

Progress Presentation - 02

Research Topic

Adaptive Learner Centric LMS

Enhanced Student Engagement and Personalised Learning Experiences

Who we are



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AI Document Assistant

Facilitate Self Directed Learning

Communicate with documents



Overview

- RAG Chatbot updated with prompt engineering techniques with the goal of achieving self directed learning and customizing for education.

PP1 Feedback

- The panel's key suggestion was to use an enhanced prompt rather than a basic one

Prompt Engineering

- The process of crafting prompts to get the right output from a model.
- The quality of results depends on how much information you provide it and how well-crafted the prompt is. A prompt can contain information like the instruction or question you are passing to the model and include other details such as context, inputs, or examples. You can use these elements to instruct the model more effectively to improve the quality of results.

Prompt Engineering in Student Learning

- Studies indicate that structured prompting enhances learners' ability to grasp and apply complex concepts, promoting deeper comprehension rather than mere memorization.
- Reduces cognitive load, making AI-driven learning tools more engaging and effective for students.

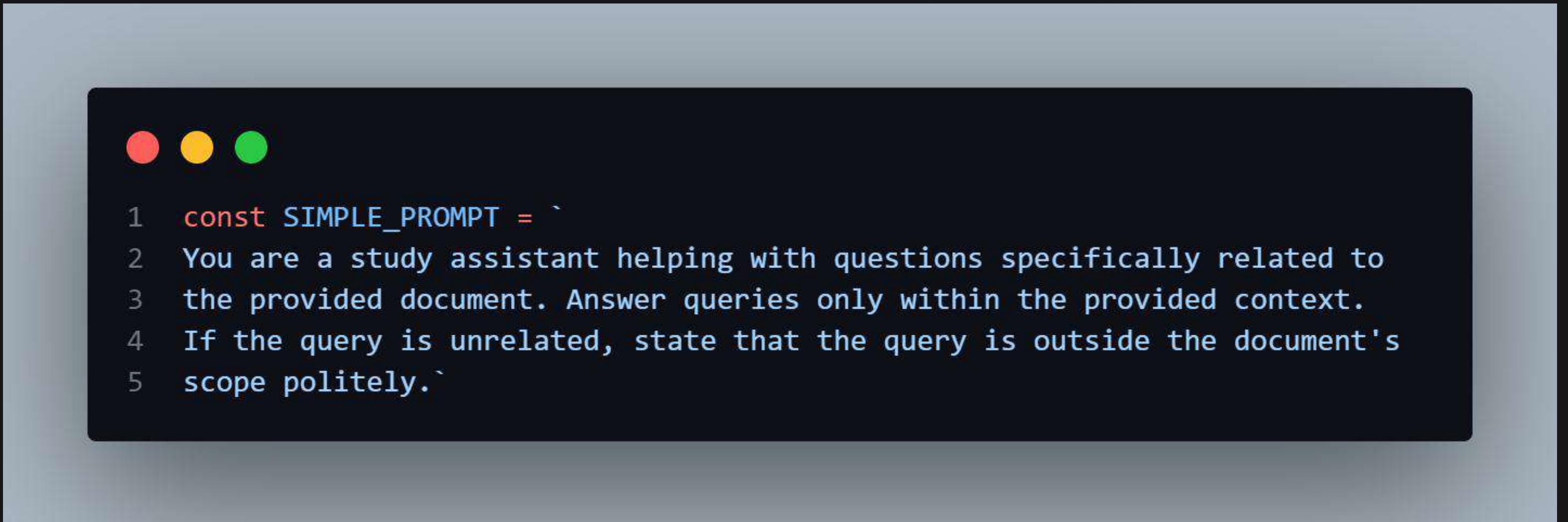
K. Mzwri and T.-S. Márta, *The Impact of Structured Prompt Driven Generative AI on Learning Data Analysis in Engineering Students*, Science And Technology Publications, 2024.

RQ: How does structured prompt engineering with Generative AI, influence the mastery of programming and data analysis concepts among learners with no prior programming experience?

Zeroshot prompt

- Zero-shot prompting means that the prompt used to interact with the model won't contain examples or demonstrations.
- The zero-shot prompt directly instructs the model to perform a task without any additional examples to steer it.

<https://www.promptingguide.ai/techniques/zeroshot>



The image shows a screenshot of a code editor with a dark theme. At the top, there are three colored circular icons: red, yellow, and green. Below them, a snippet of code is displayed:

```
1 const SIMPLE_PROMPT = `2 You are a study assistant helping with questions specifically related to3 the provided document. Answer queries only within the provided context.4 If the query is unrelated, state that the query is outside the document's5 scope politely.`
```

Intent Aware Structured Prompt

- A prompt crafted using multiple prompt engineering techniques, specifically Few Shot and Chain of Thoughts.
- The prompt provides instructions to first identify the student's intent and examples for to process the answer in a structured and educative manner.

Table 1. Simple Prompt and Intent-Aware Structured Prompt

	Simple Prompt	Intent-Aware Structured Prompts
Prompt Engineering Technique	Zero-Shot	Combination of Zero-Shot, Chain of Thoughts, Meta Prompting and Prompt Chaining
Description	Instructions to assume the role and provide responses strictly within the context of the document.	Recognises the user's intent and formats responses accordingly, strictly within the document context (e.g., summaries, tables, quizzes, or explanations).

Experiments and Results

- An experiment was conducted to differentiate the response accuracy, structure, clarity, and relevance to the document content for both prompts against 40 questions.

Table 2. Query Types

Query Type	Description
General Queries	Basic factual questions based on the document
Summarisation	Requests for a summary of key topics
Table Generation	Requests to organise information into structured tables
Quiz Creation	Request to generate quiz questions
Code Snippets	Request for relevant code examples
Simplify a concept	Request to explain complex ideas in simple terms
Explanation	Detailed explanations
Unrelated Queries	Questions unrelated to the document.

Key Findings

- The Simple Prompt approach showed signs of hallucination and inconsistency with the inability to respond to certain queries stating the query was out of scope when it was not.
- Intent Aware Structured prompt performed better in structured responses in formatting summaries, tables, code snippets and quizzes.
- Both prompts performed well in providing factually accurate answers, but the intent-aware structured prompt provided better clarity and organization.
- Handling of unrelated queries was similar for both prompts, but the intent-aware structured prompt provided a more polished response.

Progress – 8 / 9 (90%)

- PDF Extraction + LLM Querying
- Integrating Vector Database
- Conversation History
- Restricting Scope
- Frontend
- Prompt Engineering
- Moderation
- Deployment
- Unit Testing

Task Tracking

Name		Assignee
<input checked="" type="checkbox"/>	sign up view and backend implementation for user login	
<input checked="" type="checkbox"/>	PDF Text Extraction	
<input checked="" type="checkbox"/>	Integrate with LLM API	
<input checked="" type="checkbox"/>	Implement RAG	
<input checked="" type="checkbox"/>	Conversational Implementation	
<input checked="" type="checkbox"/>	Chat history	

Deployment

Home >

rag-chatbot-api

Web App

Search

Browse Stop Swap Restart Delete Refresh Download publish profile Reset publish profile Share to mobile Send us your feedback

Overview Activity log Access control (IAM) Tags Diagnose and solve problems Microsoft Defender for Cloud Events (preview) Recommended services (preview) Resource visualizer Favorites Scale up (App Service plan) Deployment Deployment slots Deployment Center Settings Environment variables Configuration

Essentials

Resource group (move) : DefaultResourceGroup-SEA Status : Started: 1 Location (move) : Southeast Asia Subscription (move) : Azure for Students Subscription ID : a77e5085-0d6e-4630-b8a1-1567376274f5 Tags (edit) : Add tags

Default domain : rag-chatbot-api-gvb2ftcdhnesggeu.southeastasia-01.azurewe... App Service Plan : ASP-DefaultResourceGroupSEA-93b6 (B1: 1) Operating System : Linux Health Check : 100.00% (Healthy 1 / Degraded 0) GitHub Project : <https://github.com/russellpeiris/rag-chatbot>

Properties Monitoring Logs Capabilities Notifications (0) Recommendations

Web app

Name	rag-chatbot-api
Publishing model	Container
Container Image	index.docker.io/ardpeiris/rag-chatbot:7022c902be9c7ad83ca3f21a2c8e36ffaf3a3621

Domains

Default domain	rag-chatbot-api-gvb2ftcdhnesggeu.southeastasia-01.azurewebsites.net
Custom domain	Add custom domain

Deployment Center

Deployment logs

Application Insights

Name

Not supported. [Learn more](#)

Networking

Virtual IP address	20.212.64.3
Outbound IP addresses	172.188.197.214, 172.188.197... Show More
Additional Outbound IP addresses	172.188.197.214, 172.188.197... Show More

<https://portal.azure.com/#@clitlk/resource/subscriptions/a77e5085-0d6e-4630-b8a1-1567376274f5>

Continuous Deployment

The screenshot shows the GitHub Actions workflow runs page for the repository `russellpeiris / rag-chatbot`. The page displays four workflow runs, each corresponding to a deployment of a container app to Azure Web App. The runs are listed in descending order of age:

- Updated Prompts**: Last run on main branch, pushed by russellpeiris, 1m 20s ago.
- Refactor file download and vector store initializing process**: Last run on main branch, pushed by russellpeiris, 1m 26s ago.
- Merge branch 'main' of https://github.com/russellpeiris/rag-chatbot**: Last run on main branch, pushed by russellpeiris, 1m 12s ago.
- Add or update the App Service deployment workflow configuration...**: Last run on main branch, pushed by russellpeiris, 1m 19s ago.

