Cover Page

CEBU INSTITUTE OF
TECHNOLOGY UNIVERSITY

COLLEGE OF COMPUTER STUDIES

Software Design Description

for

TechnoDynamic V2: AI-Enhanced Dynamic Content for Technopreneurship

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Preface

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1. Introduction

In the ever-evolving landscape of education, the integration of technology plays a pivotal role in enhancing teaching methodologies and enriching learning experiences. TechnoDynamic V2 represents the next iteration in the evolution of educational tools, offering innovative solutions to address the dynamic needs of both educators and learners.

1.1. Purpose

The purpose of TechnoDynamic V2 is to provide teachers with AI-enhanced dynamic content for the Technopreneurship course based on insights gathered from student FAQs. By leveraging artificial intelligence (AI), the system recommends content enhancements that address common student questions and areas of confusion. This approach aims to maximize teacher efficiency by minimizing student inquiries and providing targeted, relevant content to facilitate deeper learning experiences.

1.2. Scope

The scope of TechnoDynamic V2 includes the development of a system that utilizes AI to recommend content enhancements for the Technopreneurship course based on insights derived from student-generated FAQs. The system analyzes common themes and areas of confusion among students to generate recommendations for dynamic content updates that address student needs and optimize teaching efficiency.

1.3. Definitions and Acronyms

To ensure clarity and understanding, key terms and acronyms pertinent to TechnoDynamic V2 are defined:

1. TechnoDynamic V2: The advanced iteration of the TechnoDynamic system, integrating AI capabilities to enhance dynamic content for the Technopreneurship course.
2. AI (Artificial Intelligence): The simulation of human intelligence processes by machines, enabling tasks such as natural language processing and pattern recognition.
3. Dynamic Content: Educational materials and resources that adapt and evolve based on user interactions and feedback, aiming to optimize learning experiences.
4. Teacher Efficiency: The ability of educators to maximize the effectiveness of their instructional delivery while minimizing resource expenditure.
5. Content Enhancements: Improvements and updates made to course materials to enhance clarity, relevance, and effectiveness in supporting student learning objectives.

TechnoDynamic V2 represents a paradigm shift in educational technology, leveraging AI-driven insights to create a more responsive and engaging learning environment. Through collaboration between technology and pedagogy, TechnoDynamic V2 seeks to empower both teachers and students on their educational journey.

2. References

3. Decomposition Description

3.1. Module Decomposition

3.1.1. Module 1: Teacher Profile

Description: This module allows teachers to manage their profiles, set notification thresholds, and configure preferences for content suggestions. It ensures that teachers can customize their interaction with the system based on their preferences and teaching needs.

Sub-modules:

1. Setting Threshold for Notification and Context Similarity

- **UI / Screen**: An interface for updating personal information and setting thresholds.
    - **Functionality**:
        - **Set Notification Threshold**: Allows teachers to define the threshold for receiving notifications about new insights or content suggestions.
        - **Set Context Similarity Threshold**: Enables teachers to adjust the context similarity threshold to fine-tune the AI suggestions, ensuring relevance to their teaching material.

By adhering to these requirements, the Teacher Profile module ensures that teachers have control over their notification preferences and the relevance of AI content suggestions. This customization facilitates a personalized and efficient teaching experience.

3.1.2. Module 2: Student Lesson Page

Description: This module displays lessons and facilitates interaction between students and lesson content. It provides a seamless and interactive learning experience for students.

Sub-modules:

1. Display Lesson Page

- **UI / Screen**: An interface for displaying lesson content.
    - **Functionality**:
        - **Display Lesson Content**: Students can view the detailed lesson content in a structured and engaging manner.
        - **Chatbot Interaction**: Students can interact with a chatbot to ask questions related to the lesson. The chatbot processes these inquiries, creates FAQs based on the context, and sends notifications to teachers if needed.

By adhering to these requirements, the Student Lesson Page module ensures that students have easy access to lesson content and can interact with the system to clarify doubts. This interaction generates valuable data for improving lesson content and reduces repetitive queries.

3.1.3. Module 3: Frequently Asked Questions (FAQ)

Description: This module provides a centralized FAQ page for students to find answers to common questions. It helps in reducing the repetitive queries and improves the efficiency of the learning process.

Sub-modules:

1. Display FAQ Page

- **UI / Screen**: An interface for displaying FAQs.
    - **Functionality**:
        - **View FAQs**: Displays frequently asked questions categorized by topic or lesson, allowing both students and teachers to access relevant information quickly and efficiently.

By adhering to these requirements, the FAQ module ensures that students and teachers have quick access to a repository of common questions and answers. This reduces the burden on teachers to repeatedly answer the same questions and helps students find solutions independently.

3.1.4. Module 4: Notification

Description**:** This module handles the notification process for informing teachers about insights gathered from students' Frequently Asked Questions (FAQs) for specific lessons.

Sub-modules:

1. In-App Notifications

- Send Notifications: This submodule is responsible for sending notifications to teachers via in-app notifications regarding insights gathered from student FAQs for a particular lesson.
- Content of Notifications: Notifications will include a message informing teachers that "Your X lesson has an AI content suggestion based on FAQs from students!" This message alerts teachers about the availability of AI-generated content recommendations tailored to the X lesson, derived from insights gathered from student inquiries. The notification captures the teacher's attention and prompts them to review the suggested AI-enhanced content for potential integration into the lesson materials.
- Delivery: Notifications will be delivered directly to teachers' in-app notification centers for immediate access and visibility.
- Timeliness: Notifications will be sent in real-time or based on a predefined schedule to ensure timely communication with teachers.

By adhering to these requirements, the notification module ensures effective communication between the system and teachers, enabling them to stay informed about insights derived from student interactions and facilitating informed decision-making in the teaching process.

3.1.5. Module 5: Ask for Insights / Ask for Content Page

Description: This module serves as the interface for teachers to request either insights or AI-enhanced dynamic content based on student FAQs, providing a streamlined user experience.

Sub-modules:

1. Choose Request Type
    - Present Options: This submodule presents clear options for teachers to choose between requesting insights or AI-enhanced content, ensuring straightforward navigation within the system.
    - Capture Selection: Responsible for capturing the teacher's selection and routing them to the corresponding page based on their choice, facilitating efficient user interaction.
2. Request Insights Page
    - Insights Presentation: This submodule displays insights gathered from student FAQs for the selected lesson, providing teachers with valuable information to enhance their teaching materials.
    - Review Insights: Enables teachers to review and analyze the presented insights, identifying common themes or areas of interest among student inquiries.
    - Feedback Mechanism: Allows teachers to provide feedback or take further actions based on the insights received, such as refining lesson plans or requesting additional resources.
3. Request AI suggested content Page
    - Content Suggestions: Presents AI-generated content suggestions based on student FAQs for the selected lesson, offering teachers alternative teaching materials enriched with student-driven insights.
    - Review Content: Provides teachers with the opportunity to review and evaluate the suggested AI-enhanced content, assessing its relevance and potential impact on the lesson.
    - Acceptance Mechanism: Enables teachers to accept the proposed content for integration into their teaching materials, streamlining the content selection process and enhancing lesson quality.

By adhering to these requirements and sub-modules, the Ask for Insights / Ask for Content Page module enhances user experience and facilitates informed decision-making for teachers within the system.

3.1.6. Module 6: Insights Page

Description: This module provides teachers with AI-generated insights on the lesson based on the FAQs gathered from students, aiding in lesson planning and content refinement.

Sub-modules:

1. Generate Insights:

   This submodule generates insights using AI algorithms analyzing student FAQs related to the lesson, offering valuable information to teachers.

- It utilizes natural language processing (NLP) techniques to analyze student questions and inquiries, identifying common themes, areas of confusion, and notable trends within the FAQs.
- The submodule then generates comprehensive insights reports summarizing key findings and providing actionable recommendations for the lesson.
- Additionally, on the Insights Page, student FAQs will be displayed under categorized groups of questions and notifications, enabling teachers to easily review and understand the context behind the insights.

2. Present Insights:

   This submodule presents AI-generated insights to teachers in a clear and accessible format, aiding in decision-making and possible lesson planning.

- Display insights reports derived from AI analysis of student FAQs, highlighting key findings and recommendations.
- Organize insights into categories such as common questions, areas of interest, and suggested actions.

3. Request Content Suggestions:

   This submodule allows teachers to request AI-generated content suggestions directly from the Insights Page.

- Provide an interface for teachers to request additional content suggestions based on the insights provided.
- Trigger AI algorithms to generate content suggestions tailored to the lesson and insights gathered.
- Present generated content suggestions to teachers for review and integration into teaching materials.

By incorporating these sub-modules, the Insights Page module provides teachers with valuable AI-generated insights tailored to the lesson, empowering them to make informed decisions and enhance the teaching and learning experience.

3.1.7. Module 7: Accept/Ignore Content Page

Description: This module enables teachers to review and decide whether to accept or ignore AI-enhanced dynamic content suggested by the system, based on insights gathered from student FAQs.

Sub-modules:

1. Present Content Changes:

   This submodule presents the proposed AI-enhanced content to the teacher for evaluation, highlighting modifications based on insights derived from student FAQs.

- Display the original content alongside the proposed AI-enhanced content for comparison.
- Highlight changes and enhancements made to the content, emphasizing areas influenced by student inquiries.
- Provide clear visual cues and annotations to facilitate the review process.

2. Acceptance Mechanism:

   This submodule captures the teacher's decision to accept the proposed AI-enhanced content for integration into the lesson materials.

- Provide options for the teacher to accept the proposed content changes, signaling approval for integration into the lesson materials.
- Capture the teacher's acceptance decision and store it in the system for future reference.
- Enable teachers to communicate their decisions effectively, providing any accompanying feedback or comments.

3. Ignore Mechanism:

   This submodule allows teachers to ignore the proposed AI-enhanced content and retain the original lesson materials.

- Provide options for the teacher to ignore or reject the proposed content changes, indicating a preference to retain the original lesson materials.
- Capture the teacher's decision to ignore the proposed changes and store it in the system for future reference.
- Facilitate communication of the decision to ignore the proposed changes, if necessary.

By incorporating these sub-modules, the Accept/Deny Content Page module enables teachers to make informed decisions about integrating AI-enhanced content into their lesson materials, based on insights derived from student FAQs.

3.1.8. Module 8: Revert Content Page

Description: This module provides teachers with the functionality to revert to the original lesson materials after accepting the AI-enhanced dynamic content changes.

Sub-modules:

1. Revert Changes:

   This submodule allows the teacher to revert the AI-enhanced content changes, restoring the original lesson materials.

- Present a clear option for the teacher to revert the accepted content changes.
- Capture the teacher's decision to revert changes and update the lesson materials accordingly.
- Provide confirmation messages or notifications to acknowledge the reversion of content changes.

By incorporating these sub-modules, the Revert Content Page module allows teachers to revert AI-enhanced content changes to the original lesson materials, providing flexibility and control over the teaching material

3.2. Concurrent Process Decomposition

3.2.1. User Interaction Flow

- Student Interaction
  - Module 2: Student Lesson Page
    - Students view lesson content.
    - Students interact with the chatbot to ask questions.
    - The chatbot processes these inquiries and generates FAQs.
- Teacher Interaction
  - Module 1: Teacher Profile
    - Teachers set notification and context similarity thresholds.
  - Module 5: Ask for Insights / Ask for Content Page
    - Teachers choose between requesting insights or AI-enhanced content.
    - Teachers review insights gathered from student FAQs.
    - Teachers review AI-generated content suggestions.
  - Module 7: Accept/Ignore Content Page
    - Teachers review proposed AI-enhanced content changes.
    - Teachers decide to accept or ignore the proposed changes.
  - Module 8: Revert Content Page
    - Teachers revert to the original lesson materials if needed.
- System Interaction
  - Module 1: Notification
    - System sends notifications to teachers about insights and content suggestions.
  - Module 3: Frequently Asked Questions (FAQ)
    - System displays FAQs based on student inquiries.
  - Module 6: Insights Page
    - System generates insights based on student FAQs.
    - System presents insights and content suggestions to teachers.

- Module 7: Accept/Ignore Content Page
    - System presents proposed content changes to teachers for review.
    - System captures teachers' decisions on content changes.

3.2.2. Data Processing Flow

- Insights Generation
  - Module 6: Insights Page (Sub-module 1)
    - System utilizes NLP techniques to analyze student questions.
    - System identifies common themes and trends within FAQs.
    - System generates insights reports summarizing key findings.
- Content Suggestions
  - Module 6: Insights Page (Sub-module 3)
    - System triggers AI algorithms to generate content suggestions.
    - System presents generated content suggestions to teachers.
- Content Review and Integration
  - Module 7: Accept/Ignore Content Page (Sub-module 1 & 2)
    - System presents proposed AI-enhanced content changes to teachers.
    - System captures teachers' acceptance or rejection decisions.
- Content Reversion
  - Module 8: Revert Content Page (Sub-module 1)
    - System reverts AI-enhanced content changes based on teachers' requests.
- Notification and Profile Management
  - Module 1: Teacher Profile
    - System updates notification thresholds and context similarity settings based on teacher inputs.
- Lesson and FAQ Management
  - Module 2: Student Lesson Page
    - System displays lesson content to students.
    - System processes student interactions with the chatbot to create FAQs.
    - System sends notifications to teachers about newly created FAQs.

- ➢ Module 3: Frequently Asked Questions (FAQ)
    - ■ System displays FAQs based on student inquiries, categorized for easy access.

❖ Content Request and Insights

- ➢ Module 5: Ask for Insights / Ask for Content Page
    - ■ System processes teachers' requests for insights or content suggestions.
    - ■ System generates and displays relevant insights and content suggestions based on student FAQs.

By adhering to these requirements, the Data Processing Flow ensures that each module interacts effectively to facilitate the generation, presentation, and management of insights, content suggestions, and notifications, ultimately enhancing the teaching and learning experience.

3.2.3. Feedback and Iteration Loop

- ❖ Teacher Feedback
  - ➢ Module 1: Teacher Profile
    - ■ Teachers provide feedback on notification thresholds and context similarity settings.
  - ➢ Module 2: Student Lesson Page
    - ■ Teachers review and provide feedback on student interactions and chatbot-generated FAQs.
  - ➢ Module 3: Frequently Asked Questions (FAQ
    - ■ Teachers provide feedback on the relevance and clarity of FAQs displayed.
  - ➢ Module 4: Notification
    - ■ Teachers provide feedback directly from the notification interface regarding the usefulness and timing of notifications.
  - ➢ Module 5: Ask for Insights / Ask for Content Page
    - ■ Teachers provide feedback on the insights and content suggestions generated by the system.
    - ■ Sub-module 2 & 3: Teachers provide specific feedback on the AI-generated insights and content suggestions.
  - ➢ Module 6: Insights Page
    - ■ Teachers provide feedback on the insights generated from student FAQs and the usability of the insights report.
  - ➢ Module 7: Accept/Ignore Content Page
    - ■ Sub-module 2: Teachers provide feedback when accepting or ignoring content changes suggested by the AI.
  - ➢ Module 8: Revert Content Page
    - ■ Teachers provide feedback on the reversion process and the accuracy of restoring original content.

- System Adaptation
  - Module 1: Teacher Profile
    - System adjusts notification thresholds and context similarity settings based on teacher feedback.
  - Module 2: Student Lesson Page
    - System improves the chatbot's FAQ generation and lesson content display based on feedback.
  - Module 3: Frequently Asked Questions (FAQ)
    - System refines the FAQ display and categorization algorithms based on teacher feedback.
  - Module 4: Notification
    - System adapts notification delivery based on teachers' feedback to improve timing and relevance.
  - Module 5: Ask for Insights / Ask for Content Page
    - System adjusts the generation of insights and content suggestions based on feedback, improving the relevance and accuracy of AI-generated content.
  - Module 6: Insights Page
    - System refines insights generation algorithms and the presentation of insights reports based on teacher feedback.
  - Module 7: Accept/Ignore Content Page
    - System enhances the content review process based on feedback from teachers regarding AI-suggested changes.
  - Module 8: Revert Content Page
    - System improves the accuracy and efficiency of the reversion process based on teacher feedback.

By adhering to these requirements, the Feedback and Iteration Loop ensures that the system continuously evolves based on user feedback, enhancing the overall teaching and learning experience through iterative improvements.

3.3. Data Decomposition

3.3.1. User Data

- Teacher Profiles
    - **Personal Information**: Name, email, contact details.
    - **Credentials**: Username, password, authentication tokens.
    - **Preferences**: Teaching subjects, grade levels, preferred notification channels, notification thresholds, context similarity settings.
- Student Profiles
    - Personal Information: Name, grade level, student ID.
    - Learning Preferences: Preferred learning styles, subjects of interest.

3.3.2. Content Data

- Lesson Materials
    - Textual Content: Lesson plans, textbooks, presentations, worksheets.
    - Multimedia Content: Audio, video files used in lessons.
- AI-Enhanced Content
    - Generated Materials: AI-suggested lesson enhancements, modifications, supplementary materials.
    - Metadata: Tags, categories, relevance scores.

