testing period.	- Test period: 5 Days of intermittent checks by the team.- Availability result: 98% availability logged.- Issues: Some downtime due to server restarts and updates and code change.
As a user, I want the website main pages to display within at most 10 seconds, so that I can use the website as quickly as possible.	Performance: How quickly do the main pages of the website load?	Track the load time of the main pages under normal conditions. Target is under 10 seconds.	- Test conditions: Pages were accessed at different times of the day.- Load times: Minimum: less than 1 seconds, Maximum: 5 seconds, Average: 2 seconds.- Notes: Longer times were typically after server and code updates.

5.3. Discussion

In this section, we will discuss the results presented earlier in section 5 by providing interpretation, reflections, evaluation of both test results, and finally our suggested recommendations for improvement.

5.3.1 Interpretation of Results

The results from the User Acceptance Testing (UAT) and Non-Functional Requirements (NFR) testing for the Learniverse website present a comprehensive view of its functionality and user satisfaction. The positive feedback across various features underscores the success of the design and development processes, while also highlighting areas for potential enhancement.



5.3.2 Reflections on the Process, Design, and Development

Process: The thorough testing process, involving both UAT and NFR, provided a detailed understanding of the user experience and the system's technical performance. The involvement of a diverse group of users ensured a comprehensive evaluation, capturing a wide range of feedback and issues.

Design: The design of Learniverse prioritizes user-friendliness and functionality. Features such as the summarization, to-do list, and study plans received high marks for ease of use and effectiveness. This indicates that the design successfully meets user needs and expectations. However, some areas, like the flashcard generation interface, indicate room for improvement in user experience design.

Development: The development team succeeded in creating a reliable and efficient platform. The high satisfaction rates for most features reflect the robust coding and development practices. Issues such as occasional difficulties with larger file uploads and minor UI enhancements for flashcards suggest that further refinement and optimization are needed.

5.3.3 Evaluation of UAT Results

The system evaluation revealed generally positive feedback across most features, with specific areas highlighted for improvement. The evaluations covered user interface effectiveness, functionality, and integration capabilities, providing a comprehensive view of the system's performance.

High User Satisfaction and Productivity: Features such as the To-Do List, Note-Taking, and Calendar demonstrated high user satisfaction due to their intuitive design and ease of use. Users found these features straightforward and clear, which significantly aided in productivity and engagement. The Calendar and To-Do List, in particular, were noted for their efficient task management and navigation, while the Note-Taking feature was praised for its flexible formatting options.

Effective Functionality with Scope for Enhancement: The File Upload, Pomodoro Feature, and Study Plans showed strong performance in their respective areas. Users



experienced high success rates with file uploads due to efficient backend processing and clear pathways. The Pomodoro Feature received positive feedback for interval tracking and customization, aiding in effective time management. Study Plans were effective in organizing study sessions. Improvements such as optimizing file handling for larger files, adding statistical tracking to the Pomodoro Feature, and integrating Study Plans with other educational tools can further enhance their utility.

Mixed Results Requiring Specific Improvements: The Flashcards feature had mixed results; manual creation was successful, but generating flashcards from files encountered issues. The manual process was straightforward, indicating that the core functionality is solid, but the automated generation process needs user interface improvements. Enhancing this aspect would provide a more seamless user experience.

Unique and Well-Received Features: The Summarization and GPA Calculator features stood out for their unique functionalities. The Summarization feature received universally positive feedback for its accuracy and ease, driven by effective algorithms. Continuous refinement of these algorithms is suggested to maintain high user satisfaction. The GPA Calculator was noted for its reliability and accuracy, supported by clear instructions and effective calculation logic. Allowing users to input their current GPA for personalized tracking would make this feature even more beneficial.

Collaboration Features: These features were effective for posting, discussions, and knowledge sharing, supported by an intuitive interface and useful collaborative tools. To enhance coordination, integrating shared space tasks with personal calendars is recommended.

Overall, the system evaluation highlights a high level of user satisfaction with most features, indicating that Learniverse is effective and user-friendly. Targeted improvements will further enhance functionality and user experience, ensuring the system meets and exceeds user expectations.



5.3.4 Evaluation of NFR Results

The Non-Functional Requirements (NFR) evaluation highlighted several strengths of the system, alongside areas for improvement to ensure continued high performance and user satisfaction. The focus areas included learnability, availability, and performance.

Learnability: The system exhibited high learnability, with users quickly comprehending the interface. This success is attributed to the clear and intuitive design that facilitates fast learning. To maintain this ease of use while introducing new features, it is crucial to preserve the simplicity of the interface. Ensuring that additional functionalities do not complicate the user experience will help sustain this high level of learnability.

Availability: The system achieved 98% availability, slightly below the target, due to minimal downtime primarily caused by necessary updates. While this is a strong performance, further enhancements in server stability and strategies to minimize downtime during updates are recommended. These improvements will help achieve higher availability rates, ensuring the system is accessible to users whenever needed.