The left sidebar shows navigation links for Code, Issues, Pull requests, Actions (which is selected), Projects, Wiki, Security, Insights, and Settings. The Actions section also includes links for New workflow and All workflows.

Scalability

rag-chatbot-api | Scale up (App Service plan) ⭐ ...

Web App

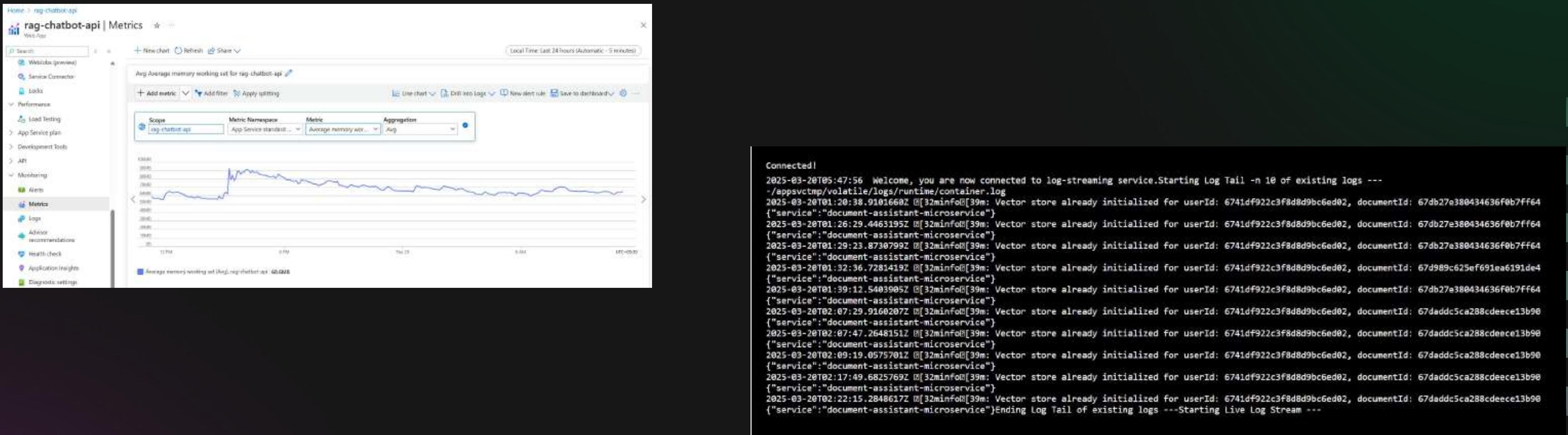
Search Access control (IAM)

Tags Diagnose and solve problems Microsoft Defender for Cloud Events (preview) Recommended services (preview) Resource visualizer Favorites Scale up (App Service plan) Deployment Deployment slots

Hardware view Feature view Showing 19 App Service pricing plans

Name	ACU/vCPU	vCPU	Memory (GB)	Remote Storage (GB)	Scale (instance)	Cost per hour (instance)	Cost per month (instance)
Free F1	60 minutes/day co	N/A	1	1	N/A	Free	Free
<input checked="" type="checkbox"/> Basic B1	100	1	1.75	10	3	0.018 USD	13.14 USD
Basic B2	100	2	3.5	10	3	0.036 USD	26.28 USD
<input type="checkbox"/> Basic B3	100	4	7	10	3	0.071 USD	51.83 USD
Dev/Test (For less demanding workloads)							
Premium v3 P0V3	195*	1	4	250	30	0.092 USD	66.795 USD
Premium v3 P1V3	195	2	8	250	30	0.183 USD	133.59 USD
Production (For most production workloads)							
Premium v3 P2V3	195	2	16	250	30	0.366 USD	169.392 USD

Monitoring



Component Research Paper

RAG Conversational AI For Context-Rich Student Learning with Intent-Aware Structured Prompting

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Abstract—Integrating Artificial Intelligence (AI) in education has opened new opportunities for personalized learning and student engagement. Retrieval-Augmented Generation (RAG) combines the generative capabilities of Large Language Models (LLMs) with external knowledge sources, improving accuracy and mitigating issues like hallucination and outdated knowledge in LLMs. This study explores the development of a RAG chatbot specifically intended to aid students in self-directed learning. Unlike traditional approaches, this chatbot employs an intent-aware prompt, designed by combining multiple prompt engineering techniques to determine the user's intent, such as summarization, quiz generation or code generation, to structure the response accordingly. This approach ensures that AI-generated responses are both pedagogically sound and contextually

ensures that the system aligns with educational objectives, producing responses that are informative, well-structured, and tailored to diverse learning needs.

II. LITERATURE REVIEW

A. Large Language Models, Small Language Models (SML)

A survey on hallucinations in LLMs highlights these models are prone to generating incorrect or non-existent information [2]. LLMs are built on the transformer-based language model architecture and trained on vast textual corpora but once trained, their internal knowledge remains static, posing a significant challenge in a rapidly evolving world [2]. Since they are primarily trained on broad, general-domain datasets, they may lack depth in domain-specific

IT21249266 - PEIRIS ARD

Thank You!

Personalized Quiz Generation

Adapts quiz difficulty based on user performance and given content using Bloom's Taxonomy.



Research Gap

- Current educational tools often fail to provide truly personalized learning experiences. While many platforms offer quizzes and assessments, they lack adaptability, resulting in several challenges:

Lack of Dynamic Quiz Generation

Most systems do not create quizzes from given materials dynamically; instead, they use pre-set questions.

Lack of Dynamic Quiz Generation

Existing quiz systems generate generic assessments that do not align with individual learning progress.

Limited Personalization

Most quizzes and assignments are static and do not adjust difficulty based on student performance.

Delayed Feedback

Lack of immediate and actionable feedback slows down student progress, making it difficult to address learning gaps in real time.

Research Question

How to Identify Adaptive Learning Gaps?

- Static assessments fail to adjust to individual learning needs, making it difficult to track student progress effectively.

How to Identify the Need for Adaptive Quizzes?

- As learning gaps increase, a basic quiz system becomes insufficient, requiring advanced adaptive mechanisms.
- Real-time feedback and automated grading become necessary to support timely interventions and improve learning outcomes.