3.3.3. Interaction Data

- Notifications
    - Message Content: Text of the notification.
    - Timestamps: Date and time of notification delivery.
    - Feedback: Teacher responses, comments, ratings.
- Teacher Requests
    - Request Type: Insights or content suggestions.

- ❖ Lesson Selection: Chosen lesson for insights or content.
- ❖ Timestamps: Date and time of the request.

- Teacher Feedback
  - ❖ Feedback Content: Textual feedback provided by teachers.
  - ❖ Timestamps: Date and time of feedback submission.
  - ❖ Associated Insights or Content: The specific insight or content being reviewed.

3.3.4. Insights Data

- FAQs
  - ❖ Student Questions: Text of student inquiries.
  - ❖ Timestamps: Date and time of question submission.
  - ❖ Lesson Association: The lesson to which the question relates.
- Insights Reports
  - ❖ Key Findings: Summarized insights, trends, recommendations.
  - ❖ Analysis Results: Data analytics output, statistical summaries, visualizations.

3.3.5. Content Review Data

- Proposed Content Changes
  - ❖ Original Content: Text or multimedia of the lesson before proposed changes.
  - ❖ Proposed Modifications: Text or multimedia of AI-suggested changes.
  - ❖ Timestamps: Date and time of proposal submission.
  - ❖ Lesson Association: The lesson being modified.
- Acceptance Decisions
  - ❖ Decision: Acceptance or rejection of proposed changes.
  - ❖ Timestamps: Date and time of decision.
  - ❖ Associated Teachers: Teachers involved in the decision-making process.

3.3.6. System Configuration Data

- Notification Settings
  - ❖ Delivery Preferences: Preferences for in-app notifications.
  - ❖ Frequency: Frequency of notifications (e.g., real-time, daily digest).
- AI Algorithms Parameters
  - ❖ NLP Techniques: Natural language processing algorithms used.
  - ❖ Analysis Parameters: Parameters for analyzing student questions (e.g., keyword extraction, sentiment analysis).
  - ❖ Content Generation Models: Models for generating AI-enhanced content (e.g., neural networks, rule-based systems).

3.3.7. Audit Trail Data

- Log of System Actions
  - ❖ User Interactions: Login/logout events, requests made, notifications sent.
  - ❖ System Responses: Responses to user requests, error messages.
  - ❖ Timestamps: Date and time of each system action.
- Revision History
  - ❖ Record of Content Changes: Details of changes made to lesson materials.
  - ❖ Reversion Actions: Records of content reversion events.
  - ❖ Timestamps: Date and time of each revision.

4. Dependency Description

4.1. Inter-module Dependencies

- Module 1: Teacher Profile
  - Dependencies:
    - Module 4 (Notification): Notification preferences and thresholds set by the teacher in Module 1 affect how and when notifications are sent.
    - Module 6 (Insights Page): Context similarity settings configured in Module 1 influence the relevance of AI-generated insights.
- Module 2: Student Lesson Page
  - Dependencies:
    - Module 3 (Frequently Asked Questions): Interactions with the chatbot in Module 2 generate FAQs that are displayed and managed in Module 3.
    - Module 4 (Notification): Significant student interactions or queries may trigger notifications to teachers.
- Module 3: Frequently Asked Questions (FAQ)
  - Dependencies:
    - Module 2 (Student Lesson Page): FAQs are generated based on student interactions with lessons and the chatbot.
    - Module 6 (Insights Page): FAQs are used as input data for generating AI-driven insights and content suggestions.
- Module 4: Notification
  - Dependencies:
    - Module 1 (Teacher Profile): Notification settings configured by the teacher dictate the delivery and frequency of notifications.
    - Module 2 (Student Lesson Page): Student interactions may trigger notifications to teachers.
    - Module 6 (Insights Page): New insights or content suggestions generated by the system trigger notifications to teachers.
    - Module 7 (Accept/Ignore Content Page): Decisions made by teachers on content changes can trigger notifications.
- Module 5: Ask for Insights / Ask for Content Page
  - Dependencies:
    - Module 6 (Insights Page): Requests for insights or content suggestions are processed and generated in Module 6.
- Module 6: Insights Page
  - Dependencies:

        - Module 1 (Teacher Profile): Context similarity settings configured by teachers affect the generation of insights.
        - Module 3 (Frequently Asked Questions): Uses FAQs as data for generating insights and content suggestions.
        - Module 4 (Notification): New insights generated may trigger notifications to teachers.
        - Module 5 (Ask for Insights / Ask for Content Page): Processes requests for insights or content suggestions.
- Module 7: Accept/Ignore Content Page
    - Dependencies:
        - Module 4 (Notification): Notifications about new content suggestions lead to interactions in Module 7.
        - Module 6 (Insights Page): Insights and content suggestions reviewed and acted upon in Module 7 are generated in Module 6.
- Module 8: Revert Content Page
    - Dependencies:
        - Module 7 (Accept/Ignore Content Page): Content accepted or ignored in Module 7 can be reverted in Module 8.
        - Module 4 (Notification): Reversion of content changes may trigger notifications.

By understanding these dependencies, we ensure that changes in one module correctly propagate and influence the necessary functions in other modules, maintaining coherence and functionality across the TechnoDynamic V2 system.

4.2. Inter-process Dependencies

This section outlines the dependencies between various processes within the system, elucidating their interactions to enable user authentication and facilitate access to specific functionalities based on user roles.

Process 1: User Authentication

Verifies user credentials to grant access to the system. All subsequent processes depend on this verification, as access and task execution are contingent on authenticated user status.

Process 2: Login Student/Teacher

Handles authentication of user credentials during login. It relies on Process 1 for credential validation. Upon successful authentication, it directs users to specific dashboards based on their roles.

Process 3: Student Dashboard

Grants access to student-specific functionalities and lessons post-authentication. Its functionality hinges on the success of Process 2 in determining the user's role.

Process 4: Teacher Dashboard with Notification

Enables access to teacher-specific features and lesson management following successful login via Process 2. It allows teachers to create and manage lessons and view system-recommended content or insights, thus relying on the success of Process 2.

Process 5: Lesson - Display Insights & Suggested Content

Facilitates access to teacher-specific features for a particular lesson, triggered by notifications shown in Process 4. It allows teachers to request insights or display suggested content, dependent on the completion of Process 4.

Process 6: Display Insights

Presents specified insights for a specific lesson, with an option to redirect to Process 7 to view suggested content. Its execution is contingent upon the completion of Process 5.

Process 7: Display Suggested Content

Showcases old and suggested content based on FAQs and previous content, dependent on either Process 5 or Process 6. Teachers have the option to accept or ignore the suggested content and retain the old content.

Process 8: Revert Changes

Enables optional reversion from new content (suggested content) to previous content, providing teachers with a means to reconsider finalized content. Its execution relies on the completion of Process 7.

4.3. Data Entities

- User
  - **Personal Information**: Stored in the User model, linked to Teacher and Student models.
- Teacher
  - **User**: Links to User model.
  - **Suggestion**: Boolean value indicating suggestion preferences.
  - **Threshold**: Float value for context similarity.
  - **Notification Threshold**: Integer value for notification settings.
- Student
  - **User**: Links to User model.
  - **Course**: String indicating the course.
  - **Year**: String indicating the year of study.
- Lesson
  - **Lesson Number**: Integer identifying the lesson.
  - **Title**: Title of the lesson.
  - **Subtitle**: Subtitle of the lesson.
  - **Cover Image**: Image for the lesson cover.
  - **Files**: List of files associated with the lesson.
- LessonContent
  - **Lesson**: Links to the Lesson model.
  - **Contents**: Text of the lesson content.
  - **URL**: URL related to the content.
  - **Files**: List of File models.
  - **Images**: List of ImageModel models.
- File
  - **File**: Actual file object.
  - **Lesson**: Links to the Lesson model.
- ImageModel
  - **Lesson Content**: Links to the LessonContent model.
  - **Image Link**: Image file.
- Notification
  - **Notif ID**: Integer identifier for the notification.
  - **Lesson**: Links to the Lesson model.
  - **Message**: Text of the notification message.
  - **Is Read**: Boolean indicating if the notification has been read.
  - **Is Open**: Boolean indicating if the notification has been opened.

- **Date Created**: Timestamp of the notification creation.

- Suggestion
  - **Lesson**: Links to the Lesson model.
  - **Insights**: Text of the AI-generated insights.
  - **Content**: Text of the suggested content.
  - **Old Content**: Previous version of the content before suggestions.
- Query
  - **Lesson**: Links to the Lesson model.
  - **User**: Links to the User model.
  - **Subqueries**: List of SubQuery models.
  - **Context**: Context of the query.
- SubQuery
  - **Question**: Text of the student question.
  - **Response**: Text of the response.
  - **Created At**: Timestamp of when the subquery was created.
- RelatedContent
  - **Related Content ID**: Integer identifier.
  - **Lesson**: Links to the Lesson model.
  - **General Context**: General context of the related content.
- Faq
  - **Lesson**: Links to the Lesson model.
  - **Grouped Questions**: Links to GroupedQuestions model.
  - **Related Content**: Links to RelatedContent model.
  - **Question**: Text of the FAQ question.
- GroupedQuestions
  - **Grouped Question ID**: Integer identifier.
  - **Lesson**: Links to the Lesson model.
  - **Related Content**: Links to the RelatedContent model.
  - **Notification**: Links to the Notification model.
  - **Notified**: Boolean indicating if the notification was sent.

By understanding these data dependencies, we ensure that each module has access to the necessary data to function effectively, maintaining data integrity and supporting the overall functionality of the TechnoDynamic V2 system.

4.4. Data Dependencies

This section highlights the data dependencies between modules within the system, indicating which data entities are required for specific functionalities.

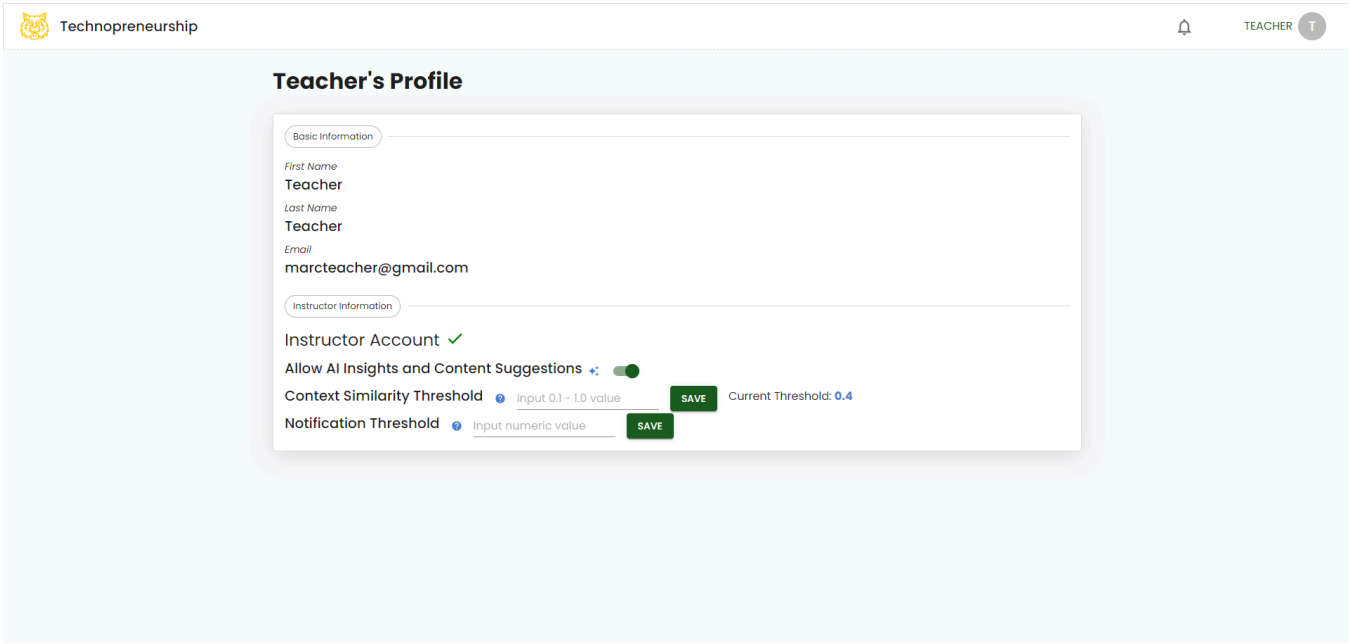
- Module 1: Teacher Profile
  - **Data Dependencies**:
    - **Teacher**: Stores user information, suggestion preferences, threshold values, and notification settings.
      - **User**: Linked to the Teacher model to manage teacher-specific settings.
      - **Suggestion**: Boolean value indicating whether the teacher allows suggestions.
      - **Threshold**: Float value for context similarity threshold.
      - **Notification Threshold**: Integer value for notification settings.
- Module 2: Student Lesson Page
  - **Data Dependencies**:
    - **Lesson**: Contains details about lessons, including lesson number, title, subtitle, cover image, and associated files.
    - **Query**: Records student interactions, including the lesson, user, subqueries, and context.
      - **User**: Linked to the Query model to identify the student.
      - **SubQuery**: Includes the question, response, and creation date.
    - **LessonContent**: Holds the content of the lessons, including text, URLs, files, and images.
      - **File**: Files associated with a lesson.
      - **ImageModel**: Images associated with a lesson content.
- Module 3: Frequently Asked Questions (FAQ)
  - **Data Dependencies**:
  - **Faq**: Stores FAQs related to lessons.
    - **Lesson**: Linked to the Faq model to associate FAQs with specific lessons.
    - **GroupedQuestions**: Links FAQs with grouped questions.
    - **RelatedContent**: Links FAQs with related content.
  - **GroupedQuestions**: Groups FAQs based on the lesson and related content.
    - **Lesson**: Linked to the GroupedQuestions model.
    - **RelatedContent**: Provides context for grouped questions.
    - **Notification**: Indicates if a notification was sent about the grouped questions.

- Module 4: Notification
  - **Data Dependencies**:
  - **Notification**: Stores notification details.
    - **Lesson**: Linked to the Notification model to associate notifications with lessons.
    - **Message**: The content of the notification.
    - **Is Read**: Boolean value indicating if the notification has been read.
    - **Is Open**: Boolean value indicating if the notification has been opened.
    - **Date Created**: Timestamp of when the notification was created.
- Module 5: Ask for Insights / Ask for Content Page
  - **Data Dependencies**:
    - **Query**: Logs requests for insights or content suggestions.
      - **Lesson**: Indicates which lesson the request pertains to.
      - **User**: Indicates which teacher made the request.
      - **SubQuery**: Details the specific questions or requests.
- Module 6: Insights Page
  - **Data Dependencies**:
    - **Suggestion**: Contains AI-generated insights and content suggestions.
      - **Lesson**: Links the suggestions to specific lessons.
      - **Insights**: Text of the insights generated.
      - **Content**: Text of the suggested content.
      - **Old Content**: Previous version of the content before suggestions.
- Module 7: Accept/Ignore Content Page
  - **Data Dependencies**:
    - **Suggestion**: Displays and manages AI-suggested content changes.
      - **Lesson**: Links the suggestions to specific lessons.
      - **Content**: Text of the suggested content.
      - **Old Content**: Previous version of the content before suggestions.
      - **User Decisions**: Logs the acceptance or rejection decisions made by teachers.
    - **Notification**: Notifies teachers about new content suggestions.
- Module 8: Revert Content Page
  - **Data Dependencies**:
    - **Suggestion**: Manages the reversion to original content.
      - **Lesson**: Links the suggestions to specific lessons.
      - **Old Content**: Text of the original content before changes.
      - **Reversion Logs**: Records details of reversion actions taken by teachers.

