EduSense
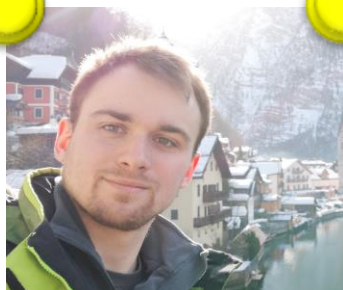
Prototype Presentation
Team Emerald 08/06/25

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Team Emerald

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ChatGPT and Grammarly have become everyday companions for students. There's a growing risk that we're letting AI do too much thinking for us, leading to weaker critical thinking, creativity, and problem-solving skills.

Recent studies show AI can boost writing quality and save time, but students who rely too heavily on AI understand less in the long term. That's why we're building a mobile/web application that will encourage users to think first with features like reflective prompts, challenge modes, and usage tracking.

EduSense will empower students and teachers to harness the benefits of AI while still building the independent skills that matter most for lifelong learning.

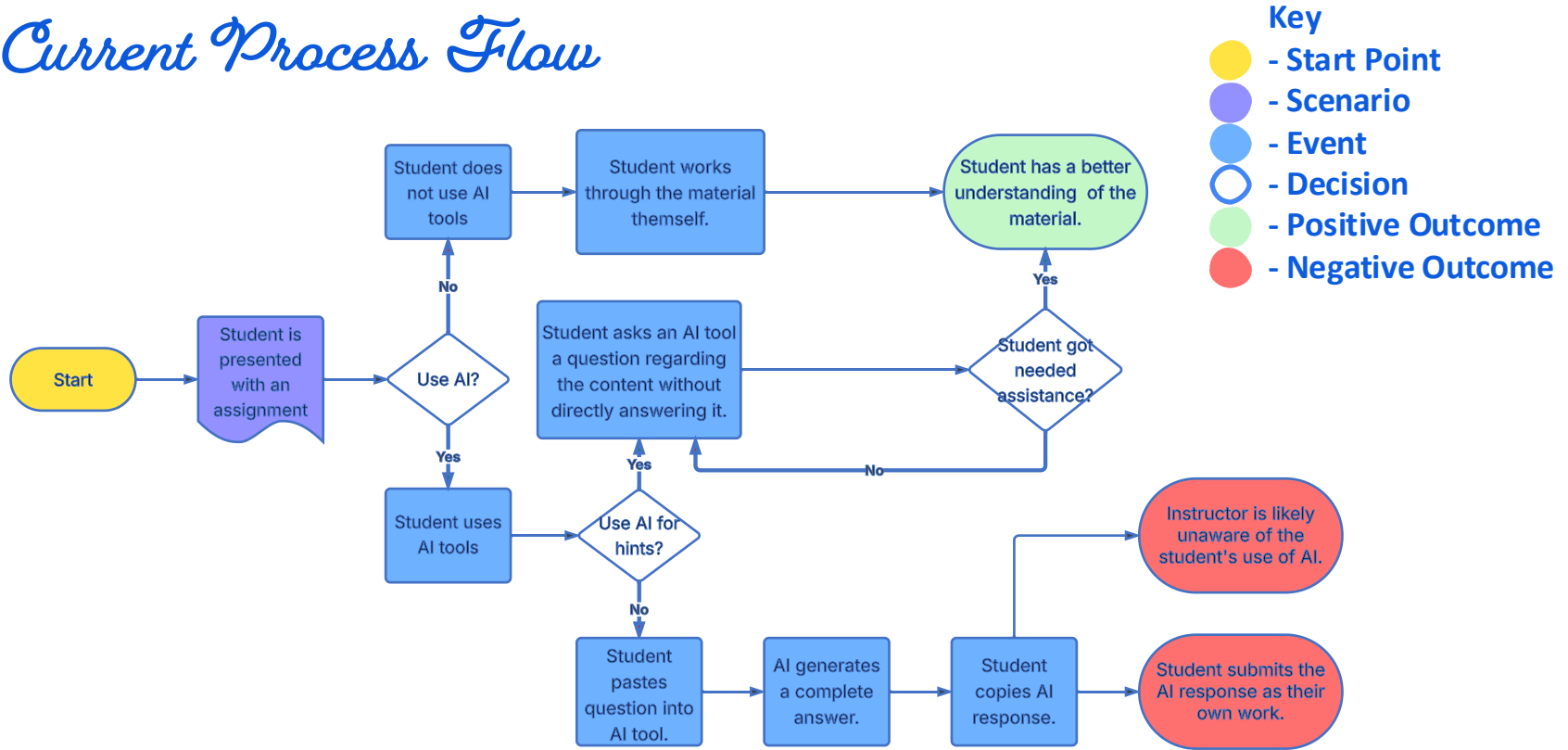# The Societal Problem

As ChatGPT, Grammarly, and AI search engines become more popular, many users, especially students, have begun to rely on them too much. Instead of using them for support, users are asking these AI tools to do their thinking for them. While that may seem helpful in the moment, it could cause long-term issues in developing critical thinking, creativity, and problem-solving skills.

Problem Characteristics

- According to Qirui Ju, a study conducted on a group of students found that those who fully relied on AI for their school assignments scored almost 20% lower during a writing assignment than those who don't. (Ju, 2025)

- A systematic review found that excessive reliance on AI dialogue systems significantly impairs students' abilities in critical thinking, decision-making, and analytical reasoning. (Zhai et al., 2024)

- Many users rely on AI responses without checking them, often because of mental shortcuts and cognitive biases. (Vasconcelos et al., 2023)

Current Process Flow

Key
- 🟡 - Start Point
- 🟣 - Scenario
- 🔵 - Event
- ⚪ - Decision
- 🟢 - Positive Outcome
- 🔴 - Negative Outcome

Start → Student is presented with an assignment → Use AI?