Current Progress

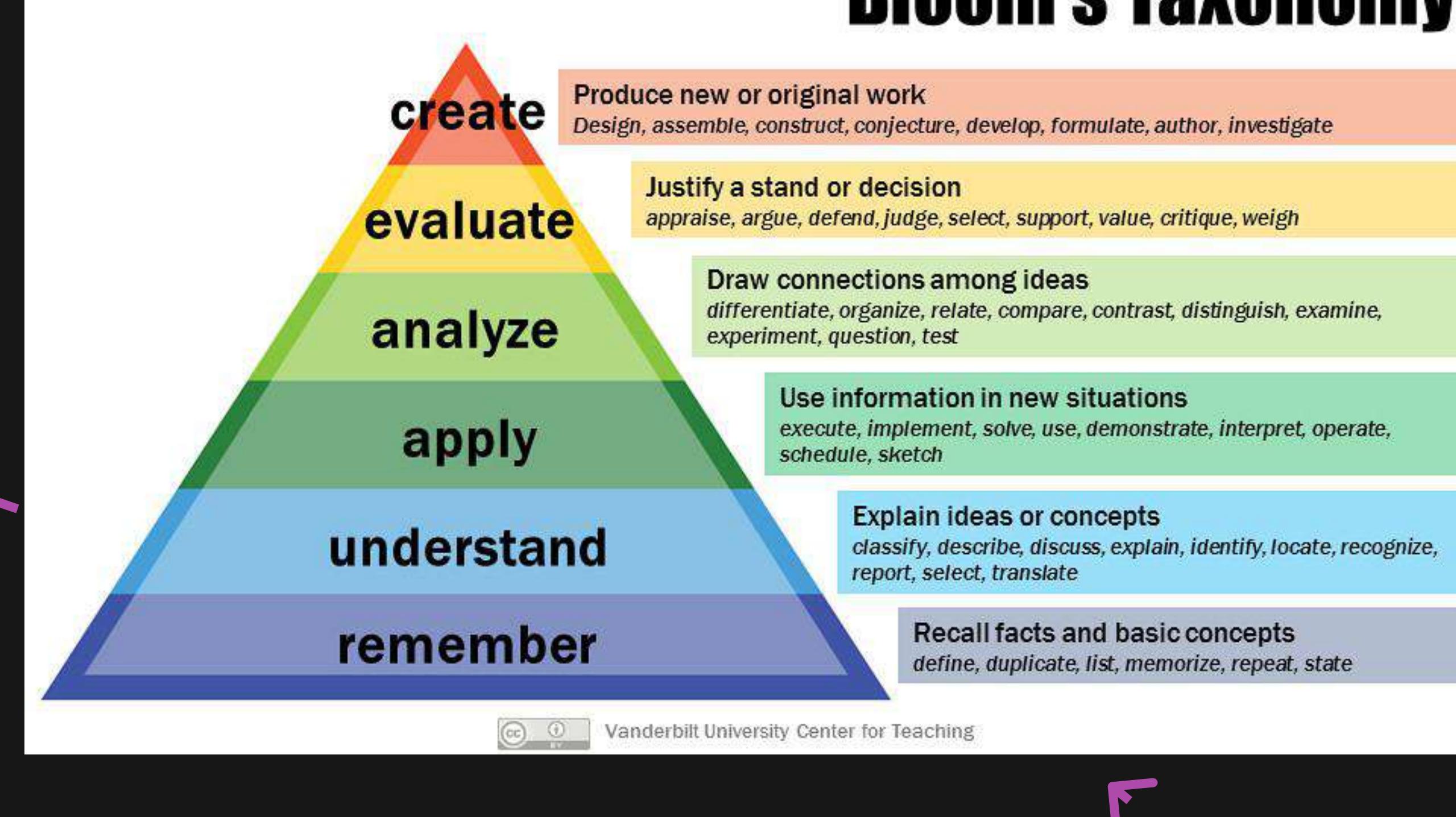
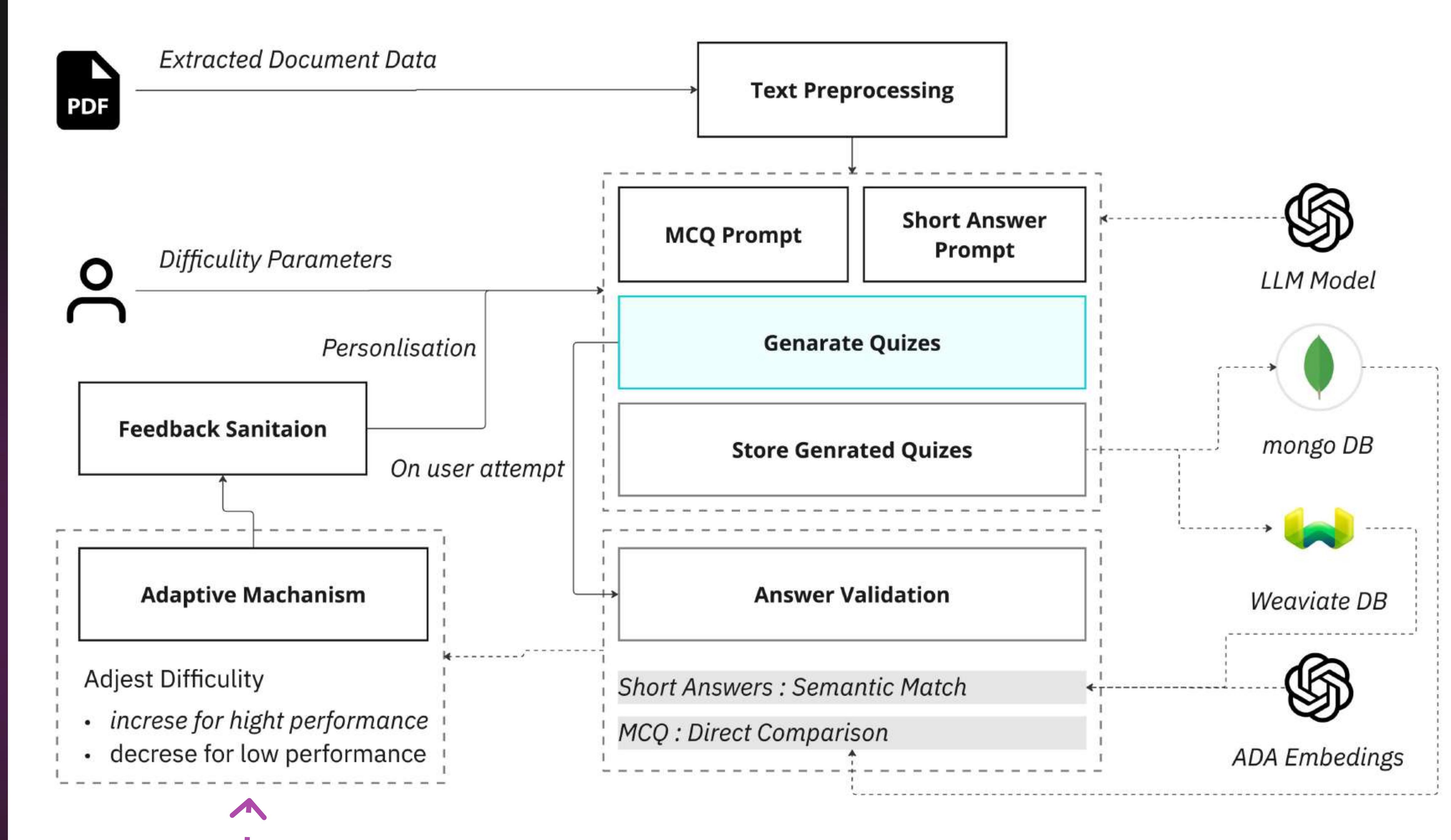
- Quiz Generation tailored to lecture content (LLMs)
- MongoDB stores MCQs, while Weaviate handles short-answer responses using semantic search.
- Validate answers using direct matching in MongoDB.
- Use Weaviate's hybrid search and OpenAI embeddings for semantic similarity and partial correctness scoring.

50%

90%

- Quiz Personalization
 - Difficulty adjusts based on user score.
 - Linked to Bloom's Taxonomy levels.
- Feedback Generation
 - Highlights strengths, weaknesses, and tips.
- Tracks user Progress