5. Interface Description

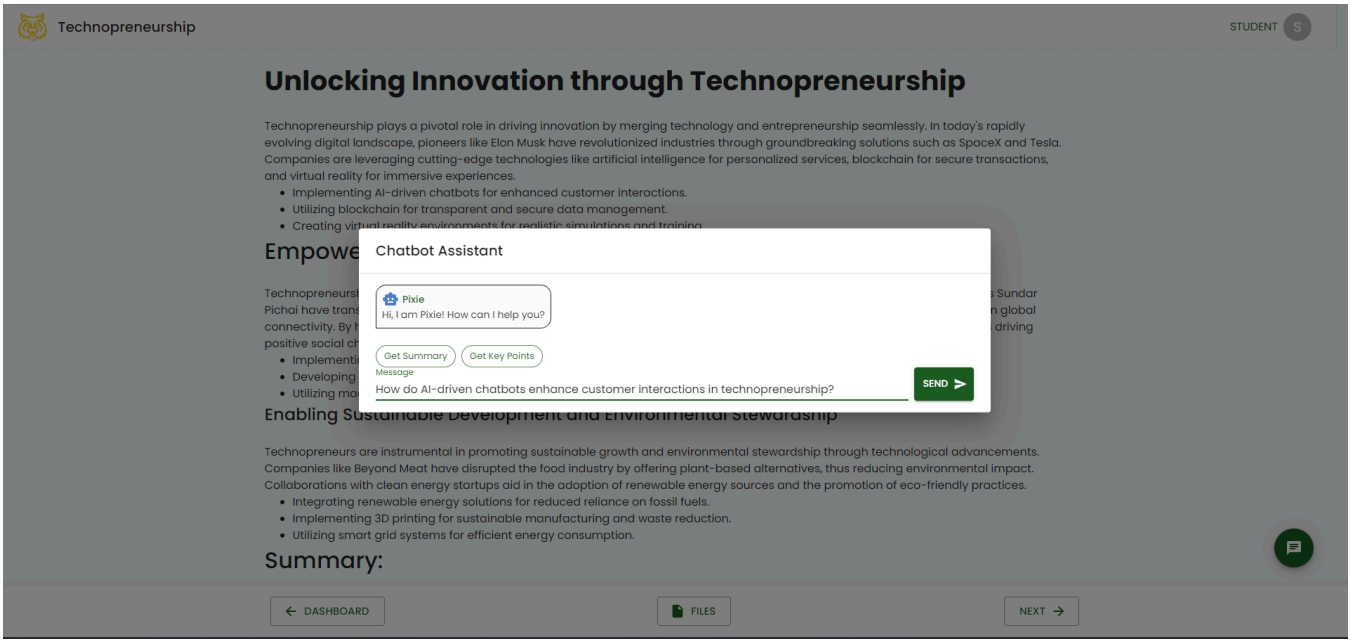
5.1. Module Interface

5.1.1. Module 1: Teacher Profile



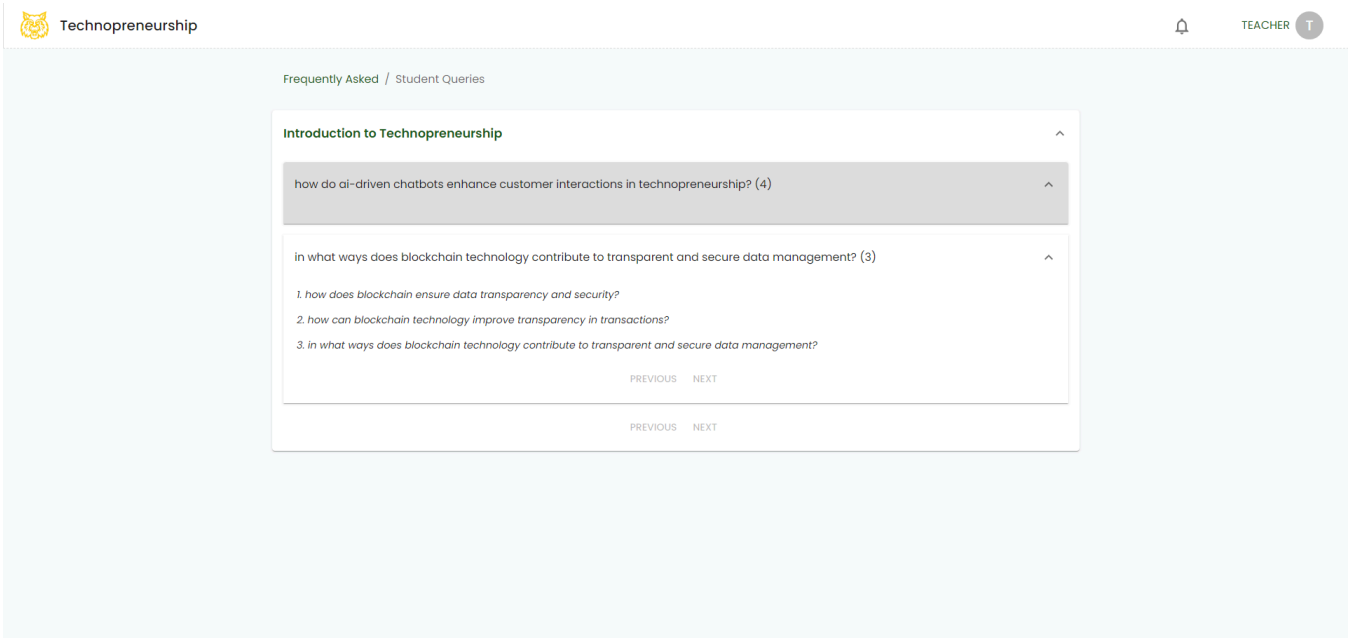
The Teacher's Profile page includes sections for "Basic Information" and "Instructor Information." The "Basic Information" section displays the teacher's first name, last name, and email address. In the "Instructor Account" section, teachers can enable or disable AI insights and content suggestions using a toggle switch. They can also set a "Context Similarity Threshold" (with a current value of 0.4) and a "Notification Threshold," each with input fields and save buttons. This page allows teachers to manage their profile and account settings effectively.

5.1.2. Module 2: Student Lesson Page



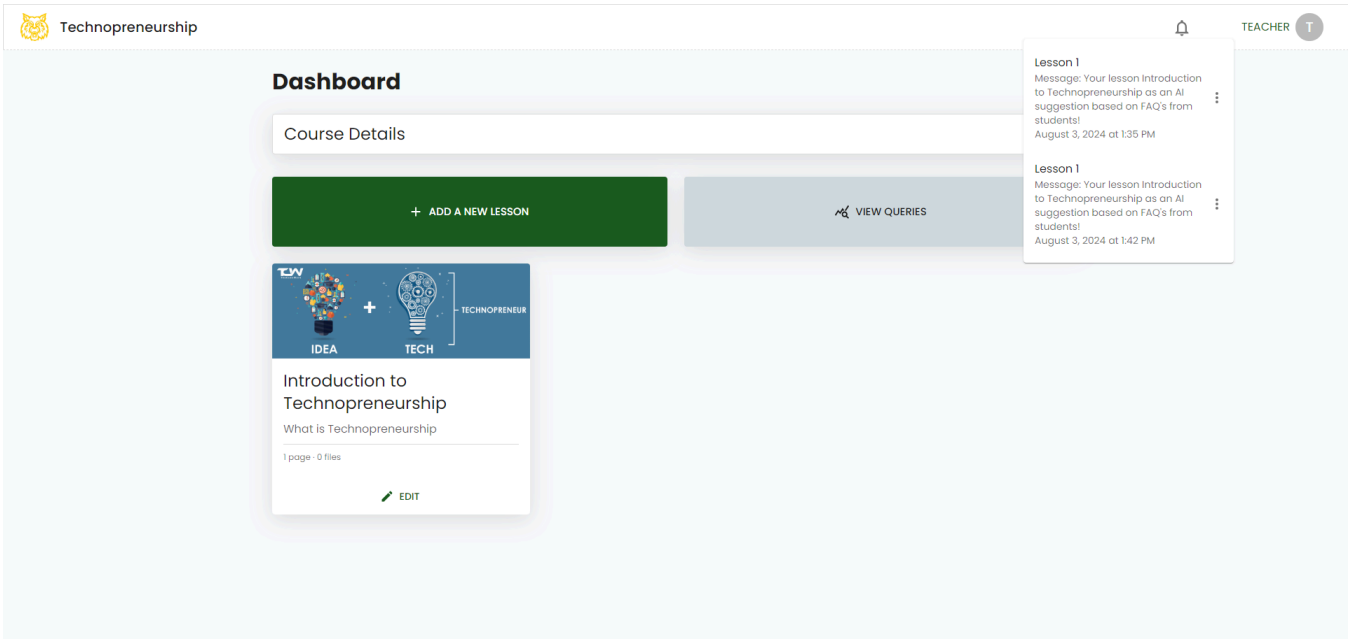
This section allows students to interact with the system by submitting questions. If these questions meet the set threshold, they may prompt suggested changes to the content. This ensures that the lesson material is continuously improved based on student feedback.

5.1.3. Module 3: Frequently Asked Questions (FAQ)



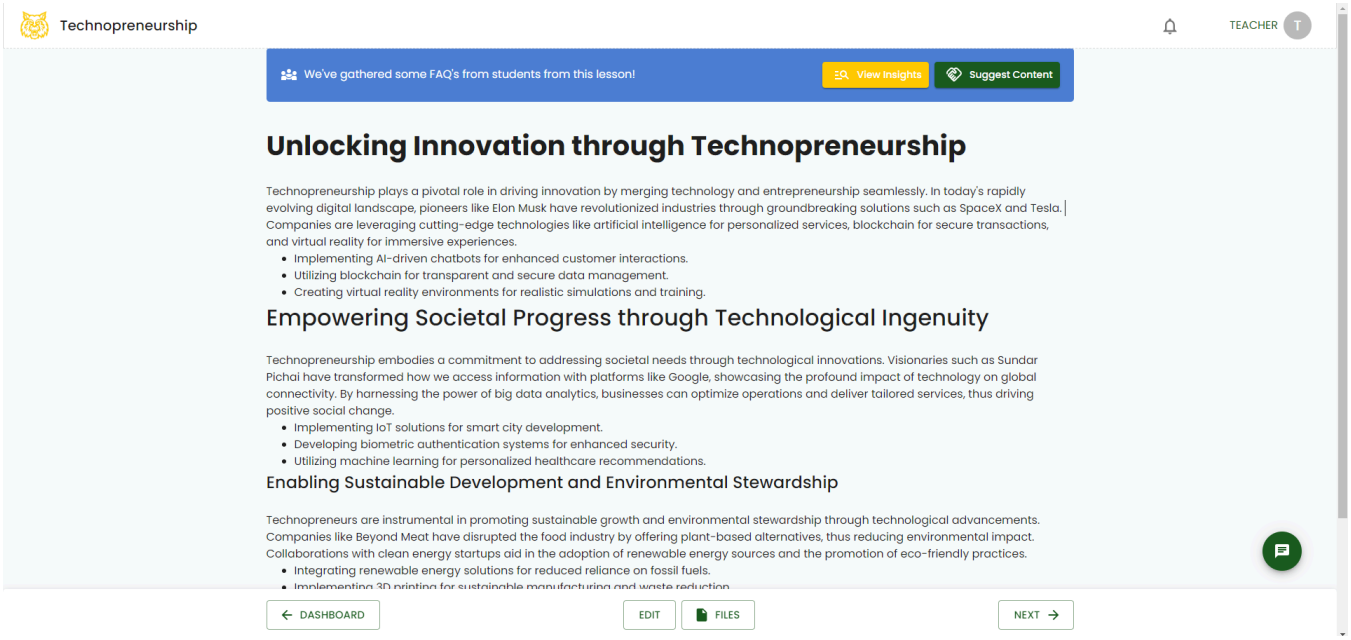
This section allows teachers to view the frequently asked questions from students regarding their posted lessons. Teachers can easily access and review these questions to understand common concerns and areas where students may need additional help. By addressing these FAQs, teachers can improve their lesson content and provide better support to their students.

5.1.4. Module 4: Notification



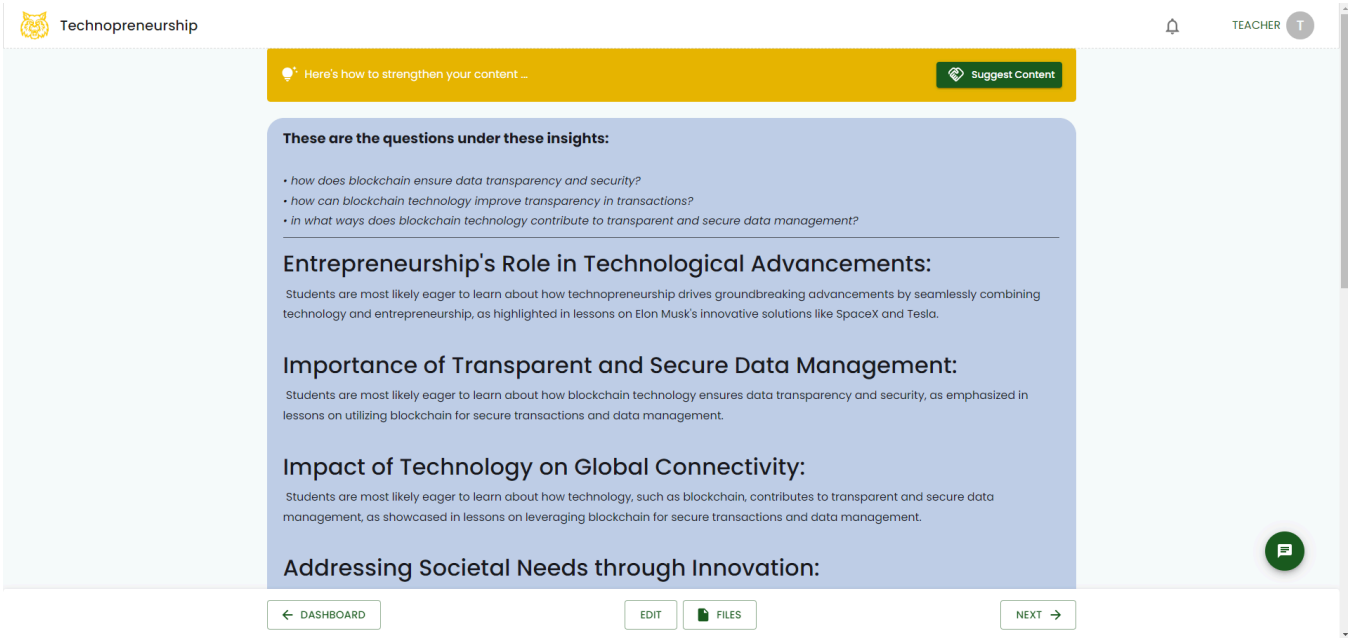
This notification interface is designed for teachers. It displays a list of topics that the AI has suggested for revision. By reviewing these suggestions, teachers can enhance their lesson content and address areas needing improvement.

5.1.5. Module 5: Ask for Insights / Ask for Content Page



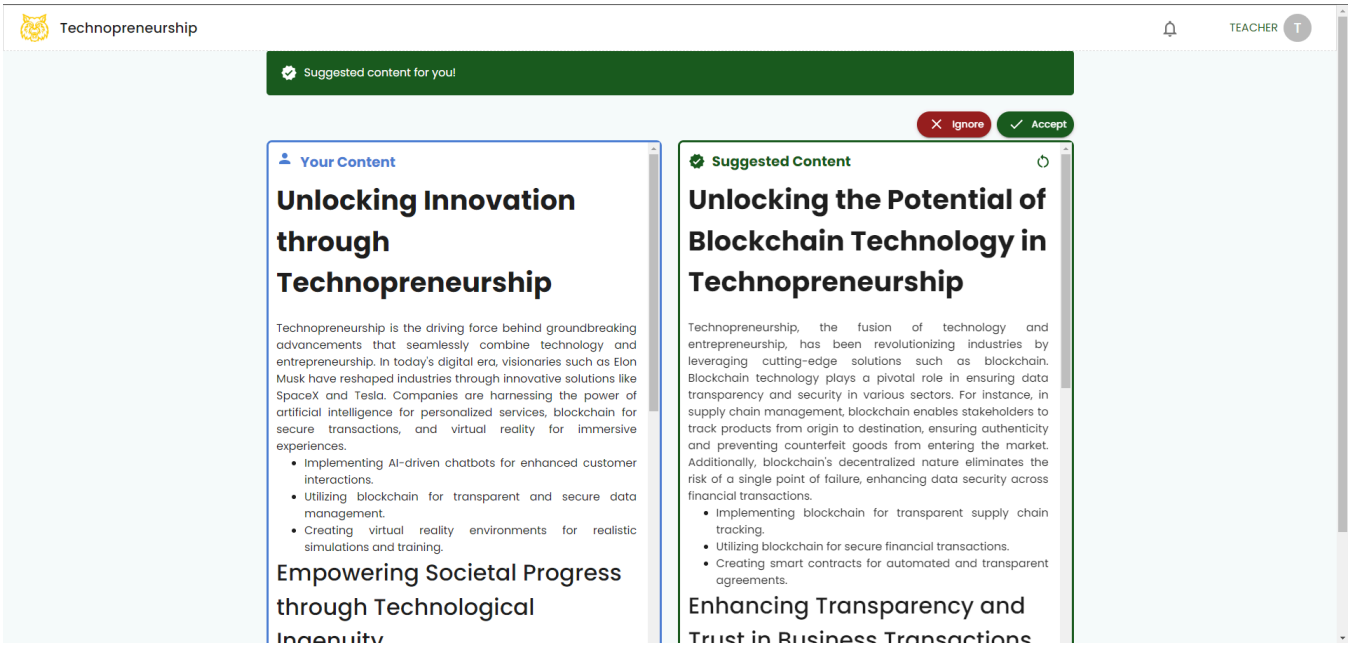
This is the Ask for Insights / Ask for Content Page Interface. This interface allows users to request insights or content from the AI based on the FAQ of the students. The interface will only generate the insights or content upon user request.