No → Student does not use AI tools → Student works through the material themself. → Student has a better understanding of the material.

Yes → Student uses AI tools → Use AI for hints?

Yes → Student asks an AI tool a question regarding the content without directly answering it. → Student got needed assistance?

Yes → Student has a better understanding of the material.

No → (back to Student asks an AI tool a question)

No → Student pastes question into AI tool. → AI generates a complete answer. → Student copies AI response. → Instructor is likely unaware of the student's use of AI.

Student copies AI response. → Student submits the AI response as their own work.
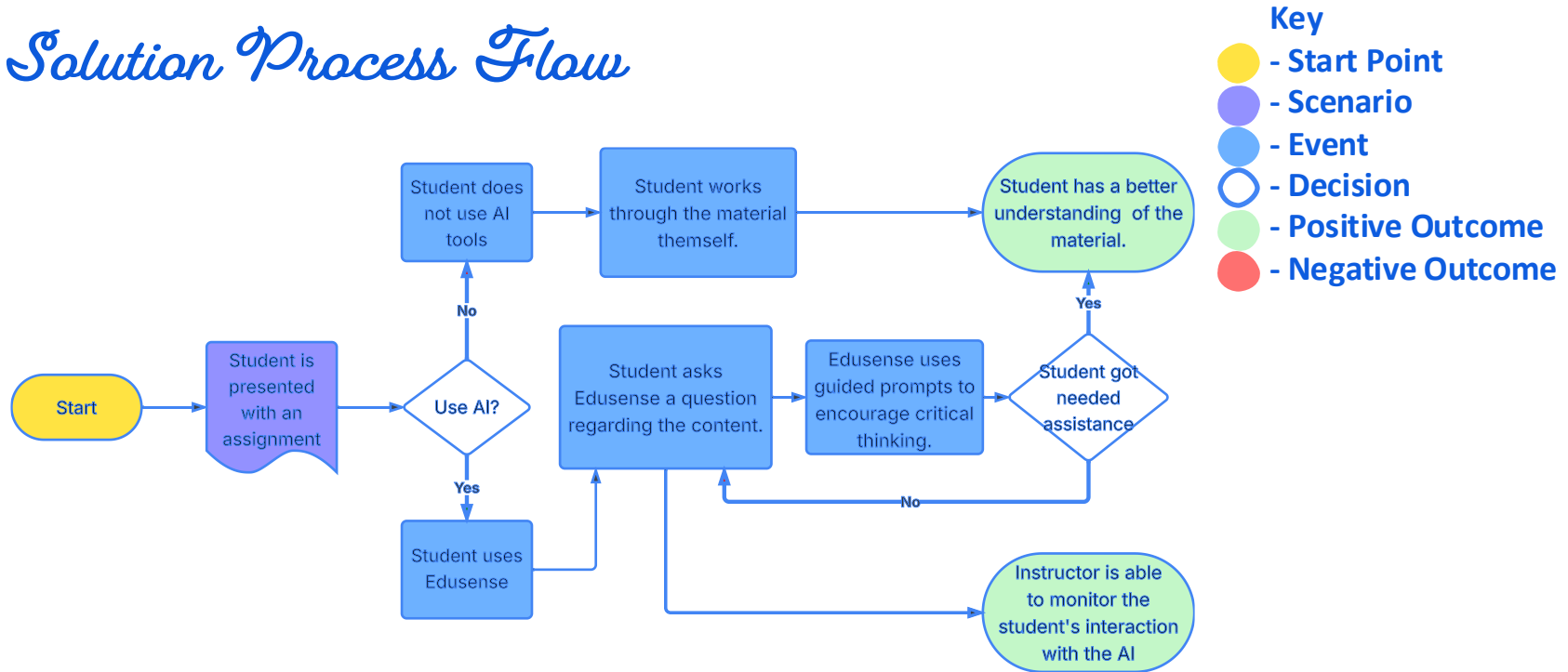
Solution Statement

Our goal is to build EduSense, a mobile app and web application that helps students and educators use AI tools more intentionally. Instead of giving direct answers, the app will encourage users to use their own thought process first with the help of guided questions, reflective prompts, and challenge modes that limit or delay AI input. The end goal is to help students better understand the material.

The student's usage history will also be accessible to educators. This will allow them to identify problem areas in student comprehension and improve their lesson plans. EduSense will include integration with Canvas so that it can recognize the context of student questions.

Canvas Integration Overview

- Canvas was selected for its widespread adoption, reducing complexity for instructors and students

- Direct integration with Canvas API enables automatic syncing of assignments, due dates, and instructional materials into EduSense

- AI generates guided prompts tailored specifically to the synced assignment content

- Instructors can directly control AI assistance levels for each synced assignment

- Student interactions are captured, allowing instructors to monitor common difficulties

Solution Process Flow

Key
- 🟡 **- Start Point**
- 🟣 **- Scenario**
- 🔵 **- Event**
- ⚪ **- Decision**
- 🟢 **- Positive Outcome**
- 🔴 **- Negative Outcome**

Start

Student is presented with an assignment

Use AI?

No → Student does not use AI tools → Student works through the material themself. → Student has a better understanding of the material.

Yes → Student uses Edusense

Student asks Edusense a question regarding the content.

Edusense uses guided prompts to encourage critical thinking.

Student got needed assistance

Yes → Student has a better understanding of the material.

No →

Instructor is able to monitor the student's interaction with the AI

This Process Flow assumes that a student does not plan on letting AI tools solve their problems.

What It Will Do

- Helps the student develop critical thinking and problem-solving skills.

- Provides the student with access to an LLM while completing their assignment.

- Guides the student's questions with leading prompts to help them arrive at the answer.

- Provides the instructor with the student's user history.