Methodology



- **Remembering:** What is $2 + 2$?
- **Understanding:** Why do we add numbers together?
- **Applying:** If you have 3 apples and get 2 more, how many do you have in total?
- **Analyzing:** What is the difference between addition and subtraction?
- **Evaluating:** Is $10 + 5$ the same as $5 + 10$? Why or why not?

```

1
2     Difficulty Level Distribution & Bloom's Taxonomy Mapping:
3     The difficulty level is: ${difficultyLevel}
4     . Based on the range, structure the quiz using the following cognitive levels:
5
6     - **0-40 (Easy)**:
7         - 4 questions from **Remembering**
8         - 4 questions from **Understanding**
9         - 2 questions from **Applying**
10
11    - **41-60 (Medium)**:
12        - 3 questions from **Understanding**
13        - 3 questions from **Applying**
14        - 2 questions from **Analyzing**
15        - 2 questions from **Evaluating**
16
17    - **61-80 (Hard)**:
18        - 2 questions from **Understanding**
19        - 2 questions from **Applying**
20        - 3 questions from **Analyzing**
21        - 3 questions from **Evaluating**
22
23    - **81-100 (Very Hard)**:
24        - 2 questions from **Applying**
25        - 2 questions from **Analyzing**
26        - 3 questions from **Evaluating**
27        - 3 questions from **Creating**

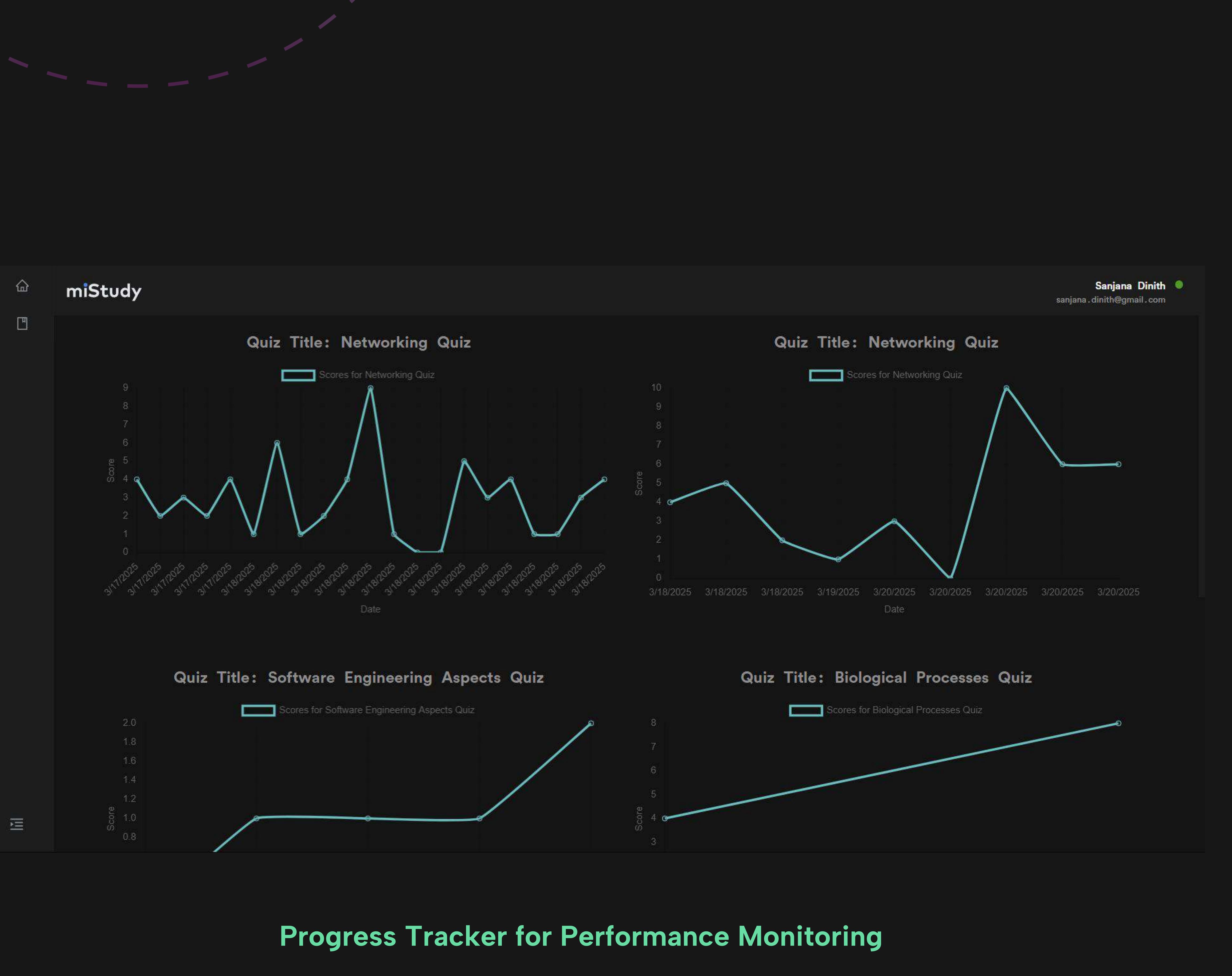
```

<pre>_id: ObjectId('67db5ca13450484c69869006') title : "Introduction to Networking Quiz" documentID : ObjectId('67db27e380434636f0b7ff64') userID : ObjectId('6741df922c3f8d8d9bc6ed02') difficultyLevel : 50 questions : Array (10) score : 3 createdAt : 2025-03-20T00:09:05.469+00:00 updatedAt : 2025-03-20T00:10:10.698+00:00 __v : 0</pre>	Defult Difficulty Level <i>50</i>
<pre>_id: ObjectId('67db5d123450484c698691da') title : "Introduction to Networking" documentID : ObjectId('67db27e380434636f0b7ff64') userID : ObjectId('6741df922c3f8d8d9bc6ed02') difficultyLevel : 30 questions : Array (10) score : 0 createdAt : 2025-03-20T00:10:58.503+00:00 updatedAt : 2025-03-20T00:10:58.503+00:00 __v : 0</pre>	<i>30</i>

Root / quiz / questions			bloomLevel	isCorrect	_id	userAnswer
question	correctAnswer	otherAnswers				
0	Networking connects devices for communication, resource sharing, and data exchange.	0 Networking is a type of software. 1 Networking is a type of hardware. 2 Networking is a type of programming language.	Understanding	false	67db3d6e4e6e831bcd281d50	Networking is a type of software.
1	Devices that use Wi-Fi or Bluetooth for file sharing and streaming.	0 A server. 1 A mainframe. 2 A supercomputer.	Understanding	true	67db3d6e4e6e831bcd281d51	Devices that use Wi-Fi or Bluetooth for file sharing and streaming.
2	Enables ATM connectivity, inter-branch operations, and customer support.	0 To provide entertainment. 1 To provide weather updates. 2 To provide news updates.	Understanding	true	67db3d6e4e6e831bcd281d52	Enables ATM connectivity, inter-branch operations, and customer support.
3	Resource Sharing	0 Increased costs. 1 Decreased efficiency. 2 Increased redundancy.	Understanding	false	67db3d6e4e6e831bcd281d53	Decreased efficiency.
4	Morse Code & Switching Stations	0 The invention of the internet. 1 The invention of the computer. 2 The invention of the smartphone.	Understanding	false	67db3d6e4e6e831bcd281d54	The invention of the computer.
5	A network that connects devices within a limited area like a home, office, or school.	0 A network that connects devices across large geographic areas. 1 A network that connects devices globally. 2 A network that connects devices within a single room.	Applying	false	67db3d6e4e6e831bcd281d55	A network that connects devices within a single room.
6	A network that connects multiple LANs across large geographic areas.	0 A network that connects devices within a limited area. 1 A network that connects devices globally. 2 A network that connects devices within a single room.	Applying	true	67db3d6e4e6e831bcd281d56	A network that connects multiple LANs across large geographic areas.
7	The layout of devices and connections in a network.	0 The layout of a computer. 1 The layout of a server. 2 The layout of a website.	Applying	true	67db3d6e4e6e831bcd281d57	The layout of devices and connections in a network.
8	A network topology where all devices connect to a central hub.	0 A network topology where all devices connect in a line. 1 A network topology where all devices connect in a circle. 2 A network topology where all devices connect randomly.	Applying	true	67db3d6e4e6e831bcd281d58	A network topology where all devices connect to a central hub.
9	Centralized Devices: Hub or switch ensures efficient data routing.	0 Decentralized Devices: Each device routes its own data. 1 Randomized Devices: Data routing is random. 2 Isolated Devices: Each device operates independently.	Applying	true	67db3d6e4e6e831bcd281d59	Centralized Devices: Hub or switch ensures efficient data routing.

Difficulty Level → 60

5 questions → Understanding
5 questions → Applying

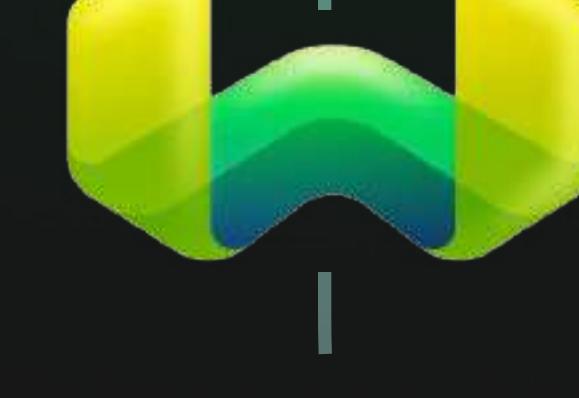


Application of Technologies in Relevant Areas

Why Weaviate?

Hybrid Search

Combines vector search (semantic similarity) and keyword search for accurate answer evaluation.



Contextual Understanding

Uses vector embeddings to compare answers beyond exact matches, ensuring better accuracy in assessing responses.

Scalability

Efficiently handles large amounts of unstructured text with fast retrieval.