Performance: Performance metrics were positive, with fast load times observed under normal conditions. This efficiency is the result of effective coding practices and robust server management. To maintain these fast load times, it is important to continuously monitor performance, especially following updates. This proactive approach will help identify and address any performance issues promptly, ensuring the system remains responsive and efficient.

5.3.5 Recommendations for Improvement:

- Design:** Focus on refining user interfaces, particularly for features like flashcard generation and file uploads. Consider user suggestions for enhanced functionality.
- Implementation:** Optimize backend processes to handle larger files more efficiently and minimize downtime during updates. Implement progress indicators for lengthy operations.



By addressing these areas, Learniverse can enhance its user experience, increase reliability, and continue to be a valuable tool for its users.



6. Conclusions and Future Work

In our comprehensive report, we have outlined the creation of Learniverse, an innovative educational platform. Starting with the core problem of fragmented learning tools, we showcased how Learniverse provides an integrated solution. The report covers the product vision, roadmap, and objectives, emphasizing our commitment to enhancing academic experiences. We detailed the technical scope, the hardware and software tools used, and the collaborative efforts of our diverse team.

Key sections included a thorough market analysis, system requirements, and a deep dive into the system's design and implementation. The report also focused on extensive system testing, ensuring Learniverse's effectiveness and user-centric design.

Now, in this conclusion and future directions section, we summarize Learniverse's global and local impacts, address the challenges encountered, and highlight our key achievements. We will also discuss the future plans of Learniverse, emphasizing its potential and areas for growth.

6.1 Global and local impact

6.1.1 Global Impact

Learniverse, as a comprehensive educational platform, stands at the confluence of a global digital revolution in learning. It redefines accessibility to educational resources, democratizing the learning experience for students worldwide. By integrating AI-driven study tools such as flashcards, quizzes, and summarization features, Learniverse not only simplifies the learning process but also makes it more engaging and effective. Its global impact is significant in standardizing the quality of study aids available to learners regardless of their geographic location, bridging educational disparities and fostering a culture of self-paced and personalized education.

6.1.2 Local Impact

On a local scale, Learniverse has the potential to transform the educational landscape of Saudi Arabia. Catering to the Kingdom's Vision 2030, which emphasizes the role of digital transformation in education, Learniverse aligns with national goals by providing a



platform that supports local educational frameworks. It offers Saudi students tools that are culturally and contextually relevant, potentially increasing academic success and creating a generation of well-equipped learners ready to contribute to the nation's knowledge economy.

6.2 Problems and challenges encountered during the software development

During the development of Learniverse, we encountered several technical and logistical challenges that necessitated strategic adjustments and innovations. One significant issue was the integration of Python code with PHP for server-side operations, which required substantial code modifications. Additionally, we faced challenges with OpenAI API integration, particularly managing the prompt engineering and the constraints imposed by token limits, which consumed considerable time and resources. We also had to pivot from using the Zoom API due to compatibility issues, opting instead for a different API that aligned better with our system architecture. Another considerable challenge was completing the shared space feature within a single sprint, given its extensive functionalities. These experiences not only tested our adaptability but also enhanced our team's problem-solving skills and contributed to the project's growth.

6.2.1 Meeting room challenges

Integrating virtual meeting capabilities into our web application presented a complex and multi-faceted challenge. Many of the major video conferencing platforms, such as Zoom, Google Meet, and Microsoft Teams, have limitations in their API offerings and documentation that make it difficult to seamlessly incorporate their features into a custom web-based solution. For example, the Zoom API and Microsoft Teams lack clear documentation, while Google Meet doesn't offer an API for meeting rooms. Additionally, the overly or lack of technical documentation from the providers makes it challenging for developers to properly understand and implement the integration. These limitations required a significant amount of time and effort to overcome.



6.3 Limitations of the system

One of the primary limitations of Learniverse is its language support; the platform currently operates exclusively in English, which could restrict access for non-English-speaking users. Another significant limitation is scalability; as the user base grows, the system will require further development to maintain performance and ensure a seamless user experience. Additionally, Learniverse is only available as a website and not as a mobile application, limiting accessibility for users who prefer mobile apps for their educational needs. Furthermore, the OpenAI API key, utilized by Learniverse for various functionalities, has limited tokens available for normal users as opposed to organizations, which can affect the size or content that can be uploaded to the platform. These limitations highlight critical areas for ongoing development and improvement, ensuring that Learniverse continues to evolve as a comprehensive educational resource.

6.4 The main contribution of the project

Learniverse's primary contribution to the educational field is its integration of AI-driven tools, such as flashcards and quiz generators, into a single web-based platform. This innovation streamlines the learning process by automating the creation of personalized study aids from user-uploaded materials. Alongside these AI features, Learniverse offers a comprehensive suite of tools including a calendar, note-taking functions, a GPA calculator, and a public community forum. This consolidation addresses the fragmented nature of online learning resources, enhancing academic productivity and fostering a collaborative learning environment. In essence, Learniverse revolutionizes digital education by making advanced learning tools easily accessible to students.