- Provides the instructor with the ability to upload assignments to EduSense.

- Integrates with learning platforms such as Canvas to better guide students.

What It Won't Do

- Provide direct answers to assignment questions.

- Replace the need for student effort and critical thinking.

- It will not diminish guardrails put in place by an LLM's originator.

Competition Matrix

Function	EduSense	Chegg	ChatGPT	Google's AI Overview
Explains how the solution was achieved	✓	✓	✓	✓
Saves user history for review	✓	✓	✓	
Integrates with learning platforms to better assist students and instructors	✓			
Provides external links to more information	✓		✓	✓
Guides the user with leading prompts based on the desired answer	✓			
Improve Student Problem-Solving and Critical Thinking	✓			

Development Tools

Development Space	Tool
Frontend	HTML, CSS, JavaScript and React
Backend	Python (Django)
Database	PostgreSQL
Testing Framework	PyTest (Python), Jest (JavaScript)
Documentation Tool	Pydoc (Python), JSDoc (JavaScript)
LLM Integration	OpenAI GPT, Claude, Gemini, or LLaMa
Version Control / CI-CD	Git, Github, Github Actions, Github Workflows

Functional Components

- User Authentication (students & educators)

- Assignment Management (upload, assign, track)

- AI Integration (prompts, challenge modes, LLM access)

- Copy/Paste restriction layer

- Admin Controls (Educators can toggle certain LLM features by assignment as well as select from a variety of LLMs)

Admin Controls Example (ChatGPT)

- Instructors will be able to enable or disable EduSense for specific assignments.

- Instructors will be able to assign a limit to the number of prompts per question as a challenge mode, encouraging students to take great care in how they structure their prompts and what they use them for.

- Instructors can assign challenge modes (unrelated to grade) based on prompt content or frequency of use and potentially reward students based on the challenge mode. This may incentivize students to be more considerate of how they use EduSense.

Gamification

- Students may feel inclined to bypass the guided prompts.

- This issue can be mitigated by employing gamification to keep them engaged.

- EduSense will feature a 'challenge mode' with different difficulties that students can select from.

- Harder difficulties will limit the amount of support they get from the LLM (e.g, less guidance).

- Educators have the option to reward extra credit for assignments completed on harder difficulties.

Major Functional Components Diagram

Canvas LMS API
[Off-the-shelf]

LLMs
[Off-the-shelf]

GitHub
[Off-the-shelf]

Sends / Recives prompts

Fetches Assignments,
Instructions, and Lecture Material

Version Control / Deployment

Users

FrontEnd (React)
[Build]

REST

BackEnd (Django)
[Build]

Reads / Writes User Data

Database (PostgreSQL)
[Off-the-shelf]

Policy Enforcement

Admin Logic Layer
[Build]

Core EduSense System Components Depolyed by Team

Risks Overview

- Bypassing Guardrails: Students may still find workarounds.

- Privacy Concerns: Tracking usage must comply with FERPA/GDPR.

- Technical Complexity: integrating restrictions and analytics.

- User Adoption: Educators and students may resist new workflows.

Risks – Customer & End User
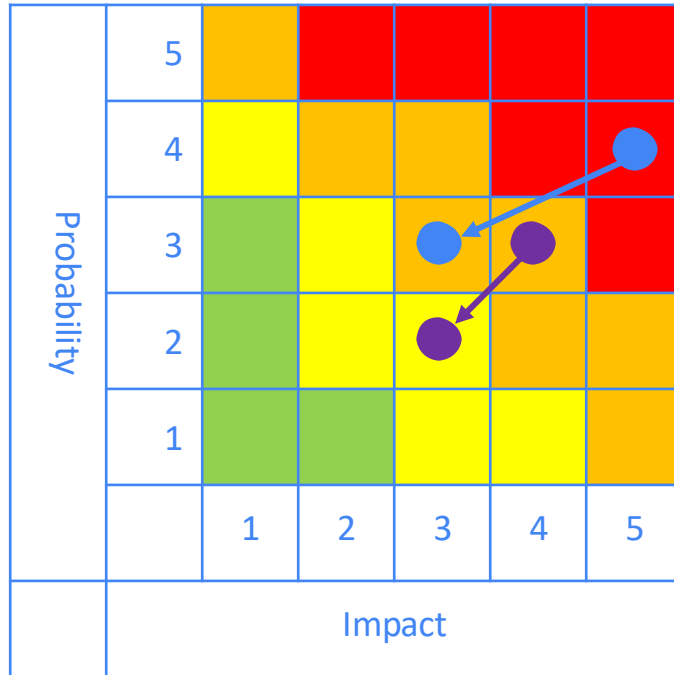
- **Risk: Students Bypass Guided Prompts**
  - Probability: 4; Impact: 5
  - Mitigation: Employ gamification and reward users to keep them engaged.
  - Expected reduction: Probability: 3; Impact: 3

- **Risk: Students Find EduSense Cumbersome**
  - Probability: 3; Impact: 4
  - Mitigation: EduSense will remember what concepts users have already mastered, bypassing unnecessary prompts in future sessions and incorporating periodic knowledge checks to ensure users don't forget what they've already learned.
  - Expected Reduction: Probability: 2; Impact: 3

Risks – Technical

- **Risk: Prompt Guidance Fails**
  - Probability: 3; Impact: 5
  - Mitigation: Employ extensive testing with diverse special cases and include 'backstep/undo' options to revert to a previous state should a prompt fail to guide the student.
  - Expected reduction: Probability: 2; Impact: 2

- **Risk: LLM Quota Limits**
  - Probability: 4; Impact: 5
  - Note: Prototype risk that only needs to be considered during development.