5.1.6. Module 6: Insights Page



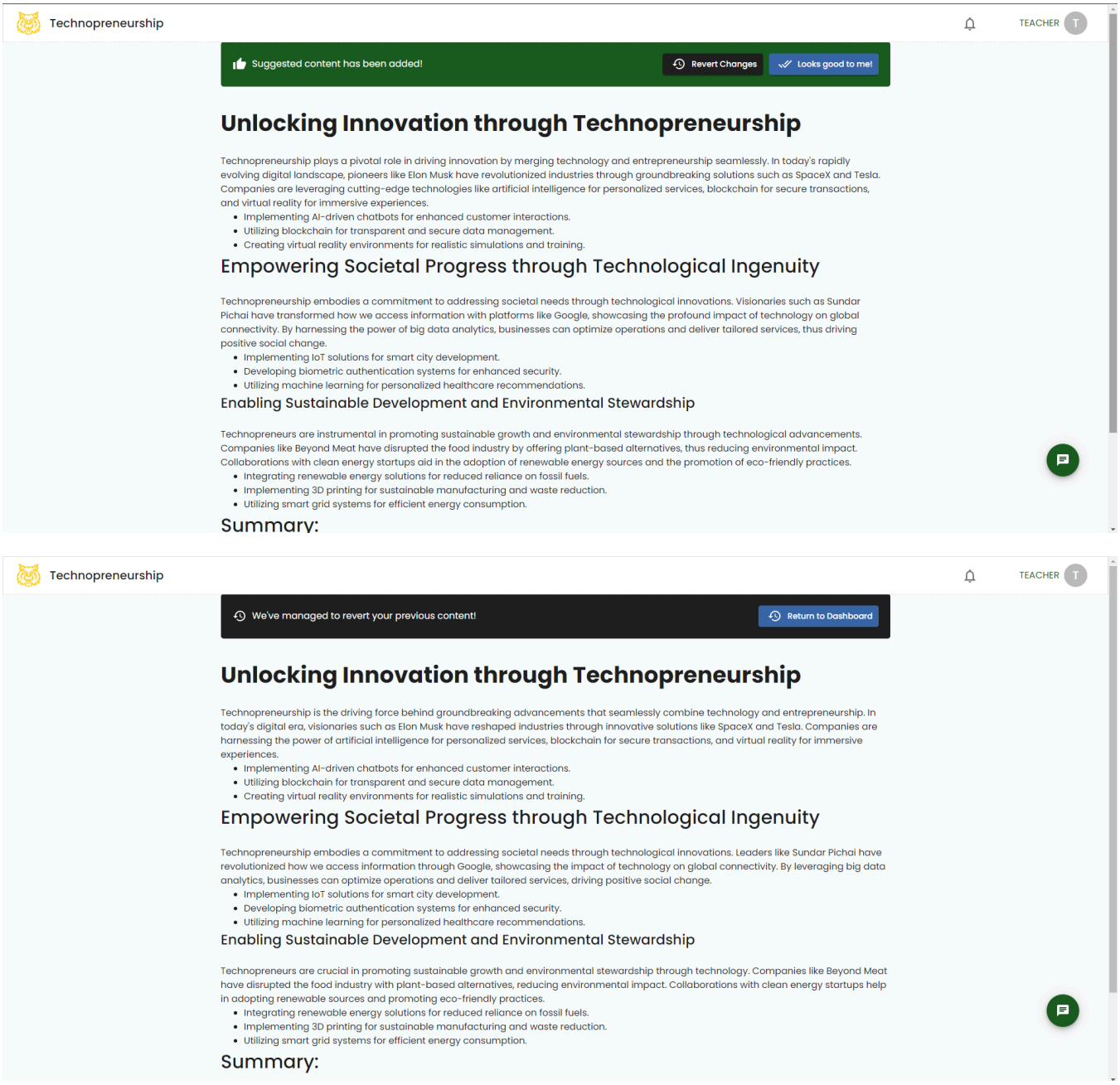
This is the Insights page Interface. It displays the generated insight of the AI. This interface also allow the user to generate new suggestion content.

5.1.7. Module 7: Accept/Ignore Content Page



This is the Accept/Ignore Content Page Interface. It displays the previous Content and the newly generated content. It allows users to ignore or accept the generated content of the AI. Ignoring the content will dismiss the changes and the page will redirect to the homepage. Accepting the changes will save the newly generated content as the new content of the Lesson and will be redirected to the Module (5.1.5).

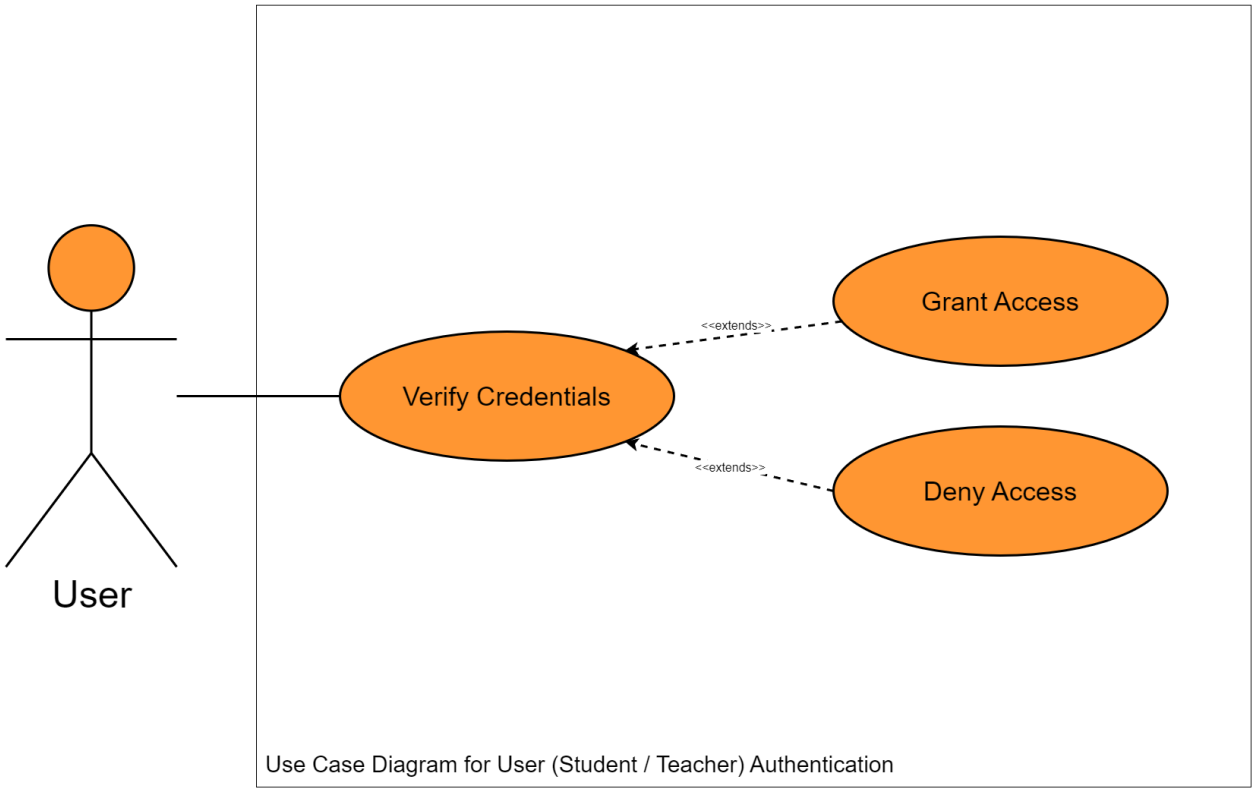
5.1.8. Module 8: Revert Content Page



This is the Revert Content Page Interface. After accepting the suggested change ‘Accept Page Interface (Module 5.1.7)’ the page will then be redirected to this page. This interface allows the user to revert the changes or save the new content and redirect to the Dashboard.

5.2. Process Interface

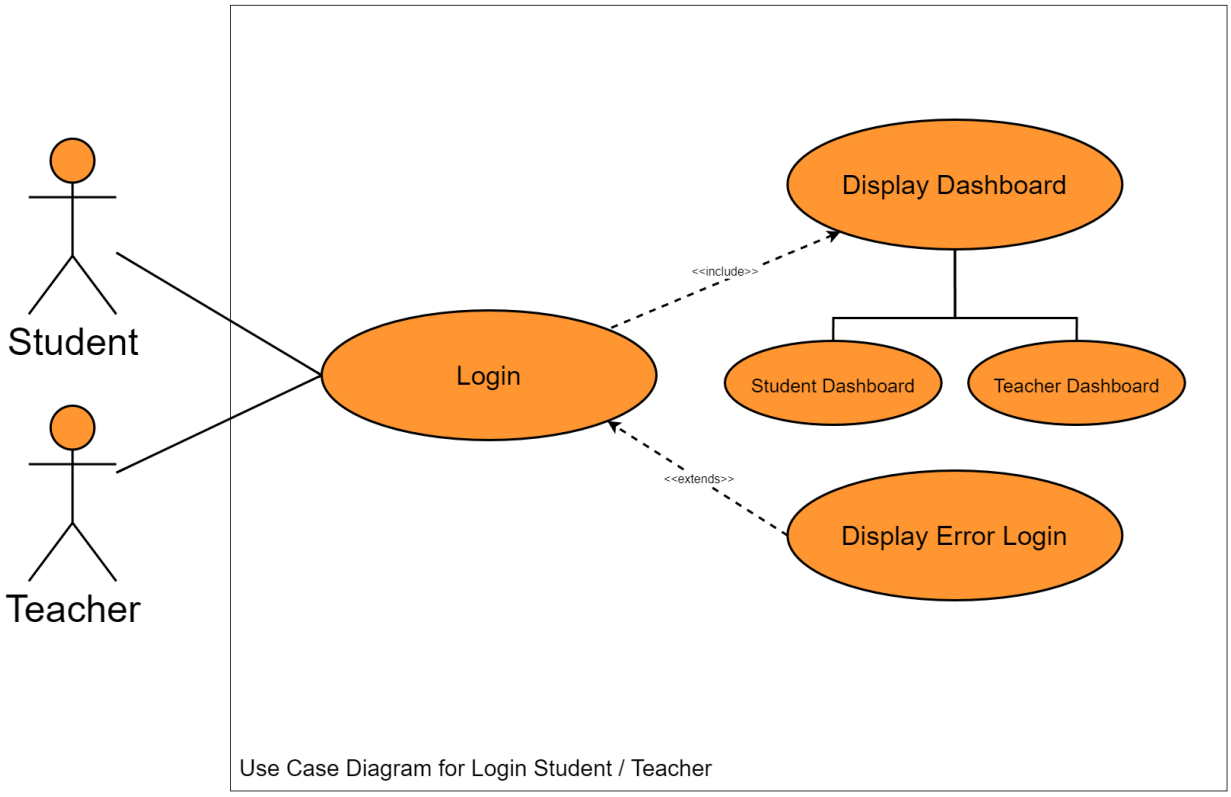
5.2.1. Process 1: User Authentication



Use Case Diagram for User (Student / Teacher) Authentication

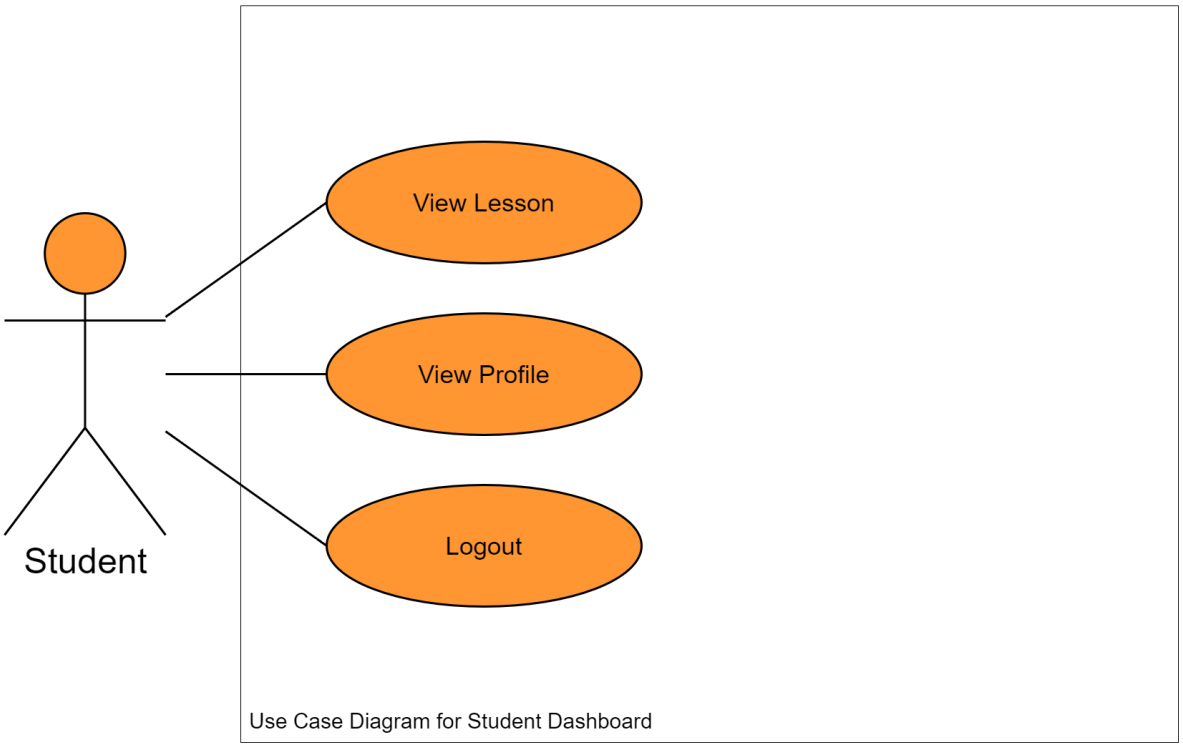
The User Authentication use case diagram illustrates the process through which students and teachers authenticate themselves in the system. The primary actor, labeled as "User," initiates the process. The initial step involves the "Verify Credentials" use case, where the system checks the provided credentials. Depending on the verification results, the process branches into two possible outcomes: "Grant Access" or "Deny Access." These outcomes are represented as extend dependencies from the "Verify Credentials" use case, indicating the conditional actions that follow the credential verification process.

5.2.2. Process 2: Login Student / Teacher



The Login Student/Teacher use case diagram outlines the process of logging into the system for both students and teachers. Two primary actors, "Student" and "Teacher," initiate the login process. The central use case, "Login," handles the login attempt. Upon a successful login, the system proceeds to "Display Dashboard," which includes two sub-cases: "Student Dashboard" and "Teacher Dashboard," depending on the user type. If the login attempt fails, the system triggers the "Display Error Login" use case. These paths are depicted as extend dependencies, indicating conditional outcomes based on the success or failure of the login process.

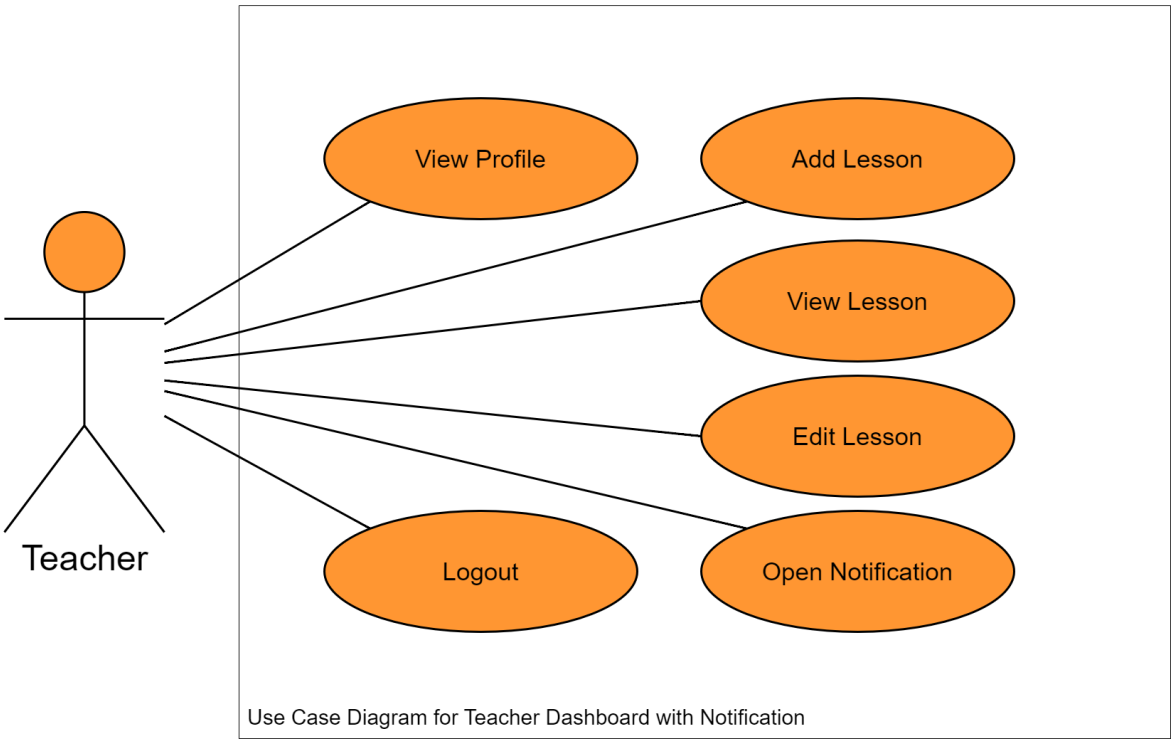
5.2.3. Process 3: Student Dashboard



Use Case Diagram for Student Dashboard

The Student Dashboard use case diagram details the functionalities available to a student upon accessing their dashboard. The primary actor, "Student," can interact with three main use cases: "View Lesson," "View Profile," and "Logout." These use cases represent the key actions a student can perform within their dashboard, allowing them to access lessons, view their profile information, and log out of the system. The diagram illustrates the direct interactions between the student and these use cases, highlighting the core features of the student dashboard.