6.5 Future work

Based on the testing results and observations, future enhancements for the Learniverse platform should focus on expanding language support to accommodate a broader user base, thereby increasing accessibility and inclusiveness. Enhancing scalability is crucial to handle an increasing number of users without sacrificing performance. The introduction of a mobile application would significantly boost accessibility, enabling



users to engage with the platform on-the-go. Additionally, refining the integration of OpenAI's API to manage token limitations effectively will ensure more consistent functionality, particularly for features dependent on external data and AI-driven processes. Improvements should also include a user interface redesign to enhance usability and aesthetic appeal, making the platform more intuitive and engaging for all users. These targeted improvements will ensure that Learniverse not only meets current user needs but also adapts to future demands and technological advancements.



7. Acknowledgements

We are immensely grateful to Dr. Rehab, our project supervisor. Her continuous support and encouragement were crucial throughout the development of this project. Dr. Rehab's initial proposal and consistent guidance helped shape the project from its conception through to its final stages, ensuring we remained on track and focused on our objectives.

We also wish to thank Dr. Duaa Alsaeed for her invaluable contributions to the project. Although Dr. Alsaeed joined our team later in the process, her insights and suggestions were pivotal in refining our strategies and approaches. Her expertise greatly enhanced the quality and depth of our project.

Our team's dedication and hard work have been central to the success of this project. Each team member has shown remarkable commitment and resilience, facing numerous challenges head-on and working collaboratively to overcome them. This project would not have reached its fruition without the collective effort and persistence of our team.

Lastly, we acknowledge the examiners for their thorough evaluations and insightful feedback at each stage of our project assessments. Their expertise and constructive criticisms were crucial for the continuous improvement of our project, pushing us to refine our work and deepen our knowledge. Their guidance was instrumental in shaping our project into a comprehensive educational platform.

These contributions have all been vital to the development and success of our project, and we extend our sincere thanks to everyone involved.



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9. Appendix

9.1 Appendix A: Interviews' Transcriptions

Interview 1: Aisha, High School Student

Q1: Can you walk me through your typical study process?

Aisha: I usually start by going through my class notes, then I read the textbook and highlight important points. After that, I sometimes use and create flashcards manually to memorize definitions.

Q2: What digital tools or platforms do you currently use for studying?

Aisha: Mostly Quizlet for flashcards and sometimes I watch YouTube videos if I don't understand something.

Q3: Are there any challenges you face with your current study methods or tools?

Aisha: Yes, sometimes it's hard to find good videos or resources for specific topics. Also, I get distracted easily.

Q4: What features or tools would make your study process more effective or enjoyable?

Aisha: Maybe some interactive quizzes or games. And a tool to summarize long textbook chapters would be great.

Q5: How do you currently manage your study schedules and deadlines?

Aisha: I have a paper planner where I write down all my assignments and tests.

Q6: How do you feel about collaborative study methods? Do you have experience with any platforms?

Aisha: I sometimes study with friends on Zoom. It's fun, but we end up talking more than studying.

Q7: Are there any specific functionalities you'd wish to see in a new study platform?

Aisha: A reminder system for upcoming tests and assignments. Also, a space to discuss and ask questions about the material with other students.

Q8: How comfortable are you with adopting new digital tools or platforms for studying?

Aisha: I'm open to trying new tools if they're user-friendly and help me study better.



Interview 2: Bader, Undergraduate Student

Q1: Can you walk me through your typical study process?

Bader: I usually rewatch the lecture recordings, make notes, and then do practice problems.

Q2: What digital tools or platforms do you currently use for studying?

Bader: Google Docs for notes, Microsoft Teams for group projects, and sometimes Khan Academy.

Q3: Are there any challenges you face with your current study methods or tools?

Bader: Group projects are tough to coordinate, and sometimes the tools aren't very effective.

Q4: What features or tools would make your study process more effective or enjoyable?

Bader: An integrated calendar for all assignments from different courses and a platform that combines note-taking, discussions, and reminders.

Q5: How do you currently manage your study schedules and deadlines?

Bader: I use Google Calendar, but sometimes I forget to add things.

Q6: How do you feel about collaborative study methods? Do you have experience with any platforms?

Bader: Collaborative methods are effective when everyone is on the same page. I've used Google Meet and Slack for group projects.

Q7: Are there any specific functionalities you'd wish to see in a new study platform?

Bader: Integration with other apps and an AI-based tool that can suggest study methods based on my progress.

Q8: How comfortable are you with adopting new digital tools or platforms for studying?

Bader: Quite comfortable. I like exploring new tools that can enhance my productivity.

Interview 3: Noor, Postgraduate Student

Q1: Can you walk me through your typical study process?