LLM , Prompt Engineering & RAG

Model Selection

Model	Purpose	Accuracy	Reason for Use	Why Not use other models?
text2vec-openai – ada 002	Embedding model for similarity search in Weaviate	High for semantic similarity and vector retrieval	Efficient for comparing short-answer responses using hybrid search	Other embedding models may lack OpenAI's optimization for semantic similarity
GPT-4	Generates MCQs and short-answer questions	Very high for quiz generation and contextual understanding	Advanced NLP ensures high-quality question generation tailored to lecture content	Other LLMs may not align well with Bloom's Taxonomy or adjust difficulty levels accurately, leading to less effective personalized learning.
GPT-4o-mini	Generates feedback on quiz answers	High for contextual understanding and explanation	Provides personalized feedback based on user responses	GPT-4o-mini has better accuracy than GPT-3.5 Turbo and lower cost than GPT-4, making it a more efficient choice for feedback generation.

Expected Completion for next stage

- Finalize and test quiz generation for large documents.
- Validate user answers through cross-checking.
- Enhance the UI and fully deploy the application.

Adaptive Mind Map Generation.

Interactive mind maps tailored to individual learners.

Provide additional resource via mind map.



Introduction – Background

What is a mind map?

- A mind map is a diagram used to visually organize information into a hierarchy, showing relationships among pieces of the whole.[4].

Why mind map important?

- Mind maps help organize complex information by breaking it into a clear, hierarchical structure. This method enhances creativity, problem-solving, and focus on the main subject while exploring related details.[1]
- Effective mind maps simplify complex information, enhance memory retention, and improve understanding by visually organizing key concepts and their relationships.



Research Gap

Traditional Learning Management Systems (LMS) lack adaptive mind map integration, leading to rigid and ineffective knowledge visualization.

Existing implementations rely on static, non-interactive templates that fail to adjust based on learner progress and performance, or evolving knowledge needs.

There is a critical need for an AI-driven system that dynamically generates and updates mind maps by incorporating real-time learner analytics, personalized assessments, and external knowledge resources.

The proposed solution ensures personalized, context-aware learning pathways, enhancing engagement, retention, and comprehension in an adaptive learning environment.

Research Question

How does AI-driven adaptive mind map generation improve personalized learning and knowledge retention?

What is the impact of integrating external knowledge resources on dynamic mind map creation in an LMS?



Main Objective

Create an adaptive and interactive mind map generation in the LMS that customizes visualizations based on initial assessments and individual learning progress, enhancing the personalization of the learning journey by providing tailored content, allowing access to additional resources, and engaging learners with customized visualizations.



Sub Objectives

Identify the most effective tool for creating and managing mind maps.

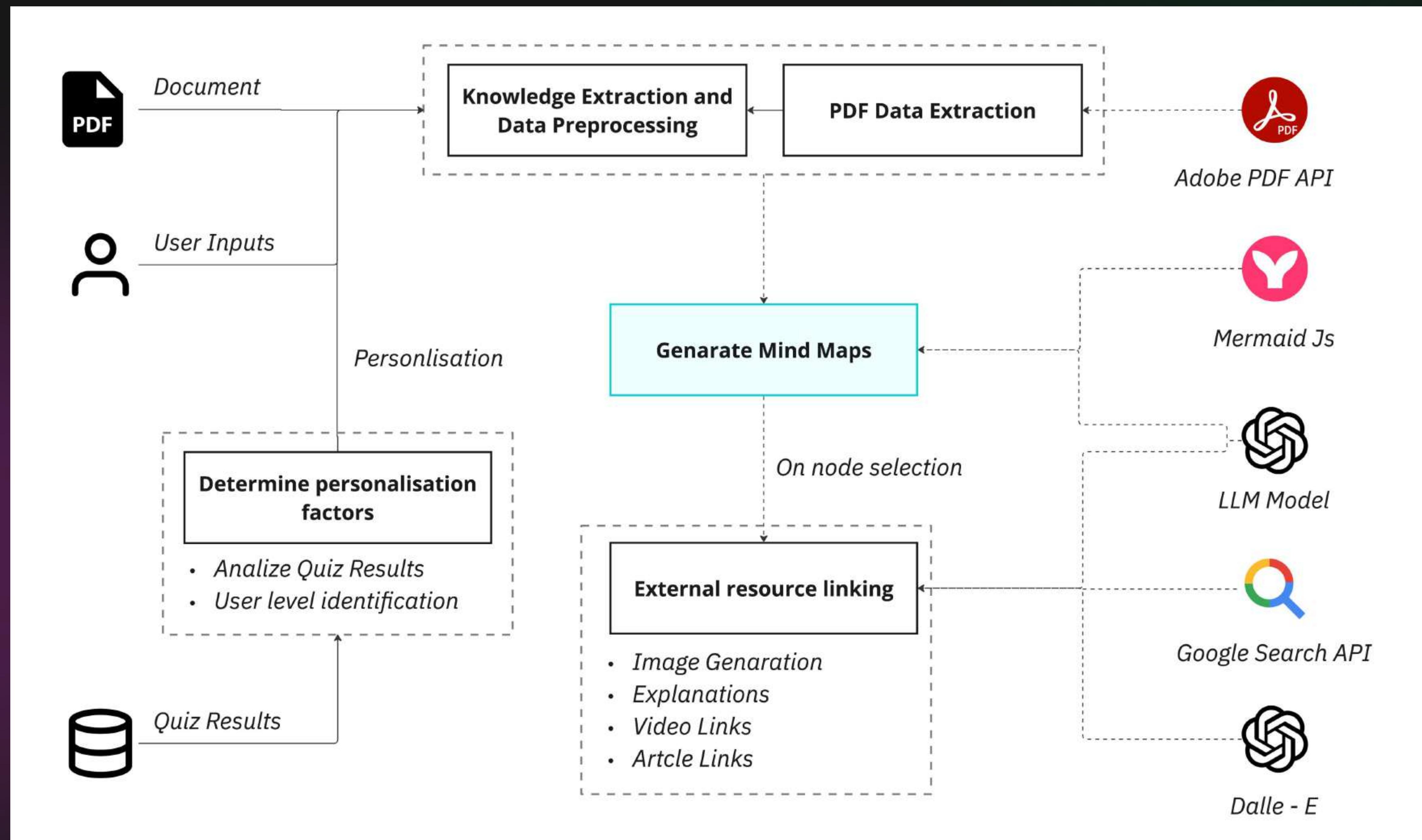
Use grading and assessment data to tailor the mind map generation, reflecting individual learning needs and progress.

Provide tools for users to search and navigate through different nodes and branches of the mind map easily.

Embed links to supplementary resources such as articles, videos, and external websites relevant to the content of each mind map node.

Use user performance data to continuously adapt and improve the mind map generation process.

Methodology



Current Progress

Notes View → Interactive and structured note-taking system UI

Chapter View → Seamless navigation through learning materials.

50%

PDF Extraction (Adobe API) → Efficient content extraction for knowledge processing.

Design (Figma) → User-centric interface designed for intuitive learning.

AI-Powered Mind Map Generation (LLMs) → Dynamic, mind maps based on extracted content.

90%

Main Mind Map Finalization: → Finalized the main mind map generation, using extracted PDF content as the basis.

Rationalization with Quiz Performance

Prompt Engineering for Invalid Questions: → Implemented prompt engineering to prevent invalid questions, ensuring higher-quality interactions.

Resource Linking & Content Generation → Integrated resource linking, description generation, status and image creation for nodes within the mind map.

Summary Display in Reader View

UI Enhancements → Improved UI with a swiper for navigating through three mind maps based on quiz performance. Resource loader view implemented.

Prompt Mind View Implementation → Developed a real-time prompt system that allows the system to respond to user queries and provide accurate answers based on the current learning context.

Expected Completion for next stage

Finalize and test the complete mind map generation process for large documents.

Validate resources for hyperlinks and integrate Bing Search API & Wikipedia Search API.

Implement further UI enhancements and fully deploy the application.

Why Mermaid is?



No need for complex d

Works search

Compatible with tools like Markdown editors and static

Construction
/

Allows customisation to align with project requirements.

Lightweight and fast rendering compared to other visualisation libraries

miStudy

1. Introduction to Networking

1.1 What is Networking?

It supports systems from simple home networks to global infrastructures.

Examples: Home devices connected to Wi-Fi, corporate LANs, and public services like online government portals.

Ensures 24/7 service reliability through robust networks.