Risks – Security

- **Risk: User Inputs Confidential/Personal Information**
  - Probability: 2; Impact: 5
  - Mitigation: Utilize the filters already present in the LLM to detect certain keywords and block certain prompts. Then relay the LLM warnings to the user. Also relay if any confirmation on the user side is required due to possible confidential data within in the prompt.
  - Expected reduction: Probability: 1; Impact: 2
- **Risk: Users Try to Access Harmful Content**
  - Probability: 3; Impact: 4
  - Mitigation: Utilize the filters already present in the LLM to detect certain keywords and block certain prompts. Then relay the LLM warnings to the user.
  - Expected reduction: Probability: 2; Impact: 2

Risks – Legal

- **Risk: Plagiarism**
  - Probability: 2; Impact: 4
  - Mitigation: Provide disclaimers and guidance on ethical AI use as well as encourage citation of AI assistance. EduSense will provide MLA / APA citations of source material in this case.
  - Expected reduction: Probability: 2; Impact: 1

- **Risk: Copyright Infringement (e.g. user uploads textbook excerpts)**
  - Probability: 2; Impact: 4
  - Mitigation: Add a user content policy that prohibits copyright violations. In addition, utilize the filters already present in the LLM to detect certain keywords and block certain prompts. Then relay the LLM warnings to the user.
  - Expected reduction: Probability: 2; Impact: 2

Work Breakdown Structure
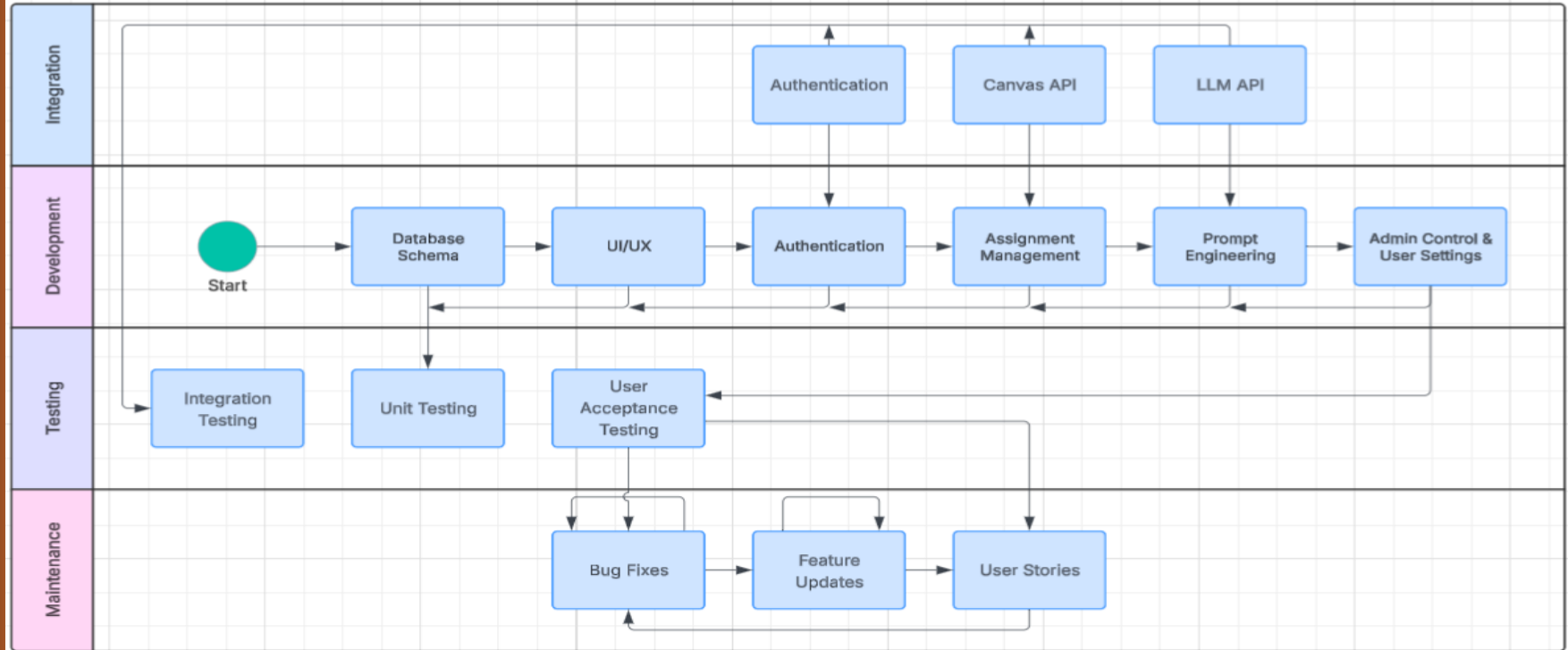
Authentication Algorithm

1. An authorization request is generated.
2. EduSense redirects based on the selected method of authentication.
   ○ Redirect options may be EduSense Login, Canvas SSO, or OAuth 2.0
3. The identity provider authenticates the user and returns an auth code.
4. The backend exchanges the code for access tokens or validates password.
5. The backend creates or updates the user's records in the database with the appropriate tokens.
6. The login event is recorded to the database.
7. A session is issued to the client.

Authentication Algorithm – Continued

8. Subsequent requests will trigger validation of the stored token.
   o Logout or session timeout will cause revocation of the token and session cleanup.