Noor: I focus more on research. So, I start by reading a lot of journals, making annotations, then drafting my insights.

Q2: What digital tools or platforms do you currently use for studying?

Noor: Google Scholar for research, and Trello for task management.

Q3: Are there any challenges you face with your current study methods or tools?



Noor: Managing references and citations is often tedious.

Q4: What features or tools would make your study process more effective or enjoyable?

Noor: A collaborative platform where I can discuss research with peers, and an enhanced citation manager.

Q5: How do you currently manage your study schedules and deadlines?

Noor: I use a digital planner and set reminders for everything.

Q6: How do you feel about collaborative study methods? Do you have experience with any platforms?

Noor: Collaboration is essential at this level. I've used platforms like Zoom and Slack for discussions.

Q7: Are there any specific functionalities you'd wish to see in a new study platform?

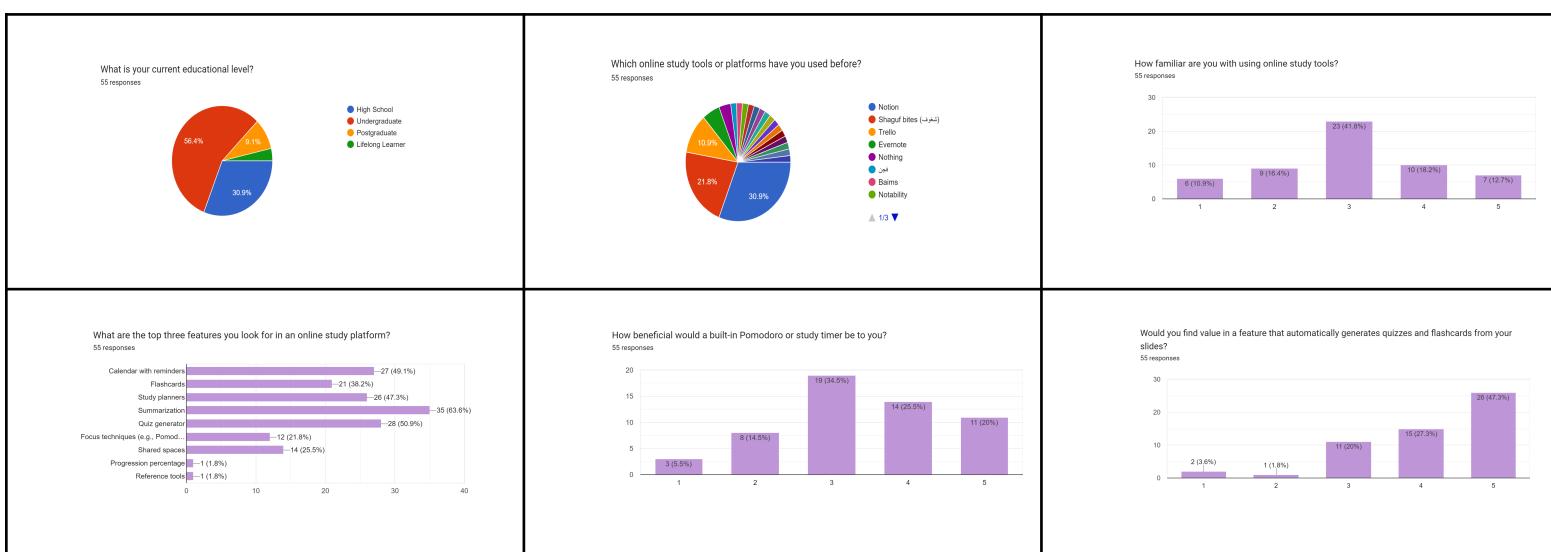
Noor: A space for peer reviews, integrated citation management, and a platform that aligns with academic integrity standards.