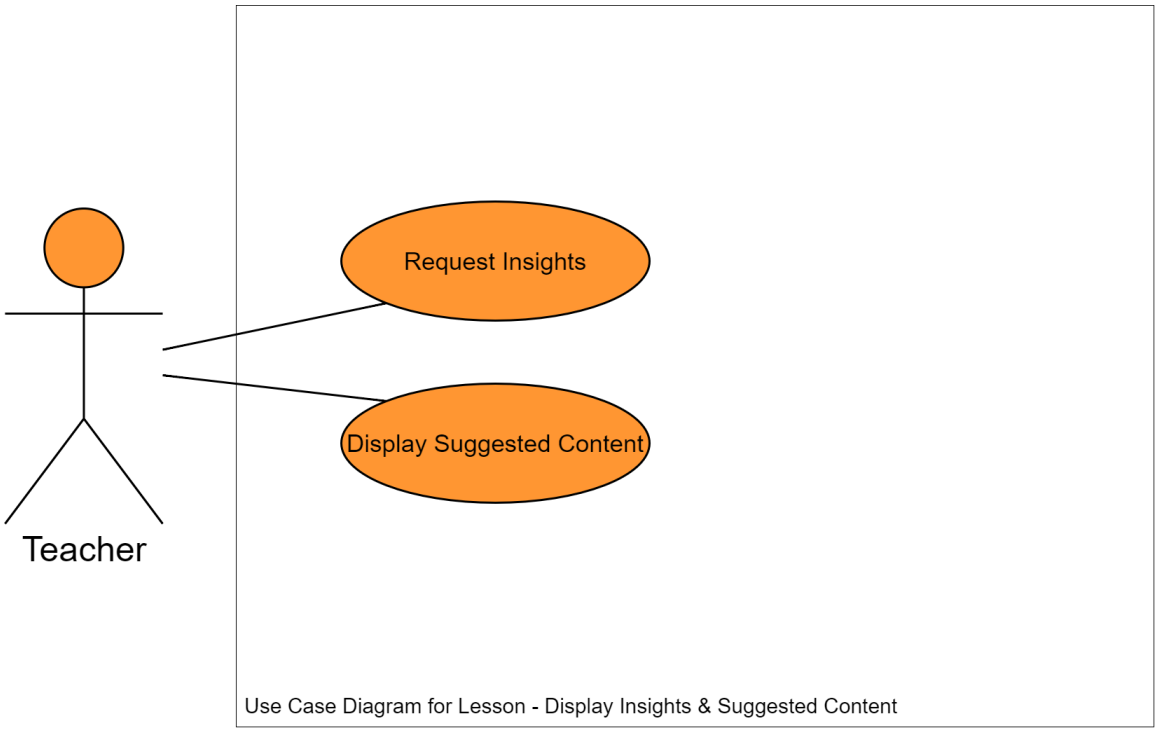
5.2.4. Process 4: Teacher Dashboard with Notification



Use Case Diagram for Teacher Dashboard with Notification

The Teacher Dashboard with Notification use case diagram outlines the various functionalities accessible to a teacher within their dashboard. The primary actor, "Teacher," can interact with multiple use cases: "View Profile," "Add Lesson," "View Lesson," "Edit Lesson," "Open Notification," and "Logout." These use cases represent the core actions a teacher can perform, including managing lessons, viewing and editing profile information, accessing notifications, and logging out of the system. The diagram highlights the direct interactions between the teacher and these use cases, showcasing the comprehensive features available in the teacher's dashboard.

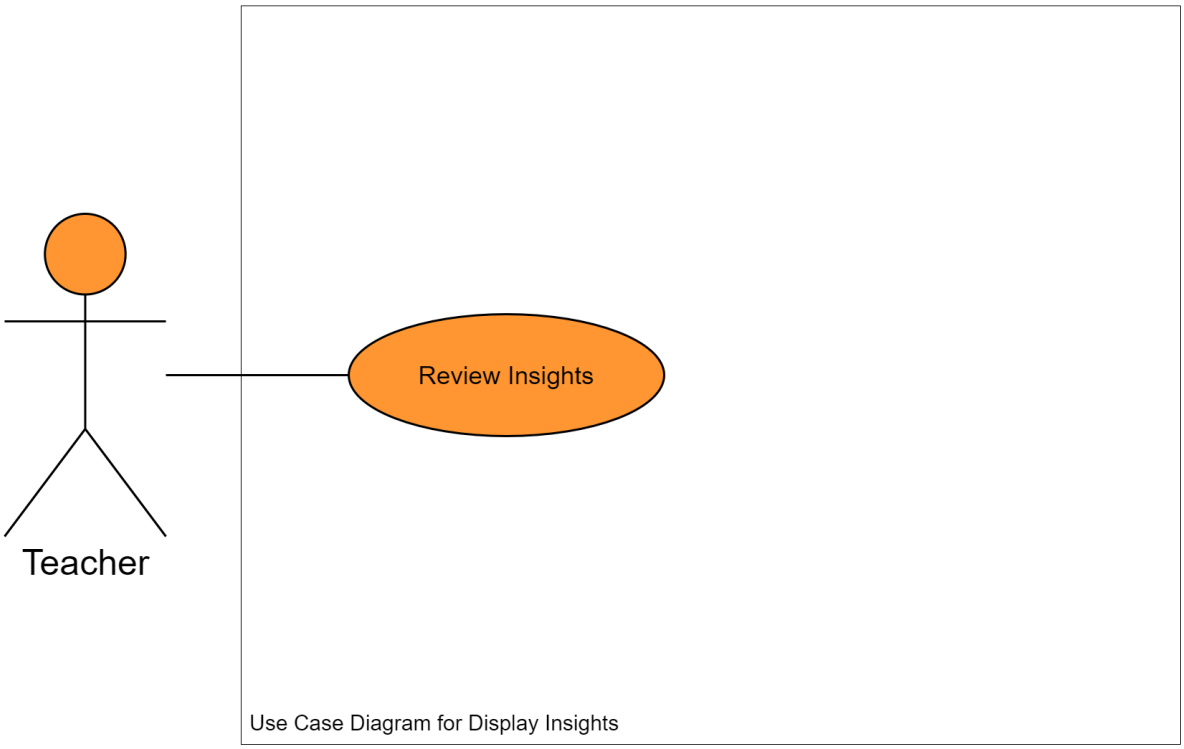
5.2.5. Process 5: Lesson - Display Insights & Suggested Content



Use Case Diagram for Lesson - Display Insights & Suggested Content

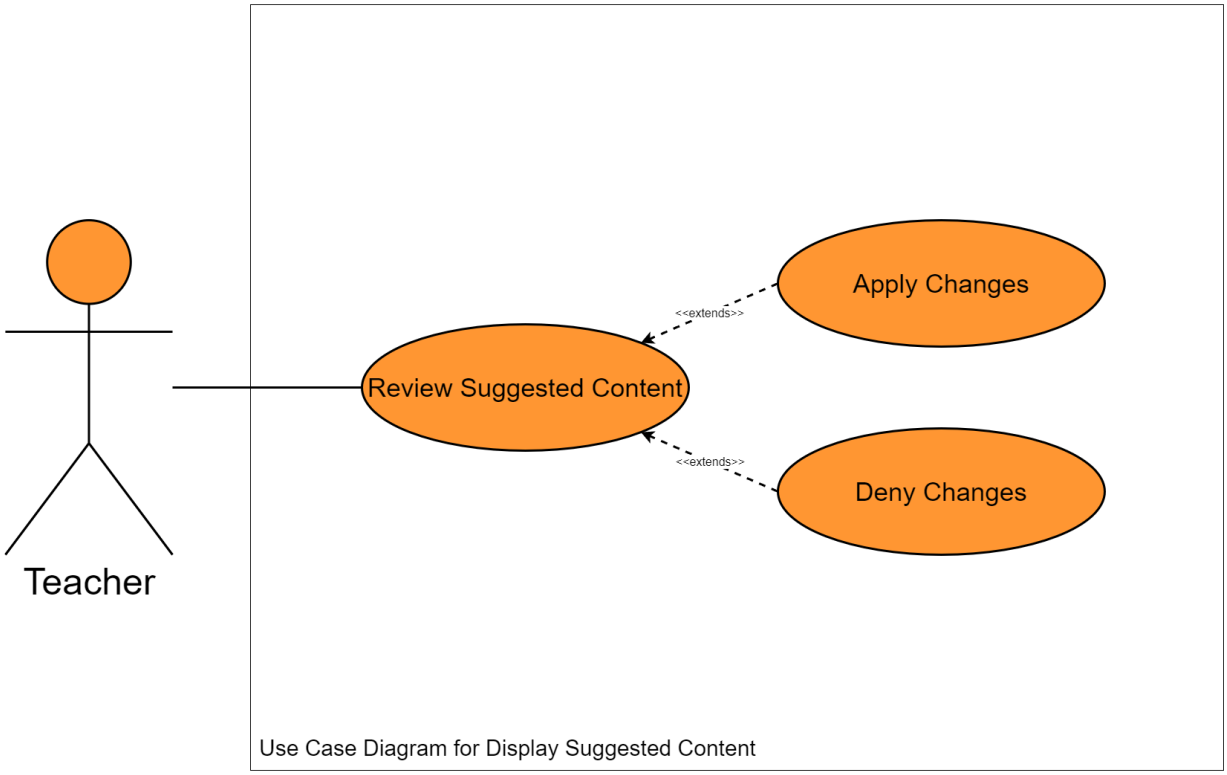
The Lesson - Display Insights & Suggested Content use case diagram illustrates the functionalities available to a teacher for managing lesson insights and suggested content. The primary actor, "Teacher," interacts with two main use cases: "Request Insights" and "Display Suggested Content." The "Request Insights" use case allows the teacher to seek analytical insights related to the lesson, while the "Display Suggested Content" use case enables the teacher to view recommended content that may enhance the lesson. This diagram highlights the teacher's ability to improve lesson quality through insights and suggested content.

5.2.6. Process 6: Display Insights



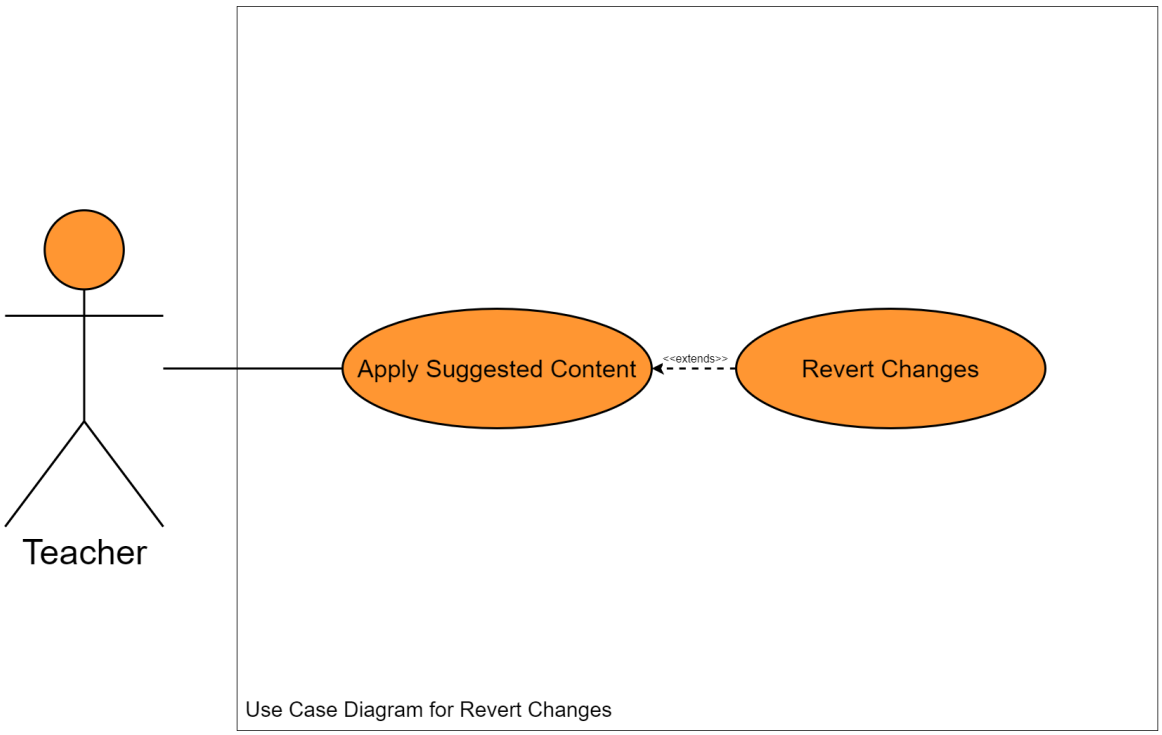
The Display Insights use case diagram shows the process by which a teacher can review insights related to their lessons. The primary actor, "Teacher," interacts with the "Review Insights" use case. This diagram highlights the teacher's ability to access and evaluate insights, which can help in assessing the effectiveness and impact of their lessons. The direct interaction between the teacher and the "Review Insights" use case emphasizes the importance of insights in enhancing the teaching process.

5.2.7. Process 7: Display Suggested Content



The Display Suggested Content use case diagram outlines the process by which a teacher reviews and decides on suggested content for their lessons. The primary actor, "Teacher," interacts with the "Review Suggested Content" use case. Depending on the review, the teacher can either "Apply Changes" or "Deny Changes." These options are represented as extend dependencies from the "Review Suggested Content" use case, indicating the conditional actions the teacher can take based on the evaluation of the suggested content. This diagram highlights the teacher's role in curating and enhancing lesson content by considering and deciding on suggestions.

5.2.8. Process 8: Revert Changes



Use Case Diagram for Revert Changes

The Revert Changes use case diagram illustrates the process by which a teacher can manage applied suggested content. The primary actor, "Teacher," interacts with two main use cases: "Apply Suggested Content" and "Revert Changes." Once suggested content has been applied, the teacher has the option to revert those changes if needed. The diagram shows an extend relationship from the "Apply Suggested Content" use case to the "Revert Changes" use case, indicating that reverting changes is a conditional action that becomes available after content has been applied. This diagram highlights the flexibility for teachers to manage and adjust lesson content dynamica