Online

res
Pul
ser

The diagram illustrates the interconnected nature of banking infrastructure. At the top left, a green box labeled 'Enables ATM connectivity, inter-branch operations, and customer support.' is connected by arrows to two other boxes: 'Ensures 24/7 service reliability through robust networks.' (green) and 'It supports systems from simple home networks to global infrastructures.' (yellow). The bottom right box, 'It supports systems from simple home networks to global infrastructures.', is also connected to the central network box. A blue circle labeled 'Networking' is positioned at the bottom right, with a line connecting it to the central network box.

Enables ATM connectivity, inter-branch operations, and customer support.

Ensures 24/7 service reliability through robust networks.

It supports systems from simple home networks to global infrastructures.

It supports systems from simple home networks to global infrastructures.

Networking

The diagram illustrates three basic network topologies:

- Bus Topology**: All devices connect to a single shared bus.
- Star Topology**: All devices connect to a central hub. This topology is highlighted with a pink star icon. Key features include:
 - All devices connect to a central hub.
 - Failure of individual devices doesn't disrupt the network.
 - Impact: Affects network speed and troubleshooting.
 - Advantages: Centralized control simplifies management.
- Ring Topology**: Devices are connected in a closed loop.

Logical Topology: Defines data flow irrespective of setup.

Physical Topology: Actual arrangement of hardware.

1.2.1 Resource Sharing

Printers: Shared printers reduce costs and improve efficiency.

File Servers: Centralized storage enhances collaboration and reduces redundancy.

Cost Savings: Shared hardware, software licenses, and energy

Google Search API key

Extracts content from PDFs, which is then displayed in the reader view.

tasks
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still o

of good results)

GPT-4	Node Description Generation	accuracy, capable of nuanced, context-aware text generation	Best for generating high-quality, detailed descriptions for nodes based on context, providing depth in explanations.	provides significantly more accurate
DALL·E 3	Image Display in resources tab for Mind Map Nodes	High accuracy in generating relevant and visually coherent images	Best for generating high-quality, contextually relevant images that match the content of the mind maps.	Other models cannot generate images

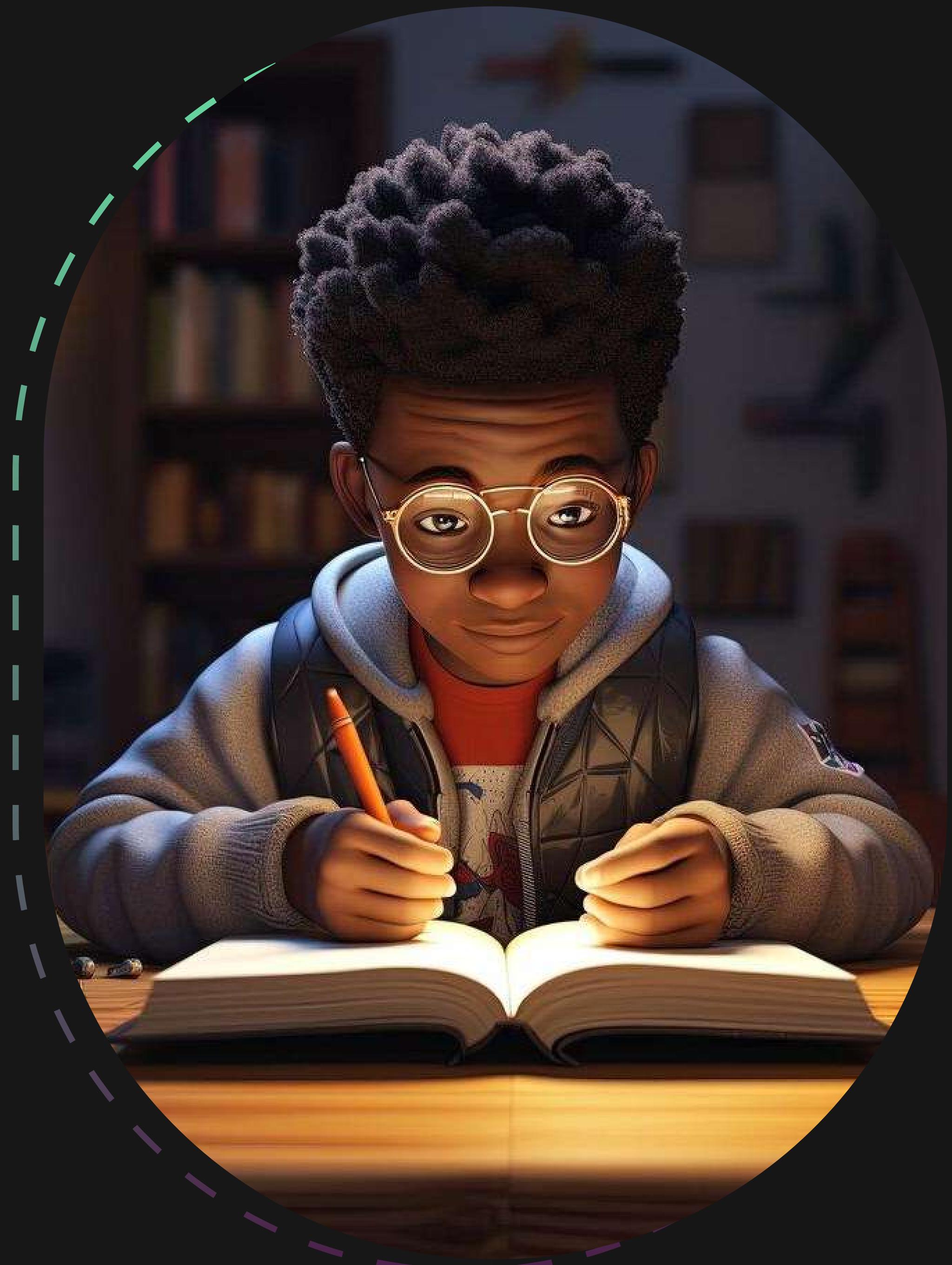
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The evaluation of using mind maps in teaching
[https://www.researchgate.net/profile/Veljko-Aleksic/publication/272792319_The_evaluation_of_using_mind_maps_in_teaching/links/56eb99f608ae9dcdd82adf79/The-evaluation-of-using-mind-maps-in-teaching.pdf?origin=journalDetail&_tp=eyJwYWdlIjoam91cm5hbERIdGFpbCJ9](https://www.researchgate.net/profile/Veljko-Aleksic/publication/272792319_The_evaluation_of_using_mind_maps_in_teaching/links/56eb99f608ae9dcdd82adf79/The-evaluation-of-using-mind-maps-in-teaching.pdf?origin=journalDetail&_tp=eyJwYWdlIjoiam91cm5hbERIdGFpbCJ9)
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Keep Students Engaged in a Learning Environment

Implement all rounded interface.

Incorporate study techniques.



Objectives

Incorporate study techniques

- To identify the best study techniques that can improve learning.
- To determine which of these techniques can be incorporated into an online learning environment and how to implement them effectively.
- To create a personalised interaction experience within the LMS.

Incorporate all the tools into one interface effectively.

- To identify the most essential tools that students need when studying.
- To present all features in a less distracting and more attractive manner.
- To optimise the system for balanced client-side load and performance.

Problems that i cover

- Takes a long time to get started and open up all tools (eg: pdfs, note taking apps, chat bots)
- Unorganized and poorly named documents in LMS
- No customizable layouts or background options when reading lecture materials
- Can't change fonts on a reading materials
- Can't edit, highlight or save your own version of the learning materials on LMS.
- Frequent distractions when switching between applications while studying.
- Disliked layouts and UI of the LMS.
- Difficulty in organizing study materials (Have to do it manually on a local machine)
- Not student-centric (Students can only read and download materials and use forums)
- Need to use multiple tabs, tools or screens when studying.



From PPI

Incorporate study techniques

To identify the best study techniques that can improve learning.