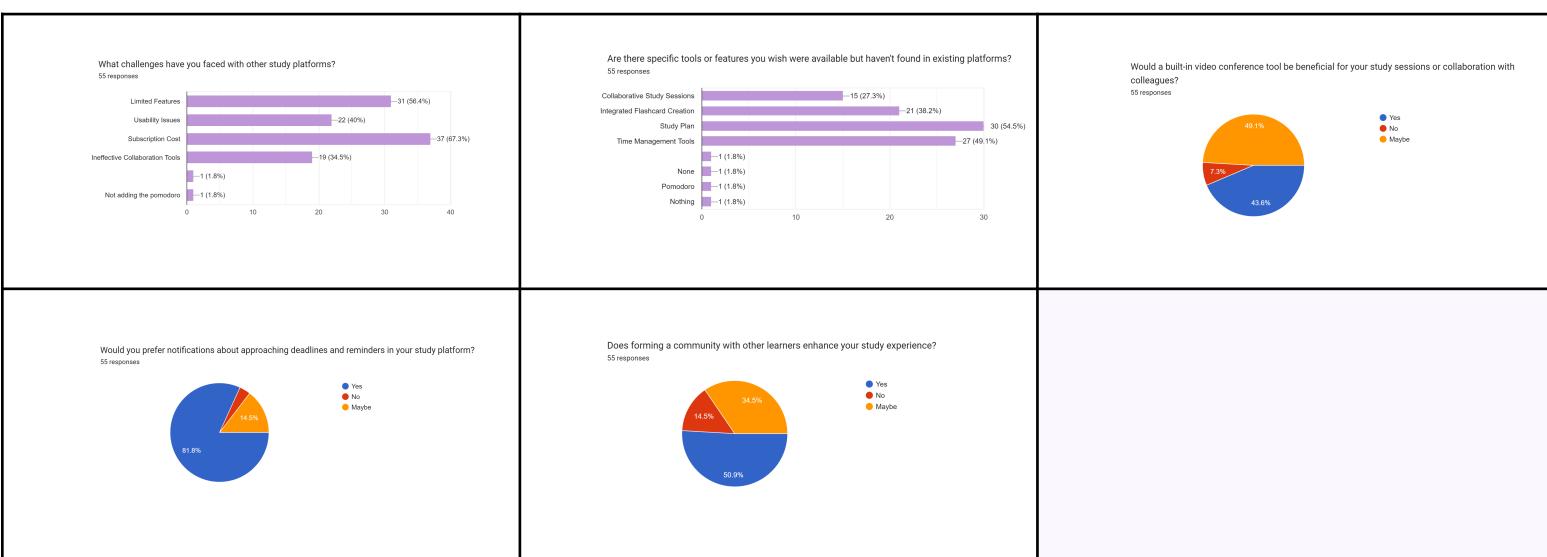
Q8: How comfortable are you with adopting new digital tools or platforms for studying?

Noor: I'm always looking for tools that can make my research process smoother. I'm very open to new platforms.

9.2 Appendix B: Questionnaire Details

Table 5: Questionnaire Details



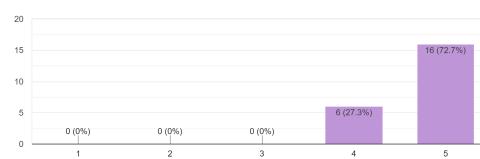


9.3 Appendix C: UAT Questionnaire Details

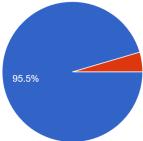
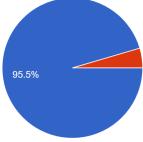
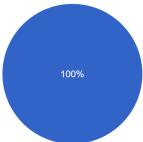
Table 6: UAT Questionnaire Details

Section 1 (User Category)	Question 1 result										
	<p>Which education category do you belong to? 22 responses</p> <table border="1"><thead><tr><th>Category</th><th>Percentage</th></tr></thead><tbody><tr><td>Undergraduates Student</td><td>45.5%</td></tr><tr><td>High School Student</td><td>27.3%</td></tr><tr><td>Postgraduates Student</td><td>13.6%</td></tr><tr><td>Lifelong Learners</td><td>13.6%</td></tr></tbody></table>	Category	Percentage	Undergraduates Student	45.5%	High School Student	27.3%	Postgraduates Student	13.6%	Lifelong Learners	13.6%
Category	Percentage										
Undergraduates Student	45.5%										
High School Student	27.3%										
Postgraduates Student	13.6%										
Lifelong Learners	13.6%										
Section 2 (Calendar Feature)	Question 2 result										

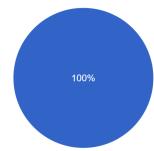
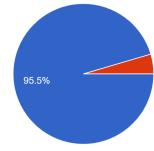
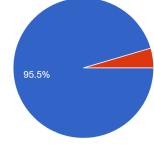
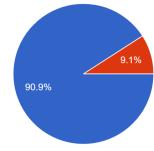
How easy was it to navigate and use the calendar feature?
22 responses