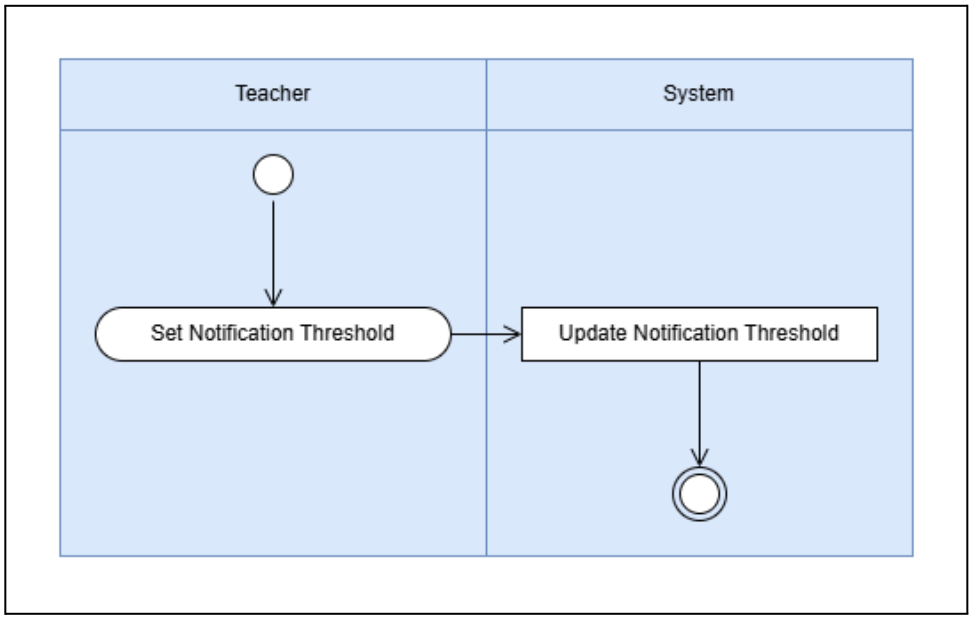
6. Detailed Design

6.1. Module Detailed Design

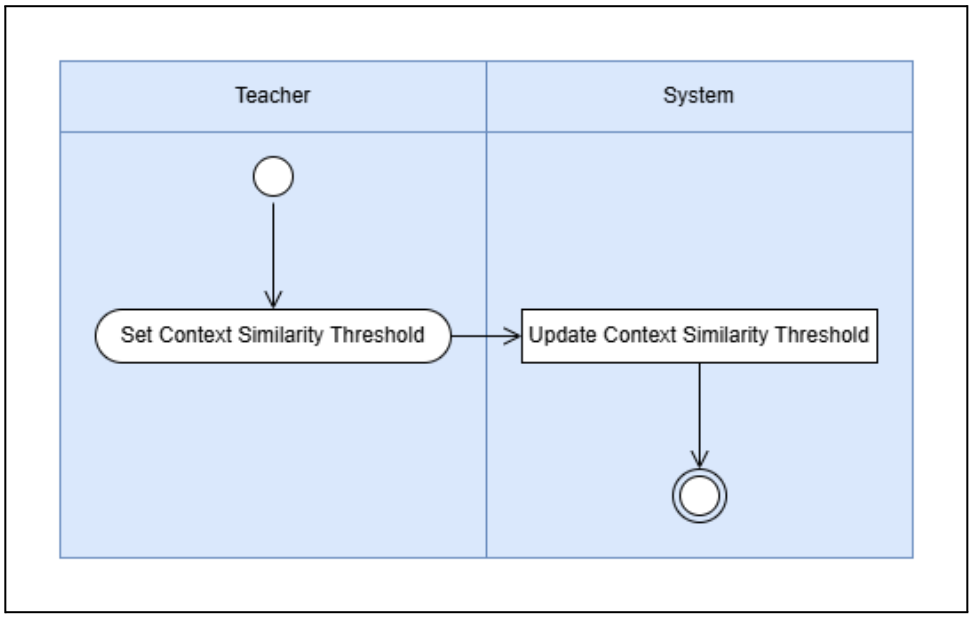
6.1.1. Module 1: Teacher Profile

6.1.1.1. Activity Diagram

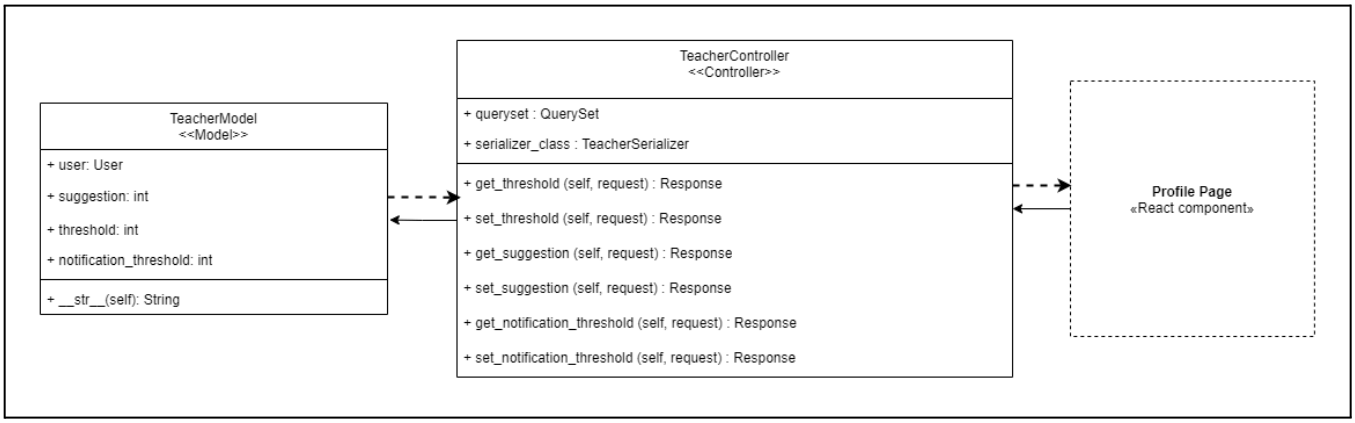
Adjusting Notification Threshold



Adjusting Context Similarity Threshold

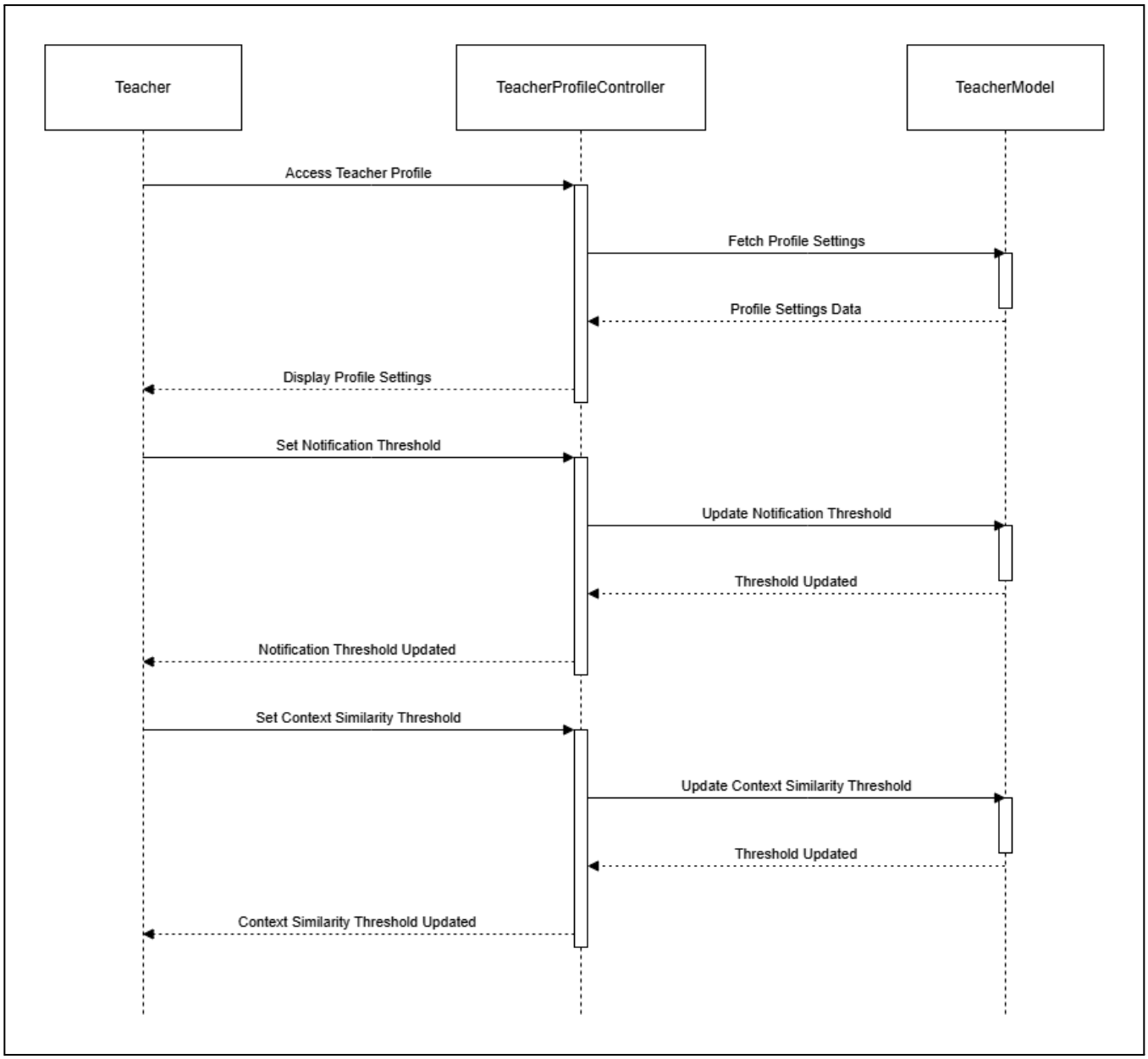


6.1.1.2. Class Diagram



Class Diagram of Teacher Profile

6.1.1.3. Sequence Diagram

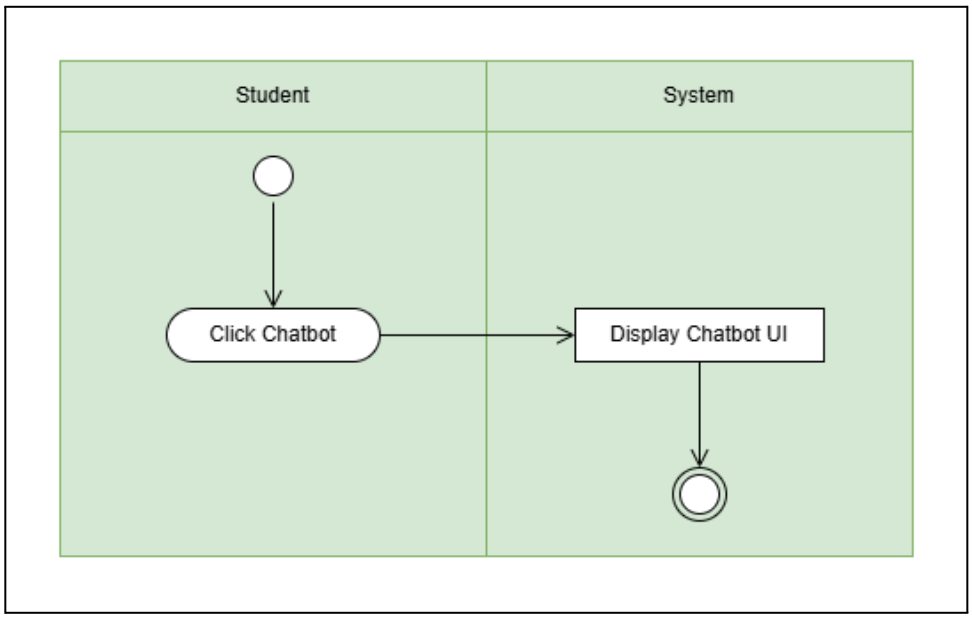


Sequence Diagram of Teacher Profile

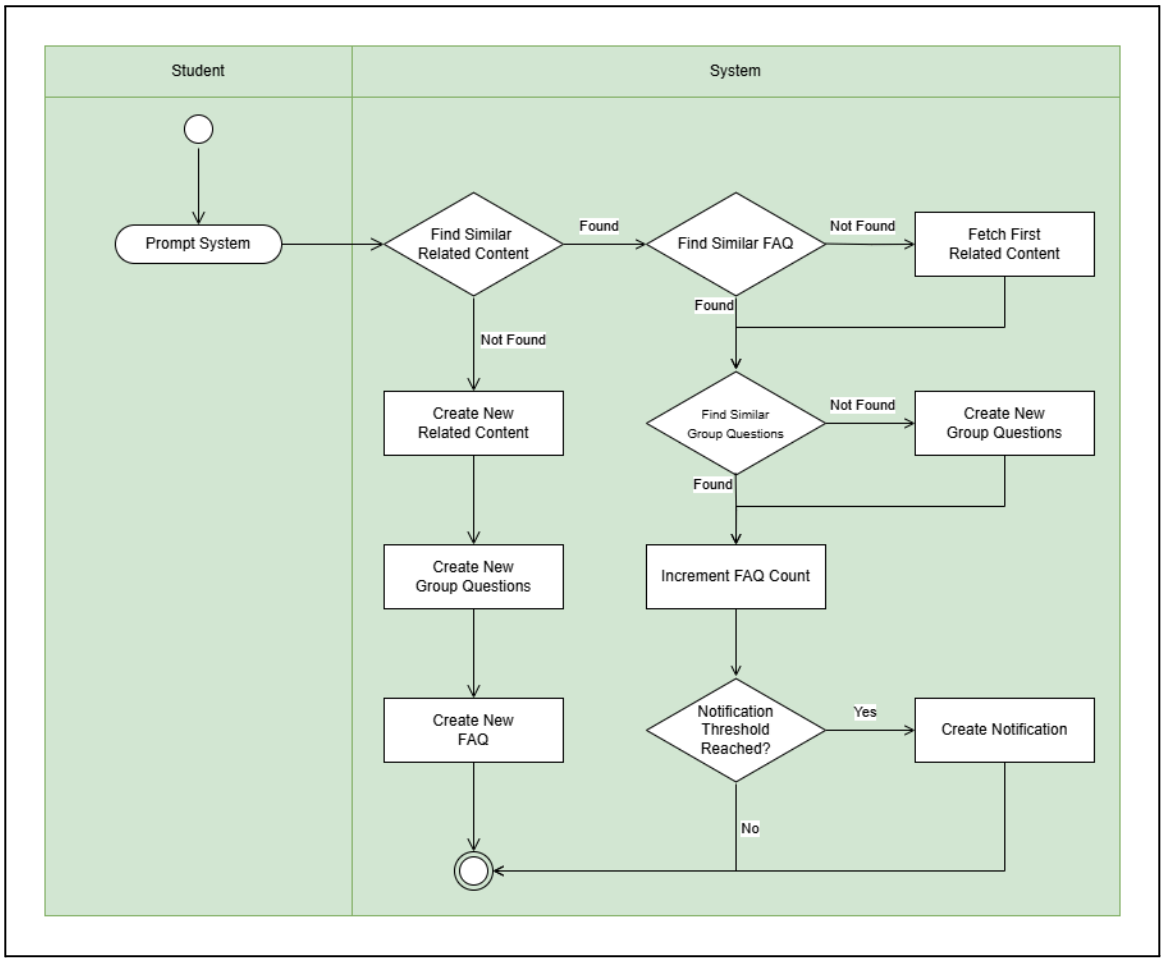
6.1.2. Module 2: Student Lesson Page

6.1.2.1. Activity Diagram

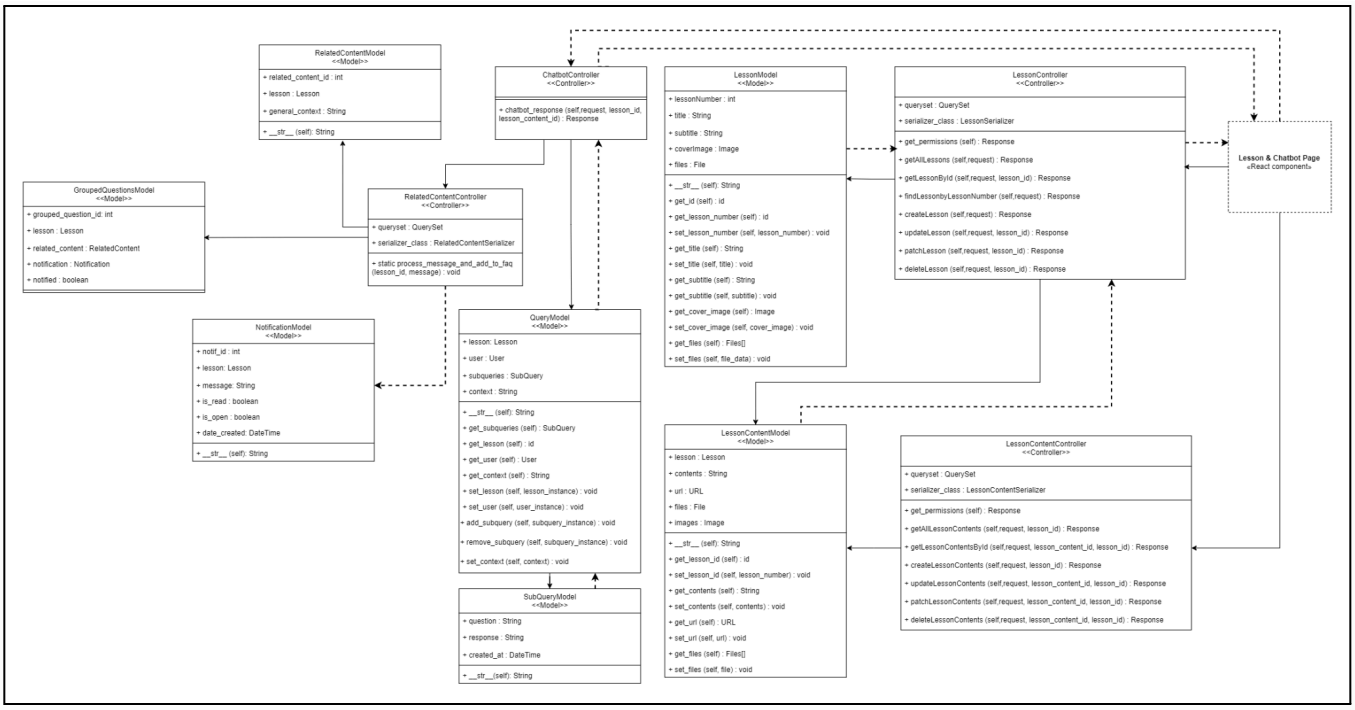