9. Error/Edge Cases
   o If a provider is unavailable, the system will issue an error and recommend using another provider.
   o If the stored token is invalid, reauthentication will be forced.
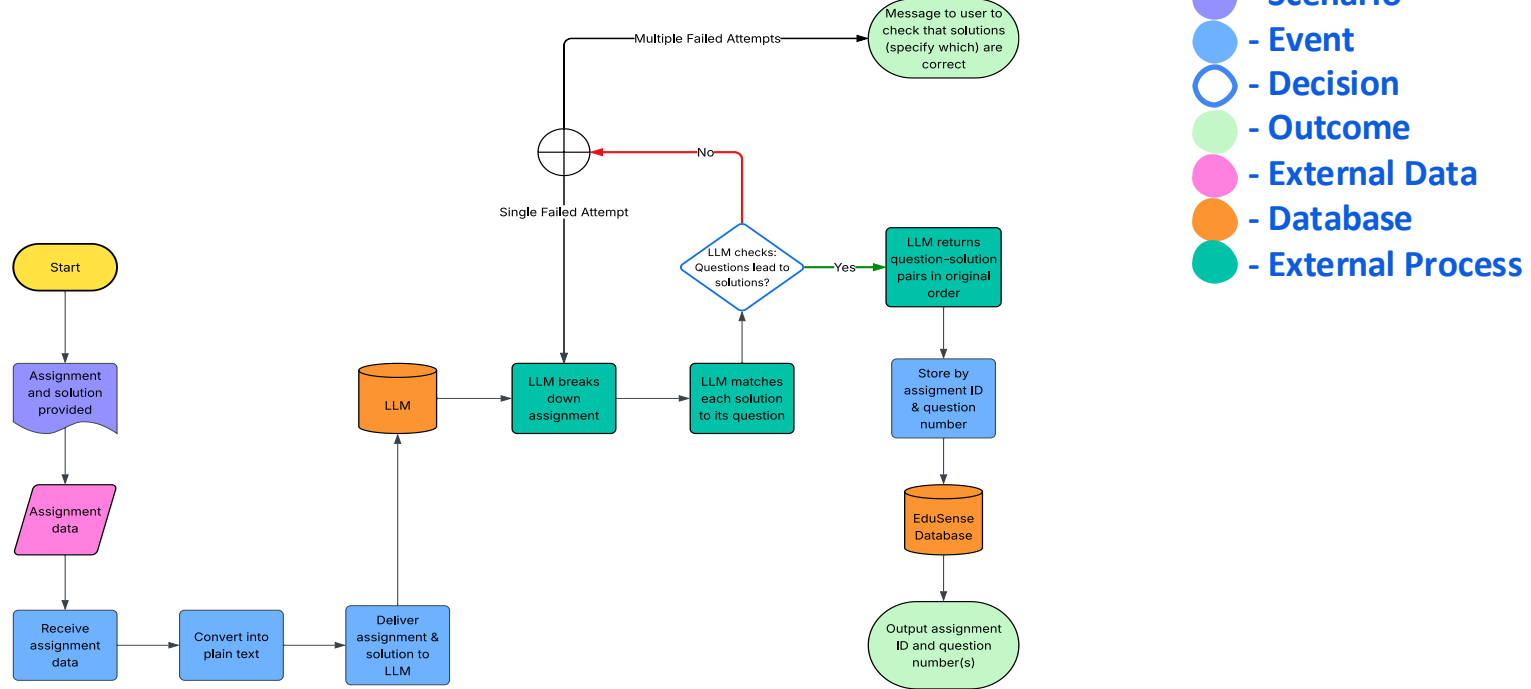   o Account lockout will occur on rapid or excessive login attempts.

Authentication Process Flow

Key
- Start Point
- Scenario
- Event
- Decision
- Outcome
- External Data
- Database
- External Process
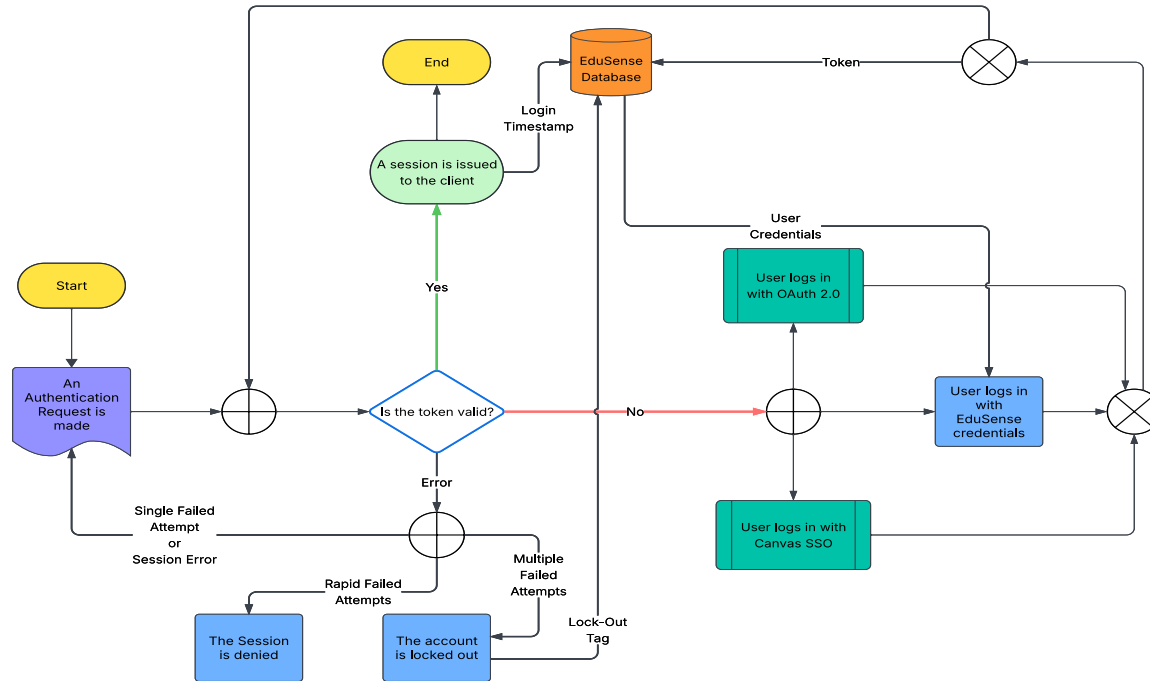
Assignment Management Algorithm