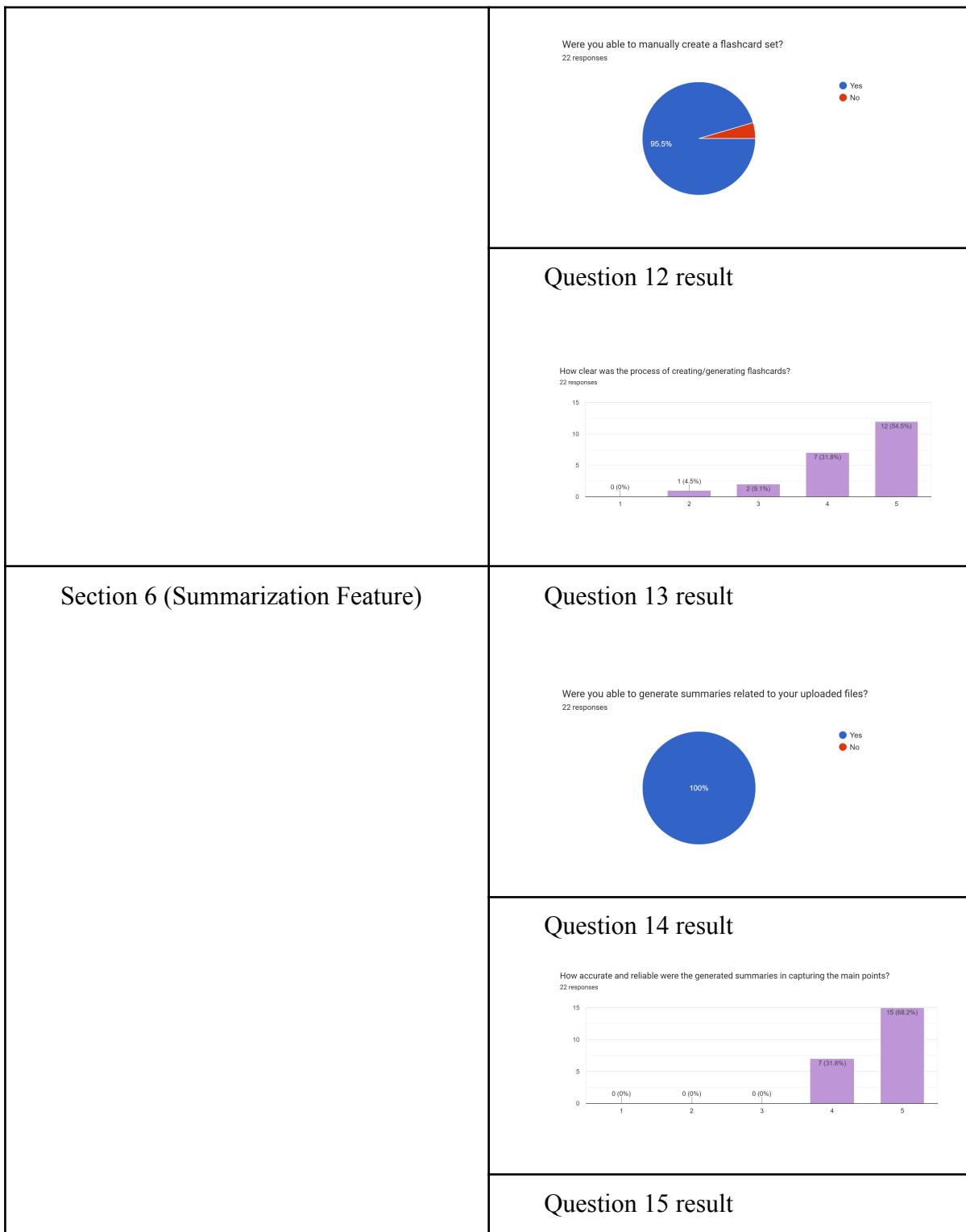




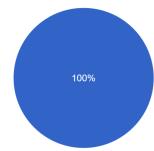
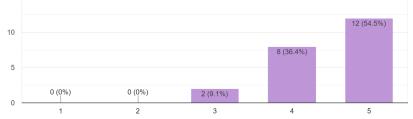
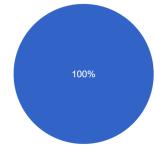
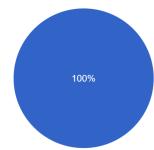
	<h3>Question 3 result</h3> <p>Were you able to add events and set reminders without any difficulties? 22 responses</p>  <table border="1"><thead><tr><th>Response</th><th>Percentage</th></tr></thead><tbody><tr><td>Yes</td><td>95.5%</td></tr><tr><td>No</td><td>4.5%</td></tr></tbody></table>	Response	Percentage	Yes	95.5%	No	4.5%						
Response	Percentage												
Yes	95.5%												
No	4.5%												
	<h3>Question 4 result</h3> <p>Did the calendar display events accurately and clearly? 22 responses</p>  <table border="1"><thead><tr><th>Response</th><th>Percentage</th></tr></thead><tbody><tr><td>Yes</td><td>95.5%</td></tr><tr><td>No</td><td>4.5%</td></tr></tbody></table>	Response	Percentage	Yes	95.5%	No	4.5%						
Response	Percentage												
Yes	95.5%												
No	4.5%												
Section 3 (To-Do Feature)	<h3>Question 5 result</h3> <p>Were you able to add, edit, and delete tasks on the todo list? 22 responses</p>  <table border="1"><thead><tr><th>Response</th><th>Percentage</th></tr></thead><tbody><tr><td>Yes</td><td>100%</td></tr><tr><td>No</td><td>0%</td></tr></tbody></table> <h3>Question 6 result</h3> <p>Did the todo list provide clear deadlines for each task? 22 responses</p>  <table border="1"><thead><tr><th>Response</th><th>Percentage</th></tr></thead><tbody><tr><td>Yes</td><td>100%</td></tr><tr><td>No</td><td>0%</td></tr></tbody></table> <h3>Question 7 result</h3>	Response	Percentage	Yes	100%	No	0%	Response	Percentage	Yes	100%	No	0%
Response	Percentage												
Yes	100%												
No	0%												
Response	Percentage												
Yes	100%												
No	0%												