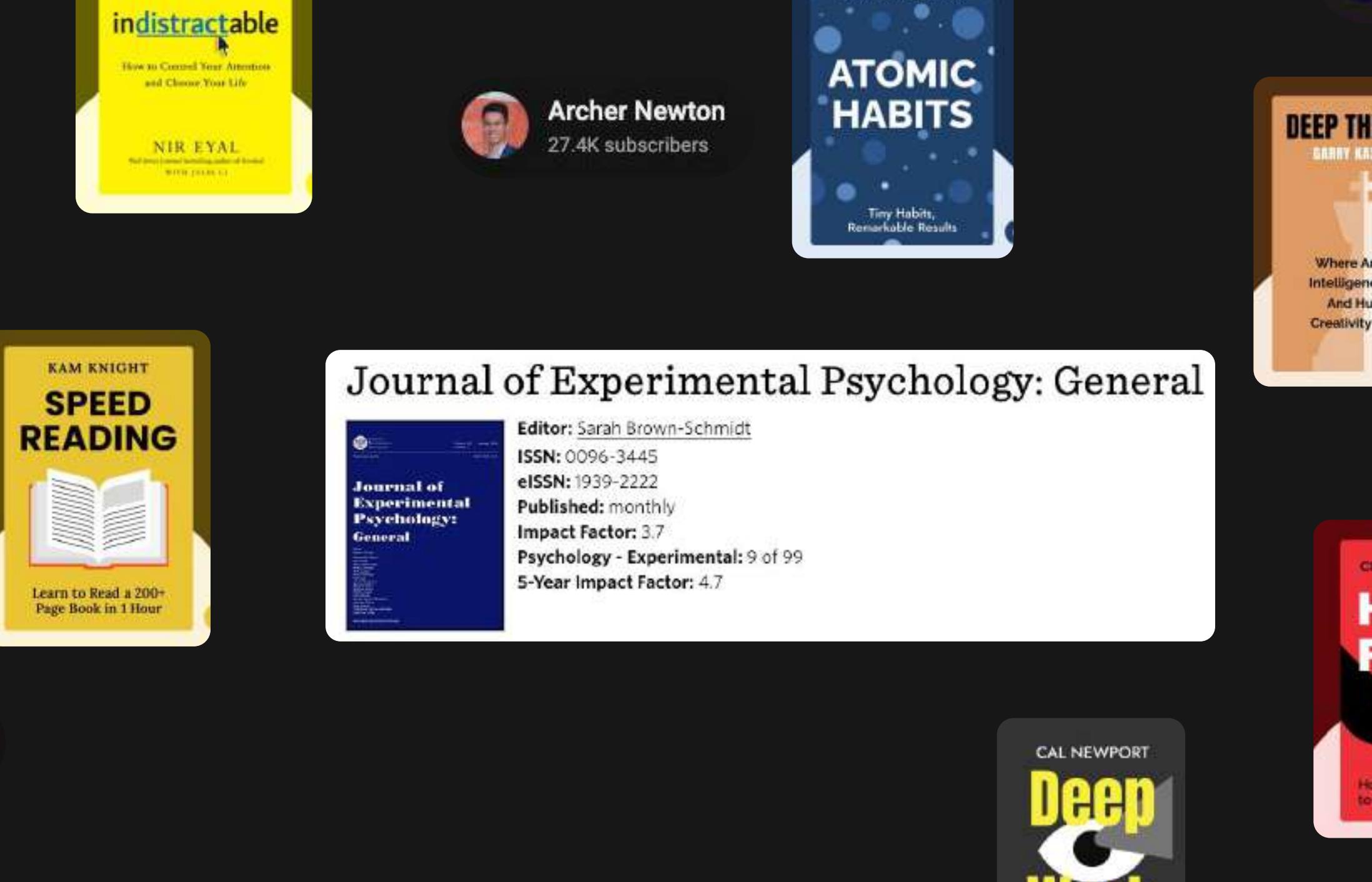
To determine which of these techniques can be incorporated into an online learning environment and how to implement them effectively.

To create a personalised interaction experience within the LMS.

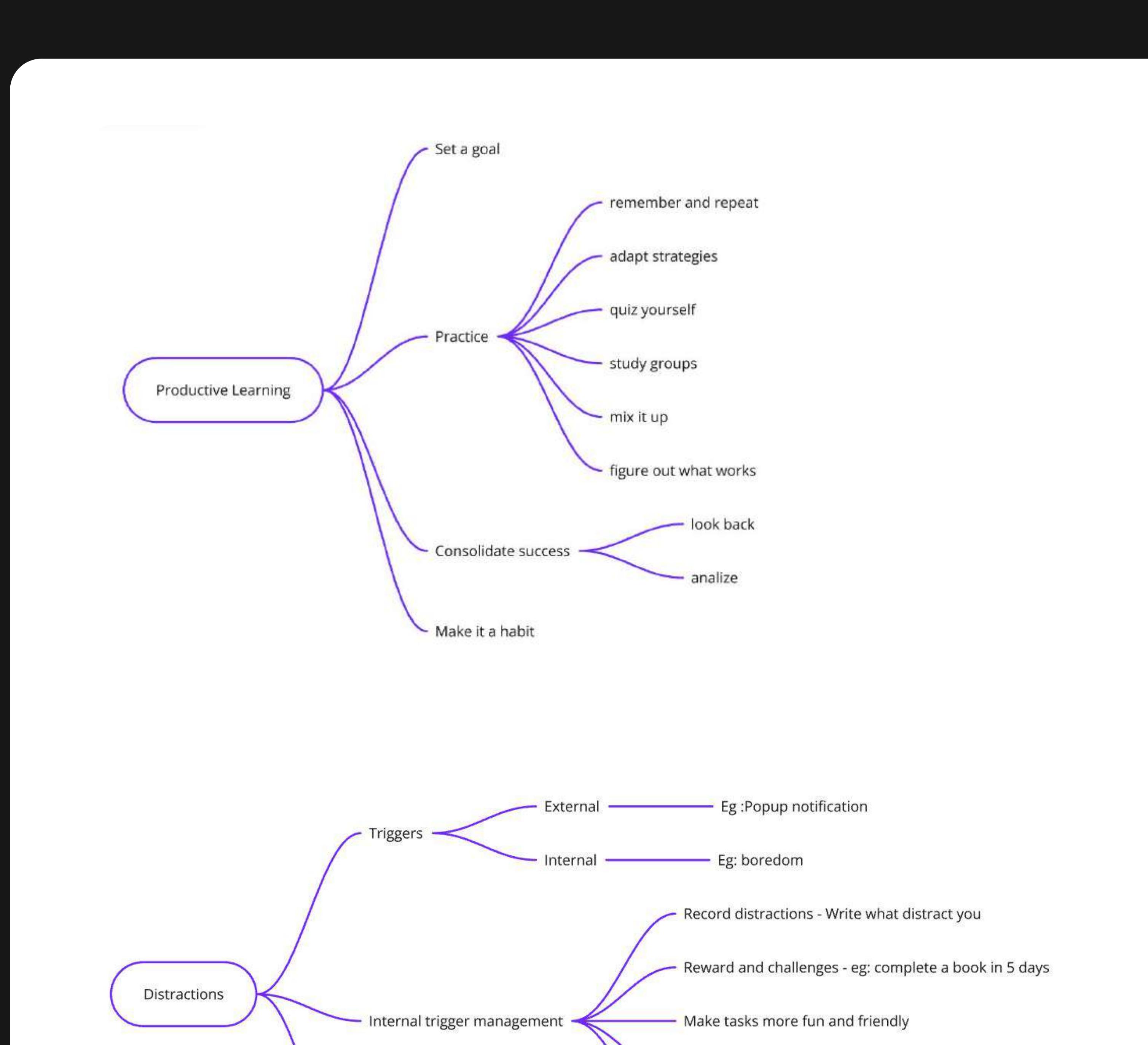
Initial Plan

	Techniques used	Proven	Personalized	Tested Online	Used in LMS
Research 01 [2]	Pomodoro + Forest app	✓	X	✓	✓
Research 02 [3]	Pomodoro	✓	X	✓	X
Research 03 [4]	Pomodoro	✓	X	✓	X
Research 04 [5]	Spaced Repetition	✓	X	X	X
Research 05 [6]	Feynman	✓	X	X	X
Research 06 [7]	Background Music	✓	X	✓	X
Article [8]	Flowtime	✓	✓	✓	X
Video [9]	Flowtime + pomodoro	X	✓	X	X

Keywords



Sources



Research Flow



Identified Techniques

Progressive Pomodoro Based on Pomodoro

- 👉 Traditional Pomodoro - (25-min work/5-min break cycles),
- 👉 Starting with a longer work period
- 👉 Gradually shortening both work and break durations
- 👉 Helps **maximise productivity** while **preventing burnout**
- 👉 60/20 40/10 20/5



Flomodoro Based on Pomodoro and Flowtime

- 👉 Work for as long as you can
- 👉 Then calculate your break based on the time spent working
- 👉 **Flexible** focus and rest strategy
- 👉 Prioritises **maintaining deep work states** (flow)

Research Update

Incorporate study techniques

Approach A- Fixed-Time Algorithms Failed.

Progressive Pomodoro Based on Pomodoro

Begins with longer work periods that gradually shorten over time. However, this method assumes a uniform cognitive load, which may not be suitable for all learner.