1. An assignment is delivered for parsing.
2. The assignment is converted into plain text.
3. The assignment and solution are delivered to the LLM with the appropriate command prompt.
   - This command prompt will request the LLM break down the assignment into individual questions.
4. The LLM breaks the assignment down into its individual questions.
   - Multi-step questions will be treated as individual questions with related information copied to each.
5. The LLM matches each solution to its respective question.
6. The LLM returns the Question-Solution pairs produced in original order.
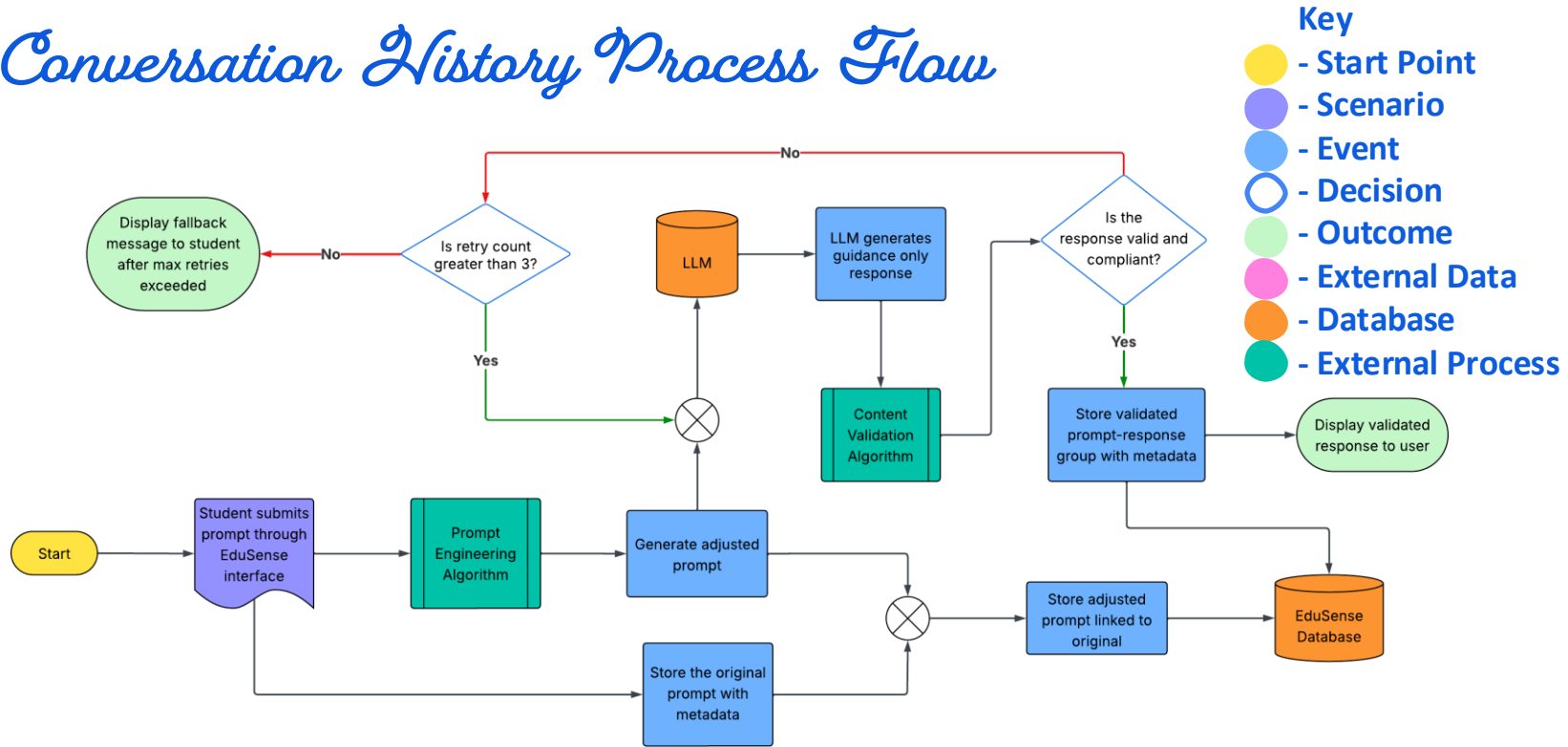7. Question-Solution pairs are stored in the database by assignment ID and question number for easy reference.

Assignment Management Process Flow

Key
- Start Point
- Scenario
- Event
- Decision
- Outcome
- External Data
- Database
- External Process

Start

Assignment and solution provided

Assignment data

Receive assignment data

Convert into plain text

Deliver assignment & solution to LLM

LLM

LLM breaks down assignment

LLM matches each solution to its question

LLM checks: Questions lead to solutions?

LLM returns question-solution pairs in original order

Store by assigment ID & question number

EduSense Database

Output assignment ID and question number(s)