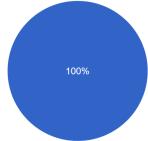
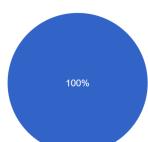
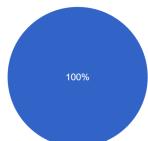
	<p>Were you able to mark tasks as completed and track your progress? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>
Section 4 (My Files Feature)	<p>Question 8 result</p> <p>Were you able to upload files to Learniverse website without any issues? 22 responses</p>  <p>95.5%</p> <p>● Yes ● No</p>
	<p>Question 9 result</p> <p>Were you able to easily find and access the uploaded files? 22 responses</p>  <p>95.5%</p> <p>● Yes ● No</p>
Section 5 (Flashcard Feature)	<p>Question 10 result</p> <p>Were you able to generate flashcards from your own files? 22 responses</p>  <p>90.9%</p> <p>● Yes ● No</p> <p>Question 11 result</p>



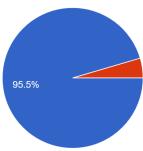
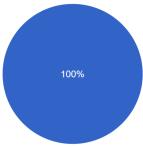
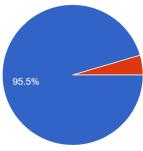
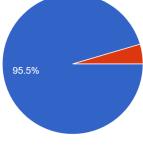
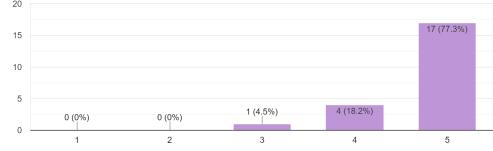


	<p>Did you find the summarization generation feature useful for condensing information? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>												
<p>Section 7 (Study Planner Feature)</p>	<p>Question 16 result</p> <p>Were you able to generate Study Plans based on your uploaded files? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>												
	<p>Question 17 result</p> <p>How effective was the study planner in helping you plan your study sessions? 22 responses</p>  <table border="1"><thead><tr><th>Score</th><th>Percentage</th></tr></thead><tbody><tr><td>1</td><td>0 (0%)</td></tr><tr><td>2</td><td>0 (0%)</td></tr><tr><td>3</td><td>2 (9.1%)</td></tr><tr><td>4</td><td>8 (36.4%)</td></tr><tr><td>5</td><td>12 (54.5%)</td></tr></tbody></table>	Score	Percentage	1	0 (0%)	2	0 (0%)	3	2 (9.1%)	4	8 (36.4%)	5	12 (54.5%)
Score	Percentage												
1	0 (0%)												
2	0 (0%)												
3	2 (9.1%)												
4	8 (36.4%)												
5	12 (54.5%)												
<p>Section 8 (Note Taking Feature)</p>	<p>Question 18 result</p> <p>Were you able to create, edit, and delete notes effectively? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>												
	<p>Question 19 result</p> <p>Did the note-taking feature provide formatting options (e.g., bold, italic, bullet points) for better organization? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>												

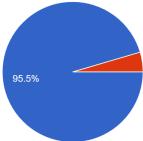
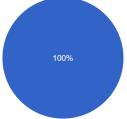
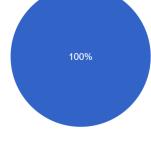
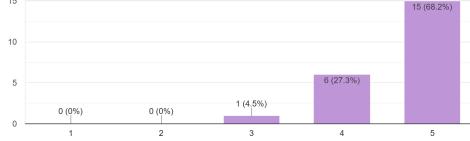
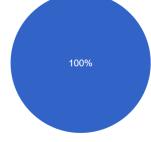


Section 9 (Pomodoro Feature)	<p>Question 20 result</p> <p>Did the timer accurately track the work and break intervals? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>
	<p>Question 21 result</p> <p>Were you able to customize the duration of work and break intervals according to your preferences? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>
	<p>Question 22 result</p> <p>Did you find the Pomodoro feature helpful for managing your study or work sessions? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>
Section 10 (GPA Calculator Feature)	<p>Question 23 result</p> <p>Were you able to input your grades and calculate your GPA accurately? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>
	<p>Question 24 result</p>

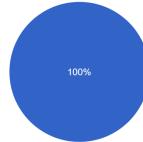
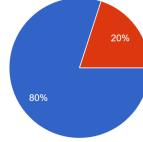