Flowtime Technique Based on Pomodoro and Flowtime

Allows uninterrupted focus, with breaks based on task completion rather than fixed intervals. While this flexibility helps, it does not account for cognitive fatigue levels, potentially leading to over exertion.

Approach B – Predefined Interval Algorithm Failed.

25:5 Pomodoro – Short sessions

with 25-minute work periods followed by 5-minute breaks. This method may be too rigid for longer study sessions

50:10 Intervals – Medium-length sessions

with 50-minute work periods followed by 10-minute breaks. Although effective, it lacks adaptability based on real-time fatigue levels.

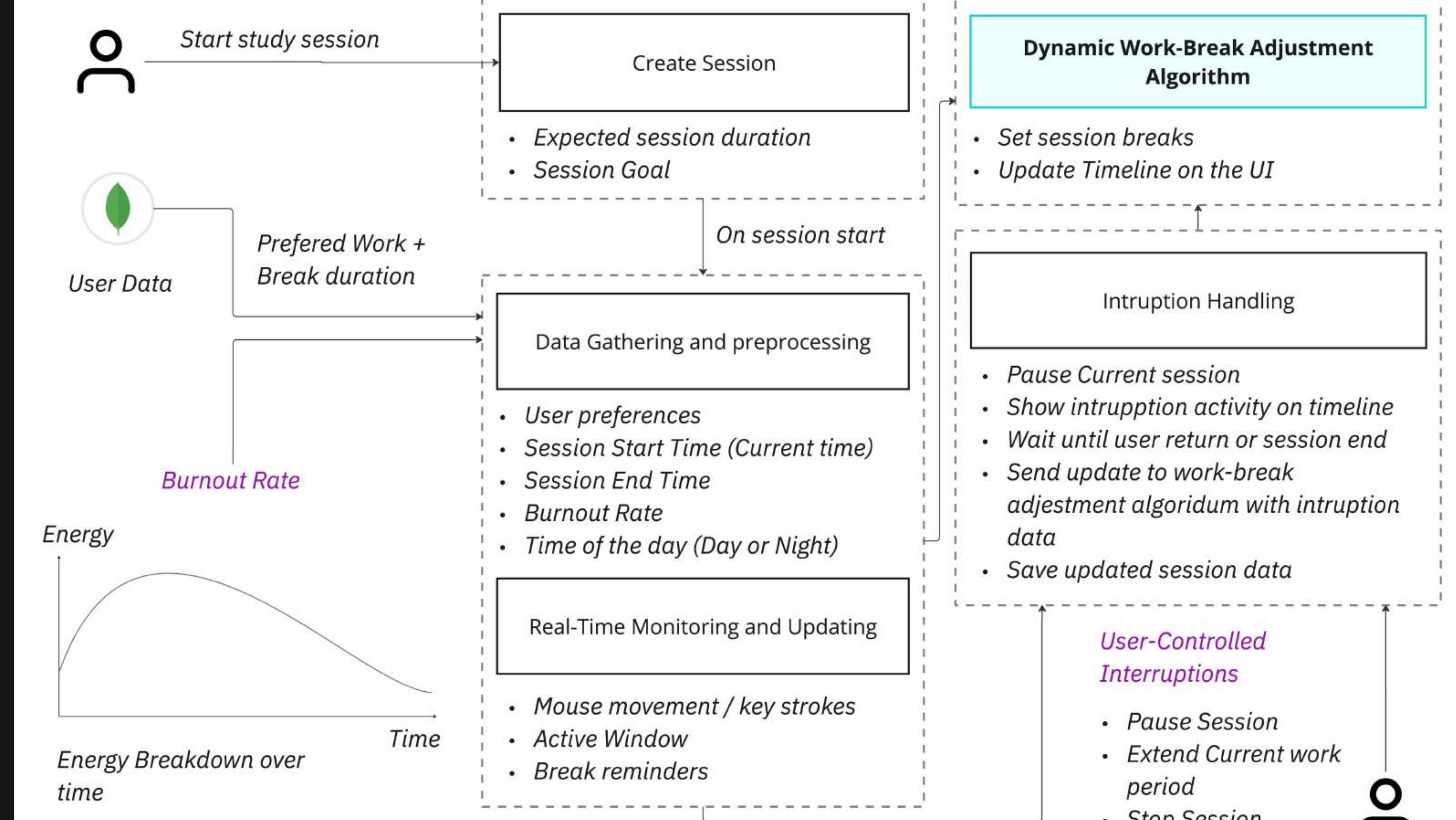
90:20 Intervals

Designed for deep work but does not accommodate fluctuations in concentration and energy levels.

Session Duration	Option 1 (25:5)	Option 2 (50:10)	Option 3 (90:20)
30 minutes	1 break (5 minutes)	No breaks	No breaks
4 hours	7 breaks (5 minutes)	4 breaks (10 minutes)	2 breaks (20 minutes)
8 hours	14 breaks (5 minutes)	8 breaks (10 minutes)	4 breaks (20 minutes)
12 hours	20 breaks (5 minutes)	12 breaks (10 minutes)	6 breaks (20 minutes)

Approach C – Dynamic Work-Break Adjustment Algorithm Success

This advanced model dynamically adjusts both work and break durations in real time based on session length and user energy levels. Unlike fixed-time approaches, this method adapts to the user's cognitive fluctuations, ensuring sustained productivity and mental well-being.



Progress

By progress presentation 01

- | Identify the best study techniques.
- | Determine which of these techniques can be incorporated into an online learning environment.
- | How to implement them effectively.
- | Design Application UI
- | Dev - Application structure design
- | Dev - User Module Added
- | Dev - Base application development

By Progress presentation 02

- | Dev - Study technique related actions integrations
- | Dev - User session management Development
- | Dev - Document history management
- | Dev - Customisation and personalisations
- | Dev - Application Deployment

Whats ToDo.

- | Dev - Performance Improvement
- | Dev - Background music feature

Idea and commercialisation

A Cloud based SASS Application

Now available for limited users

Target Market

Any Individual who are looking for application/platform to manage organise their documents and who interacts with a lot of resources.

A plugin interface

Target Market

Universities and higher education institutions with already using LMS, looking to enhance student engagement and academic performance through innovative learning technologies.

Revenue Model

Subscription-Based Plans

Monthly or annual subscription fees for institutions, based on the number of users and selected feature sets.

Freemium Model

Offering a basic version of the LMS for free, with premium features available through paid subscriptions.

Gitlab Version Controlling

The screenshot shows the GitLab interface for a repository named 'LMS-research'. The current branch is 'main' (last fetched 30 minutes ago). A merge commit from 'Feature-session-timeline' has been made. The commit message is 'Merge branch 'Feature-session-timeline''. It includes 8 changed files. The diff view shows code changes in 'main-dashboard.component.html' and other components like 'home.component.scss' and 'sessions.component.ts'. The code changes involve adding and removing HTML elements and CSS classes.

```
frontend-v2/src/app/layout/main-dashboard/main-dashboard.component.html
@@ -127,6 +127,9 @@
 127      </div>
 128      </div>
 129      <div class=" flex flex-row gap-2">
 130        +       <button nz-button nzType="primary" (click)=>en()
 131        +         <i nz-icon nzType="compress" nzTheme="light"></i>
 132        +       <button nz-button nzType="primary" (click)=>togglePanelVisibility('first')
 133          <i nz-icon [nzType]="showFirstPanel ? 'fullscreen' : 'fullscreen-exit'"></i>
 134        +         <i nz-icon [nzType]="showFirstPanel ? 'fullscreen-exit' : 'fullscreen-exit'"></i>
 135        +       </button>
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 169      +       <div *ngIf="isBreak" class="absolute top-0 left-0 -[#040404cb] flex items-center justify-center z-[10000] -col items-center gap-4">
 170        +         <div class="min-w-[20vw] p-6 rounded-xl bg-[#fff] flex items-center justify-center gap-4">
 171          +           <p class="text-[#A2C3F5] text-lg">Hello {name}</p>
 172          +           <p class="text-white text-3xl font-semibold">reak</p>
 173          +           ...
 174          +           <div class="w-24 h-24 flex items-center justify-center rounded-full border-4 border-[#1e4d6c]">
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Non-functional Requirements

Accuracy

Performance

Reliability

Security and Privacy

Usability

Robustness

Assurance of Key Pillars

Accuracy

Reliability

Security

Privacy

User Interface Designs

UI/UX

Intuitive User Interface

Real-Time Feedback

Responsive Design

Best Practices

Code Readability

Error Handling

Version Control

Protected Endpoints