Message to user to check that solutions (specify which) are correct

Multiple Failed Attempts

Single Failed Attempt

No

Yes

Conversation History Algorithm

1. The student creates a prompt; it is handed off to the platform's engineering algorithm. In parallel, the original prompt is stored in the database by assignment ID and question number.
2. When the platform's engineering algorithm produces an adjusted prompt, it is stored in the database with the original prompt by assignment ID and question number.
3. After the LLM response has been validated, the response is stored in the database with its respective original and adjusted prompts by assignment ID and question number.
4. EduSense stores a timestamp with the Prompt-Response group.
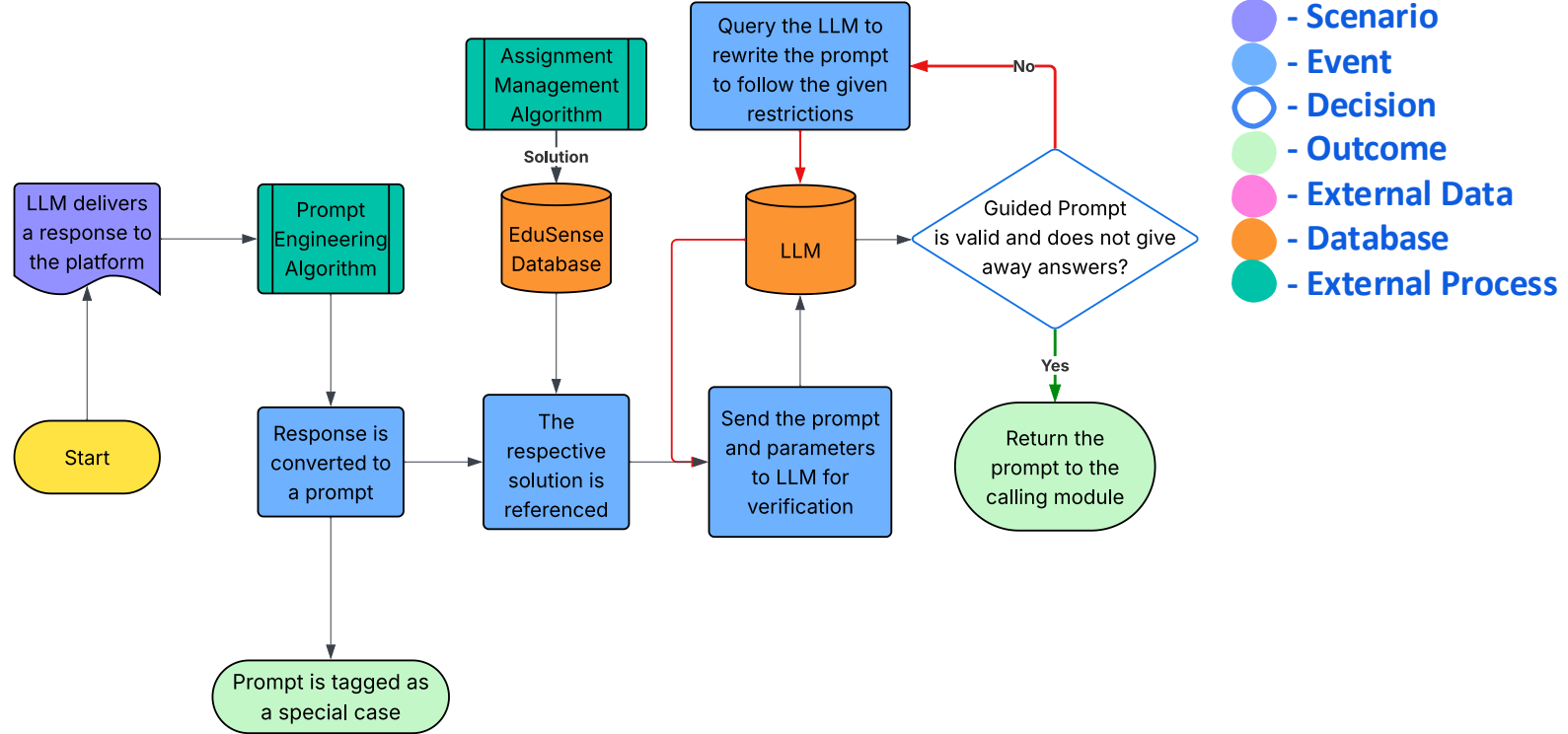
Conversation History Process Flow

Key
- Start Point
- Scenario
- Event
- Decision
- Outcome
- External Data
- Database
- External Process

Prompt Engineering Algorithm

1. The module begins by normalizing and parsing the original prompt plain text.
2. The original prompt will be scanned for banned asks.
   - Direct answer requests, plagiarism, or violations of LLM terms of use.
3. A semantic search will pull relevant excerpts from provided context.
   - The provided context will be in the form of question text, rubrics, and solutions.
4. A command prompt is sent to the LLM to produce an adjusted prompt that will return a guidance-only response based on the original prompt and provided context.
5. The newly adjusted prompt is then sent to the Content Validation Algorithm and then displayed to the user if validated.

Prompt Engineering Process Flow

Key
- Start Point
- Scenario
- Event
- Decision
- Outcome
- External Data
- Database
- External Process

Start → Receive the user's original prompt

Scan the prompt for banned asks

Does the prompt contain banned asks?

Output an error message to the user (Yes)

No

Normalize & parse the prompt as plain text

Assignment Management Algorithm

Perform a semantic search to pull relevant excerpts from provided content

Send a command prompt to the LLM to produce an adjusted prompt

LLM

LLM returns a guidance-only response

Content Validation Algorithm

Output the validated prompt to the user

Content Validation Algorithm

1. The LLM delivers a response to the EduSense.
2. The response is converted to a prompt by the Prompt Engineering algorithm.
   - Tagged as a special case to override settings and other requirements.
3. The respective question solution is referenced from the database.
4. The adjusted prompt is sent back to the LLM with the appropriate command prompt and solution for comparison.
   - This command prompt will have the LLM compare the response to the provided solution both word-for-word and by context.
   - The expected response from this step will be binary.

5T. Return the valid response to the calling module.

5F. Request the LLM to fix the prompt according to the criteria and return to Step 4.

Content Validation Process Flow

Key
- Start Point
- Scenario
- Event
- Decision
- Outcome
- External Data
- Database
- External Process

Assignment Management Algorithm

Query the LLM to rewrite the prompt to follow the given restrictions

Solution

LLM delivers a response to the platform

Prompt Engineering Algorithm

EduSense Database

LLM

Guided Prompt is valid and does not give away answers?