Accessing Chatbot



Prompting System

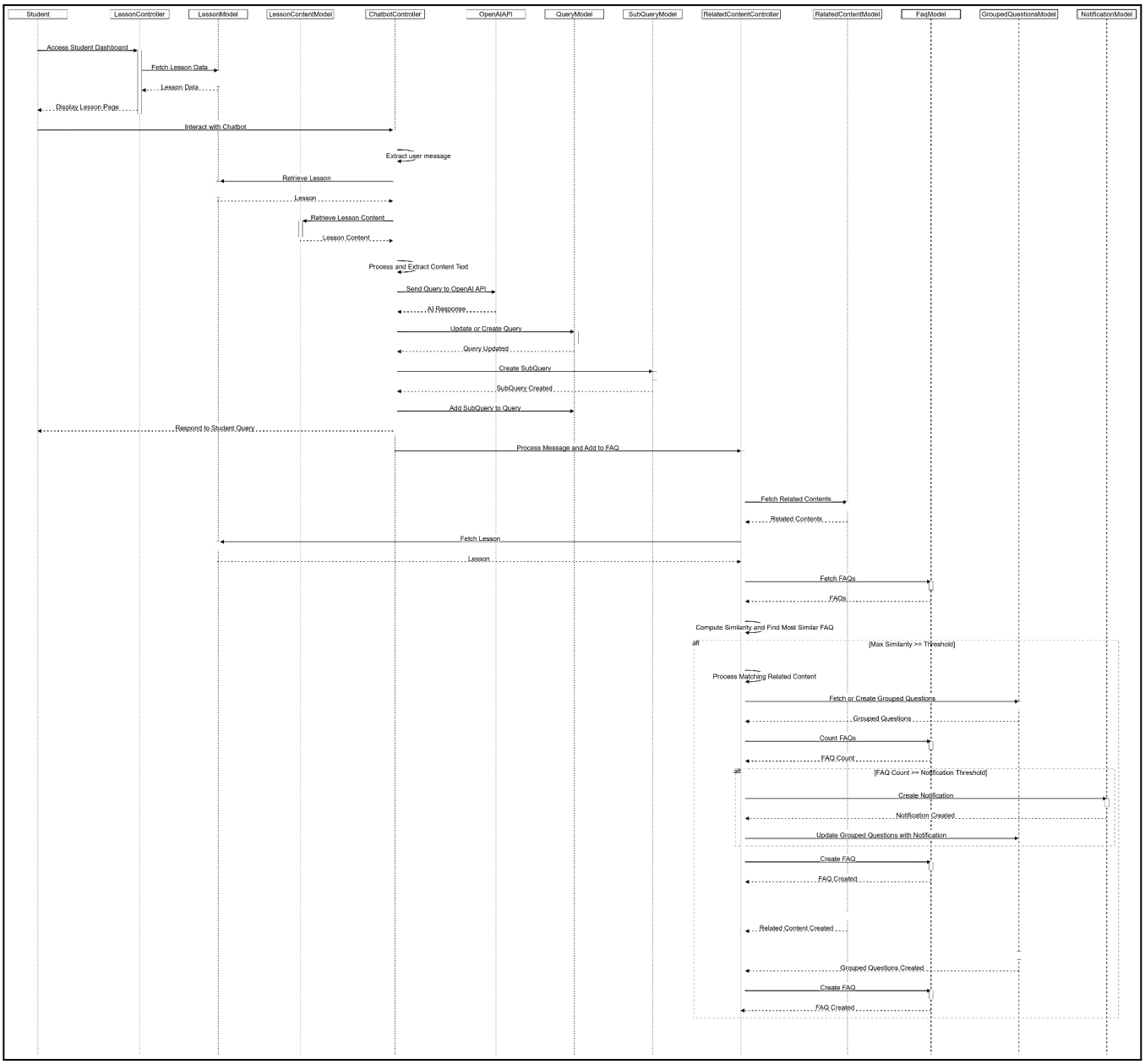


6.1.2.2. Class Diagram



Class Diagram of Student Lesson Page

6.1.2.3. Sequence Diagram

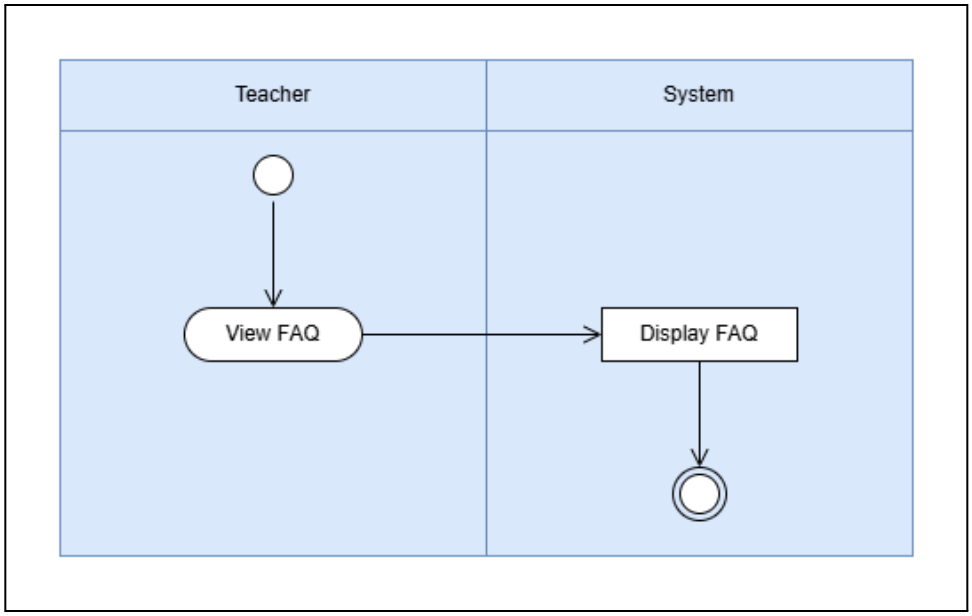


Sequence Diagram of Student Lesson Page

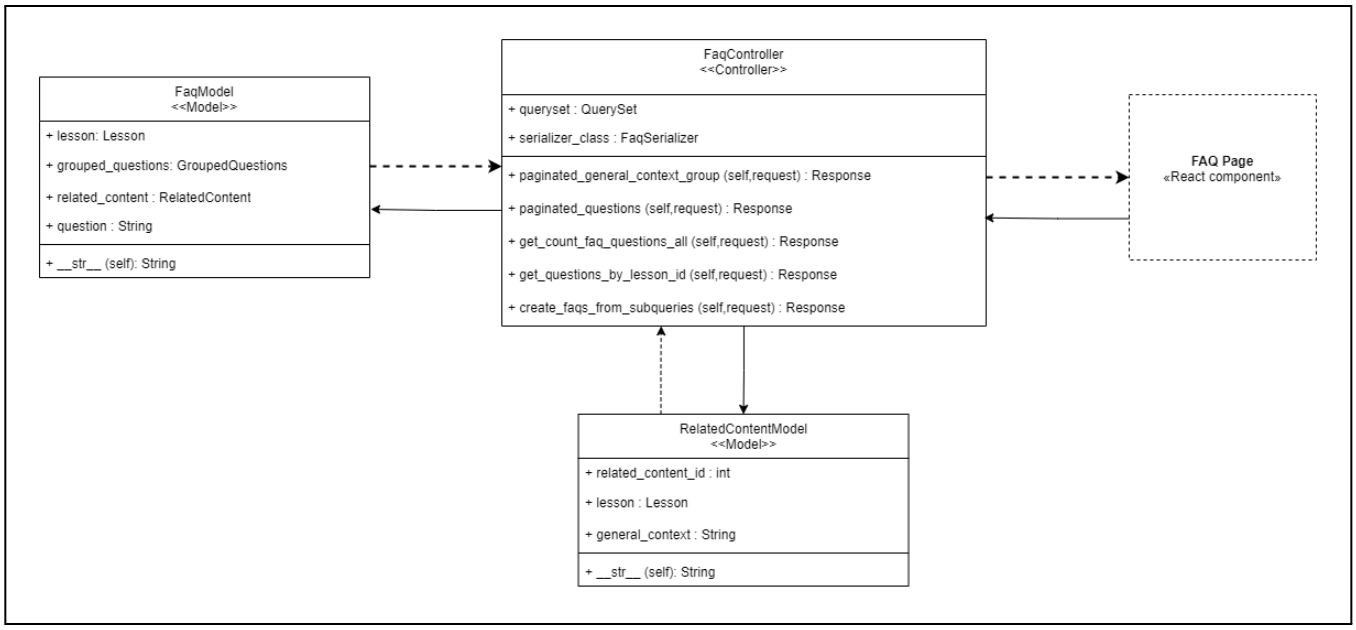
6.1.3. Module 3: Frequently Asked Questions (FAQ)

6.1.3.1. Activity Diagram

Accessing FAQs

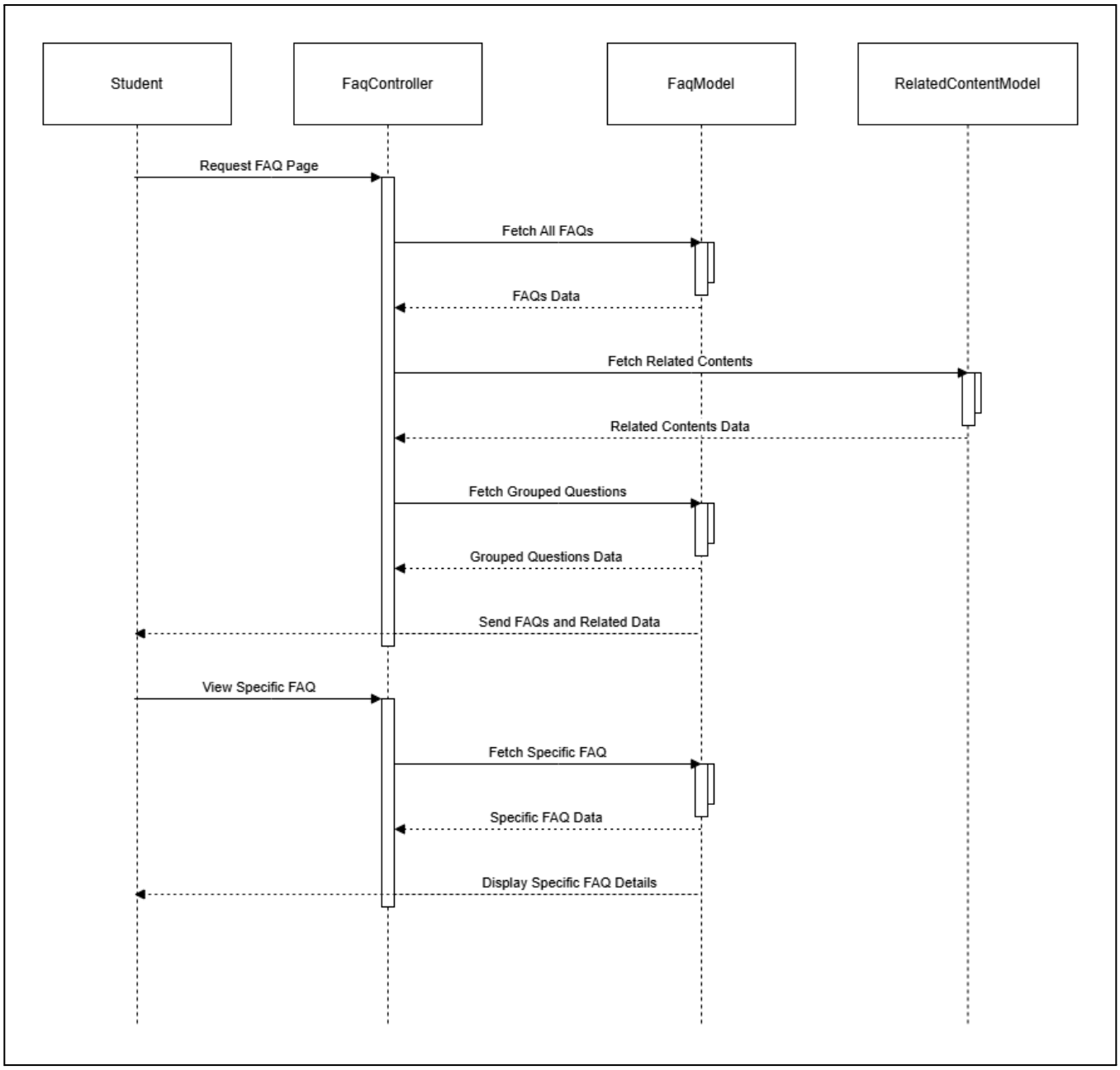


6.1.3.2. Class Diagram



Class Diagram of Frequently Asked Questions (FAQ)

6.1.3.3. Sequence Diagram

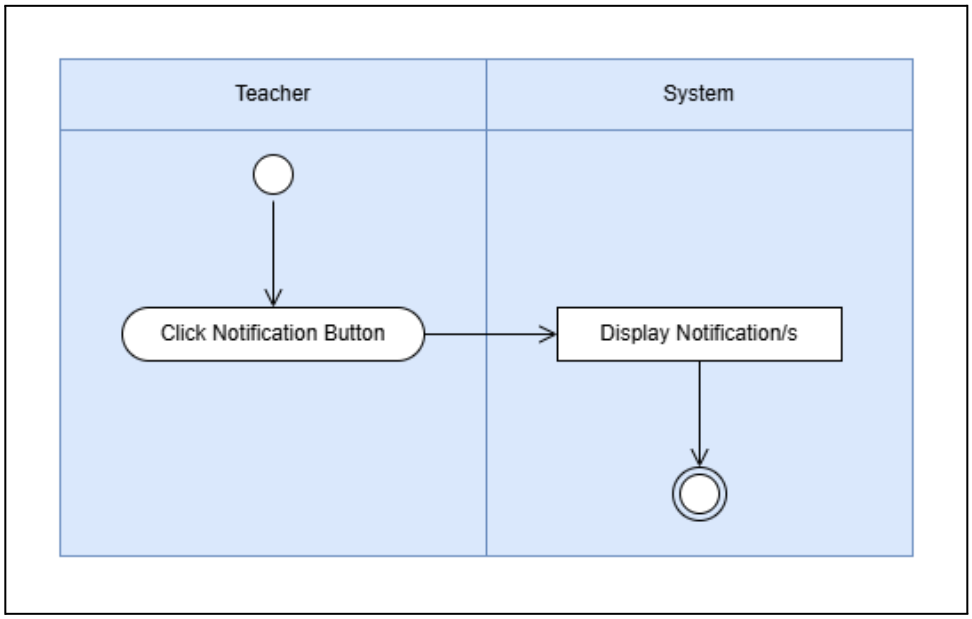


Sequence Diagram of Frequently Asked Questions (FAQ)