	<p>Did the GPA calculator provide clear instructions on how to input grades and credit hours? 22 responses</p>  <p>● Yes ● No</p> <p>95.5%</p>												
	<p>Question 25 result</p> <p>Were you able to view and track your GPA over multiple semesters? 22 responses</p>  <p>● Yes ● No</p> <p>100%</p>												
Section 11 (Shared Space Feature)	<p>Question 26 result</p> <p>Did you find the shared spaces feature useful for collaborating with others? 22 responses</p>  <p>● Yes ● No</p> <p>95.5%</p>												
	<p>Question 27 result</p> <p>Were you able to chat, share files, assign tasks, and hold mutual events seamlessly? 22 responses</p>  <p>● Yes ● No</p> <p>95.5%</p>												
Section 12 (Meeting Room Feature)	<p>Question 28 result</p> <p>How was your experience using the meeting room feature for online meetings? 22 responses</p>  <table border="1"><thead><tr><th>Experience Level</th><th>Percentage</th></tr></thead><tbody><tr><td>1</td><td>0 (0%)</td></tr><tr><td>2</td><td>0 (0%)</td></tr><tr><td>3</td><td>1 (4.5%)</td></tr><tr><td>4</td><td>4 (18.2%)</td></tr><tr><td>5</td><td>17 (77.3%)</td></tr></tbody></table>	Experience Level	Percentage	1	0 (0%)	2	0 (0%)	3	1 (4.5%)	4	4 (18.2%)	5	17 (77.3%)
Experience Level	Percentage												
1	0 (0%)												
2	0 (0%)												
3	1 (4.5%)												
4	4 (18.2%)												
5	17 (77.3%)												

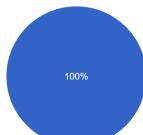
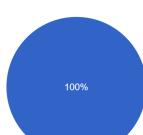
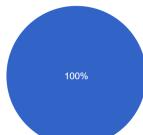
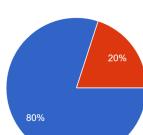


	Question 29 result																			
	<p>Were you able to join meetings easily and interact with other participants? 22 responses</p>  <p>95.5%</p> <p>● Yes ● No</p>																			
Section 13 (Community Feature)	Question 30 result																			
	<p>Did you find it easy to post new questions, start discussions, or share knowledge within the community? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>																			
	Question 31 result																			
	<p>Were you able to report or flag inappropriate or spam content within the community? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>																			
Section 14 (Final Thoughts)	Question 32 result																			
	<p>Considering all the features mentioned above, how satisfied are you with Learniverse website? 22 responses</p>  <table border="1"><thead><tr><th>Satisfaction Level</th><th>Count</th><th>Percentage</th></tr></thead><tbody><tr><td>1</td><td>0</td><td>(0%)</td></tr><tr><td>2</td><td>0</td><td>(0%)</td></tr><tr><td>3</td><td>1</td><td>(4.5%)</td></tr><tr><td>4</td><td>6</td><td>(27.3%)</td></tr><tr><td>5</td><td>15</td><td>(68.2%)</td></tr></tbody></table>	Satisfaction Level	Count	Percentage	1	0	(0%)	2	0	(0%)	3	1	(4.5%)	4	6	(27.3%)	5	15	(68.2%)	
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	Question 33 result																			
	<p>Would you recommend Learniverse website to others? 22 responses</p>  <p>100%</p> <p>● Yes ● No</p>																			



	<h3>Question 34 result</h3> <p>What improvements or additional features would you suggest to enhance Learniverse website's usability and functionality?</p> <p>12 responses</p> <p>I strongly recommend that you apply for a patent. This is awesome work. I never find similar interactive and adding value like this. Congratulations.</p> <p>Please launch the website as soon as possible because it is too beneficial for university students</p> <p>would love to see stats in Pomodoro to motivate me further.</p> <p>I recommend providing the option of a paid tutor to help students with their academic journey.</p>
	<h3>Admin Testing</h3>
<h3>Question 1 result</h3>	<p>When you login with your username and password, does the home page display the dashboard?</p> <p>5 responses</p>  <p>100%</p> <p>● Yes ● No</p>
<h3>Question 2 result</h3>	<p>Can you access the customer complaints section as an administrator?</p> <p>5 responses</p>  <p>80%</p> <p>20%</p> <p>● Yes ● No</p>



Question 3 result	<p>When you read the customer complaints, are you able to view their registered email for contacting them?</p> <p>5 responses</p>  <p>100%</p> <p>● Yes ● No</p>
Question 4 result	<p>Are you able to contact the customers by their registered email to help them resolve their issues?</p> <p>5 responses</p>  <p>100%</p> <p>● Yes ● No</p>
Question 5 result	<p>Can you mark a customer complaint as "Resolved" once the issue has been resolved?</p> <p>5 responses</p>  <p>100%</p> <p>● Yes ● No</p>
Question 6 result	<p>Have you encountered any issues or errors while performing these admin tasks?</p> <p>5 responses</p>  <p>80%</p> <p>20%</p> <p>● No ● No, but I suggest to provide options for admins to customize their dashboard layout based on their preferences and frequently used features.</p>