Start

Response is converted to a prompt

The respective solution is referenced

Send the prompt and parameters to LLM for verification

Return the prompt to the calling module

No

Yes

Prompt is tagged as a special case

Database Schema

- Primary Key (PK)
- Foreign Key (FK)
- Non-Key Attribute
- One-to-Many Relationship

Team Emerald – Prototype Presentation
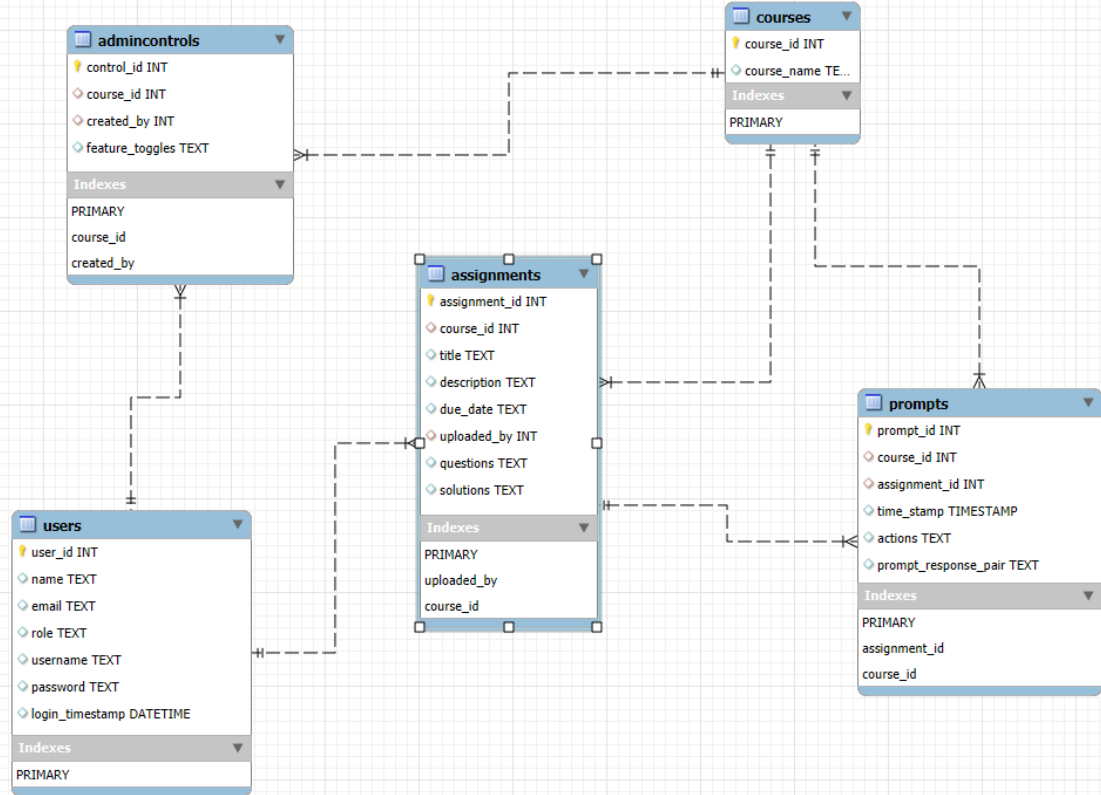
Login Page

EduSense

Email

Password

●●●●●●●●●●●●●●●●●

Login →

Don't have an account? Sign up

Reset Password

Student View

EduSense

Chat History

History 1

History 2

History 3

History 4

Select Course

First option

Select Assignment

First option

Ask a Question

Educator View

Course Setup

Course Setup

Connected to Canvas

Select Course ⌄

Course Name
Course Code
Term
Instructor

○ Challenge Mode
○ Skip Mastered Content
○ Knowledge Checks

AI Assistance

Low   Med   High
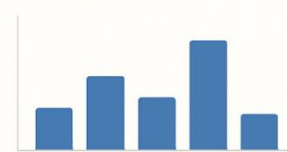
Upload Files

✔ File.pdf
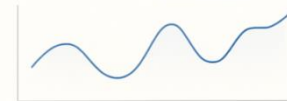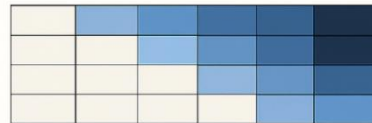
Analytics

Real World Product vs. Prototype

Feature	Real World Product	Prototype
Scalability	High	Low
Security	Robust (OAuth, encryption)	Basic
Analytics	Full (detailed exportable)	Limited
UX/UI	Polished, responsive	Basic Functional
LLM Integration	Proprietary, customizable	Open source limited
Canvas Intergration	Full API sync	Basic sync/ manual upload
Number of LLM's	Multiple supported	One LLM

Conclusion

- Large Language Models like ChatGPT and Gemini have become pervasive in education.

- Students and Educators need a tool that help them better engage with an LLM.

- EduSense will apply ethical AI use and the Socratic method of teaching to fulfill this need.

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Appendix

Glossary

- Artificial Intelligence (AI): Ability for a computer of machine to perform tasks that typically require human intelligence. Ex. Problem solving, languages, or understanding languages.
- Canvas LMS: A learning management system used by educators to manage course content, assignments, and communication with students.
- Challenge Mode: Setting that encourages learners to try on their own before getting help. It limits access to answers to encourage thinking through the assignment first.
- Guided prompts: Targeted questions or hints created to help students think critically and come up with their own solution.
- Large Language Model (LLM): An advanced AI system trained on massive text datasets to understand and generate human-like language.
- MFCD (Modified Functionality Component Diagram): A diagram showing the major hardware and software components of the product and how they interact.
- Usage Tracking: The process of recording how users interact with the system, such as which features they use or how they engage with AI prompts.