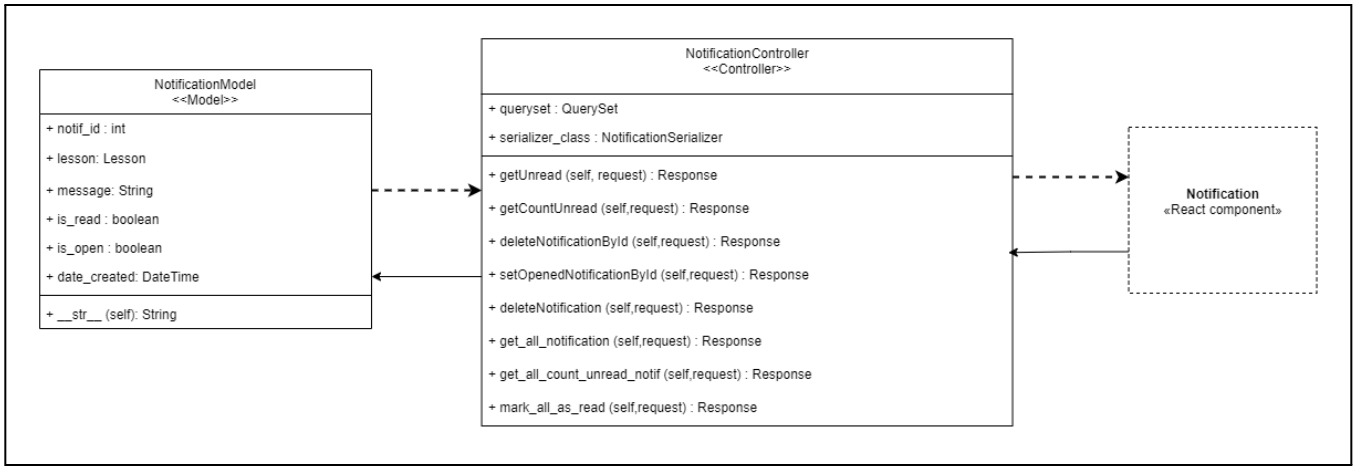
6.1.4. Module 4: Notification

6.1.4.1. Activity Diagram

Viewing Notifications

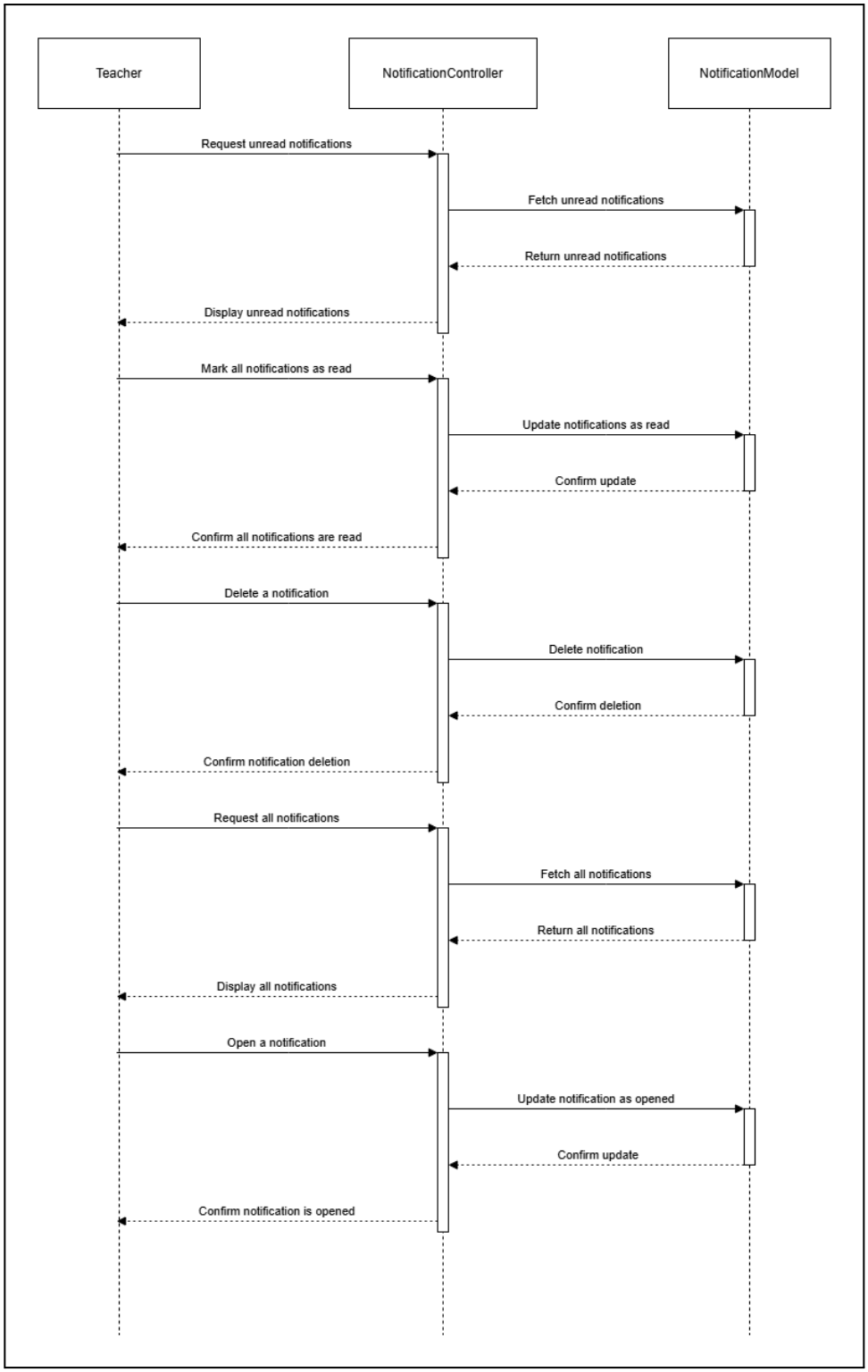


6.1.4.2. Class Diagram



Class Diagram of Notification

6.1.4.3. Sequence Diagram

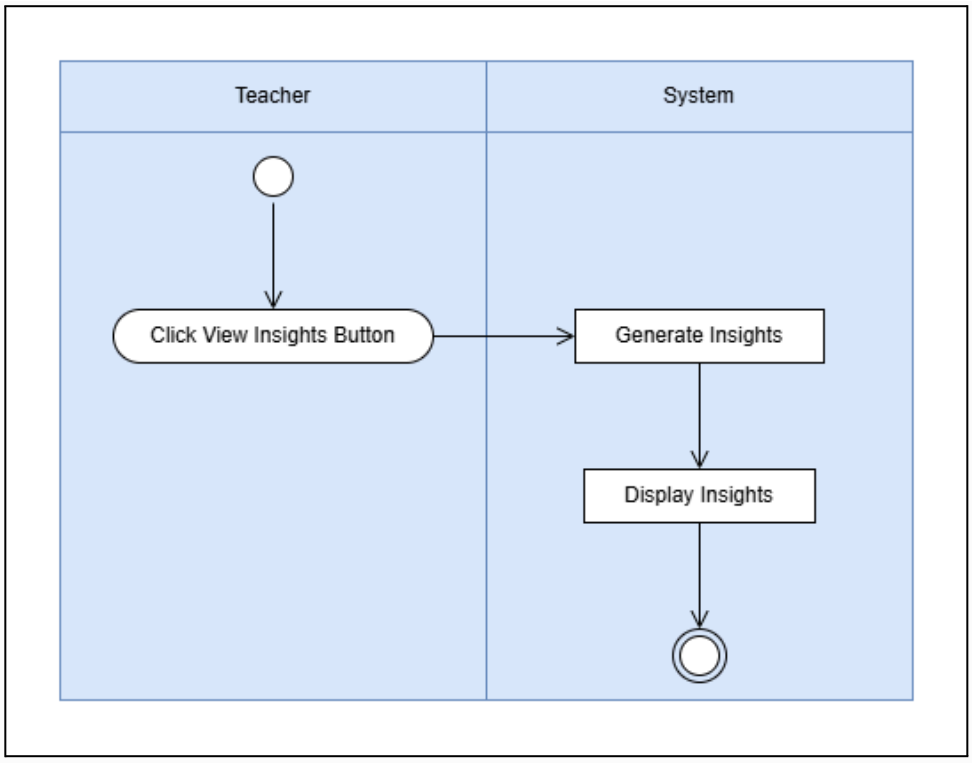


Sequence Diagram of Notification

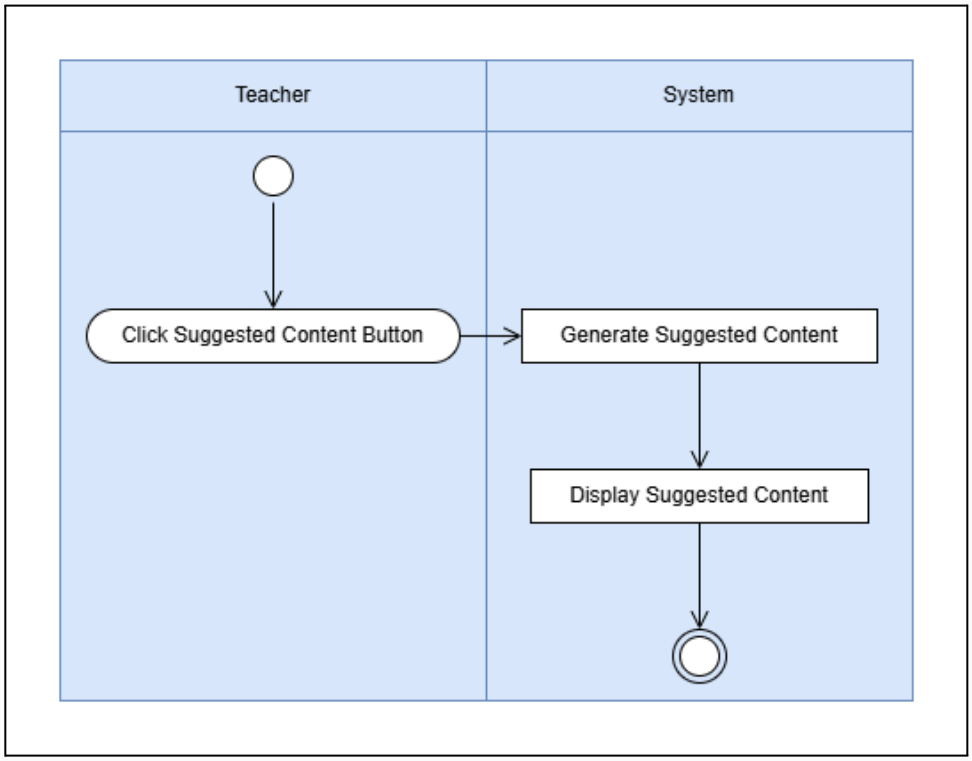
6.1.5. Module 5: Ask for Insights / Ask for Content Page

6.1.5.1. Activity Diagram

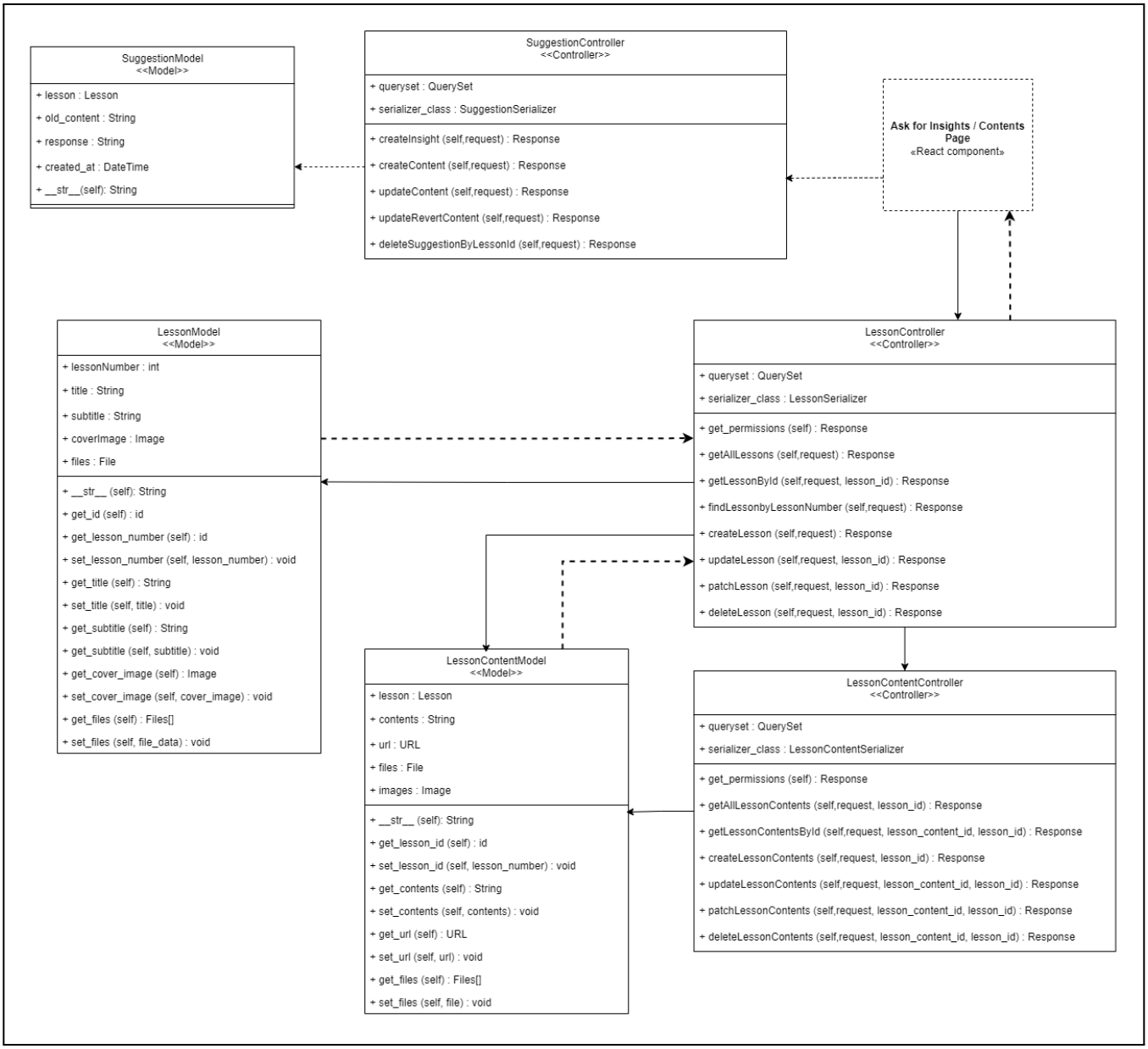
Viewing Insights



Suggesting Content

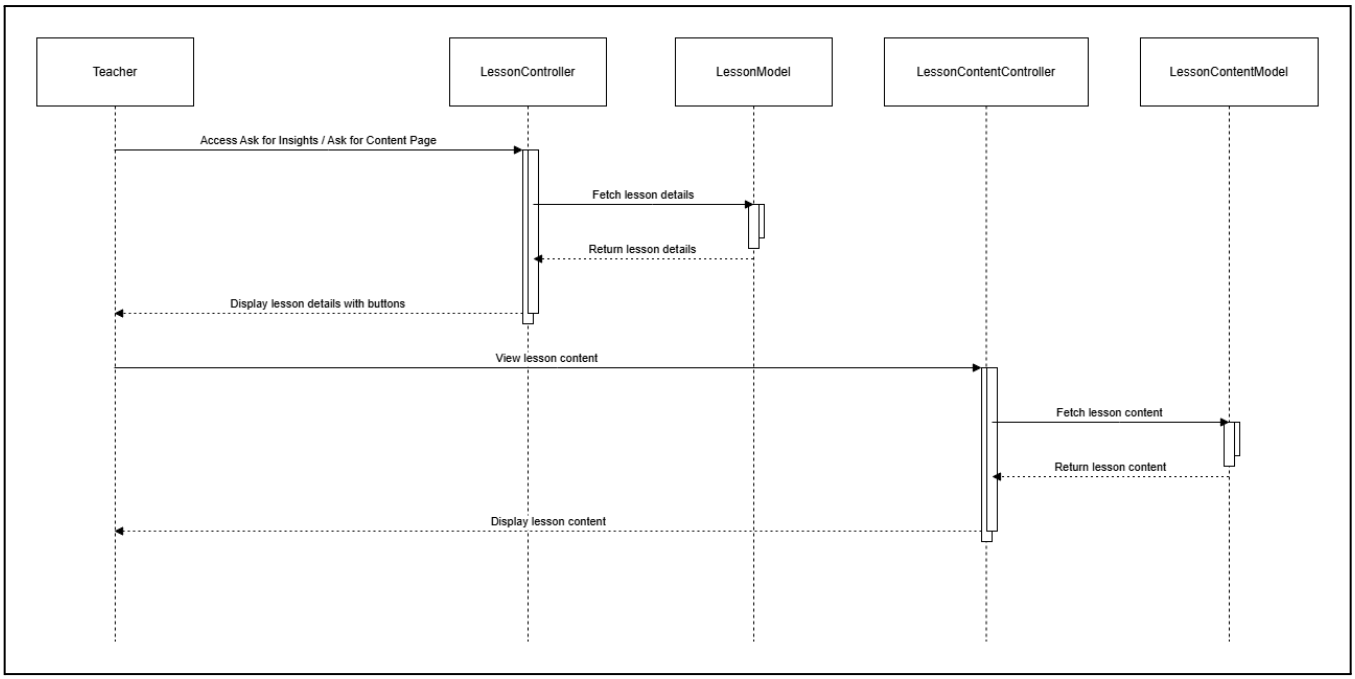


6.1.5.2. Class Diagram



Class Diagram of Ask for Insights / Ask for Content Page

6.1.5.3. Sequence Diagram

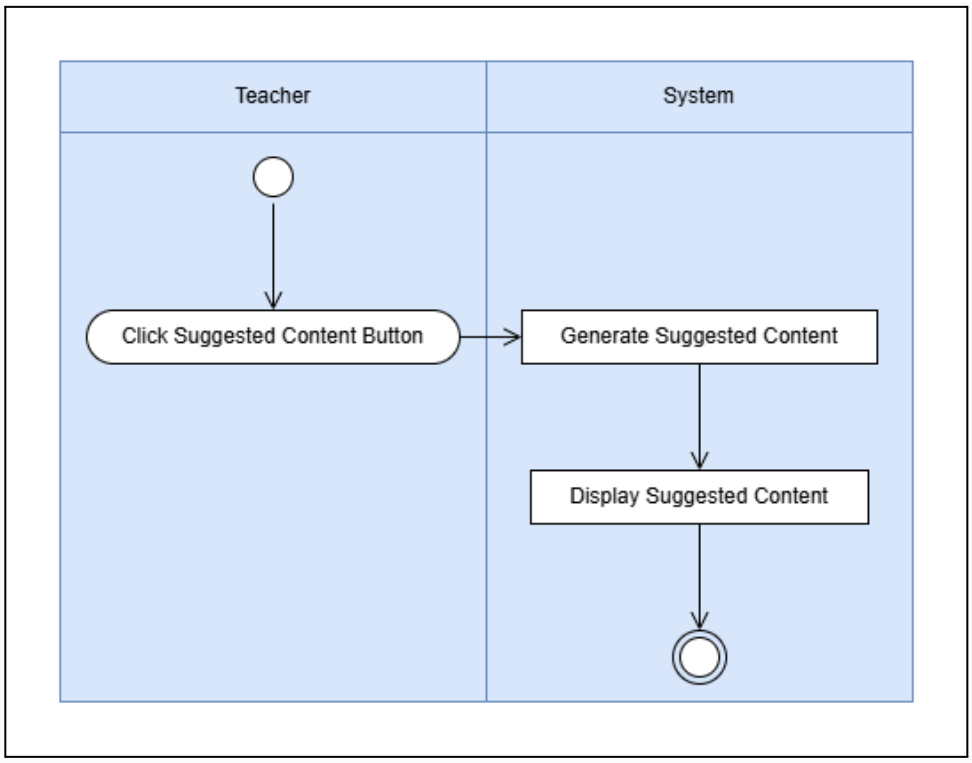


Sequence Diagram of Ask for Insights / Ask for Content Page

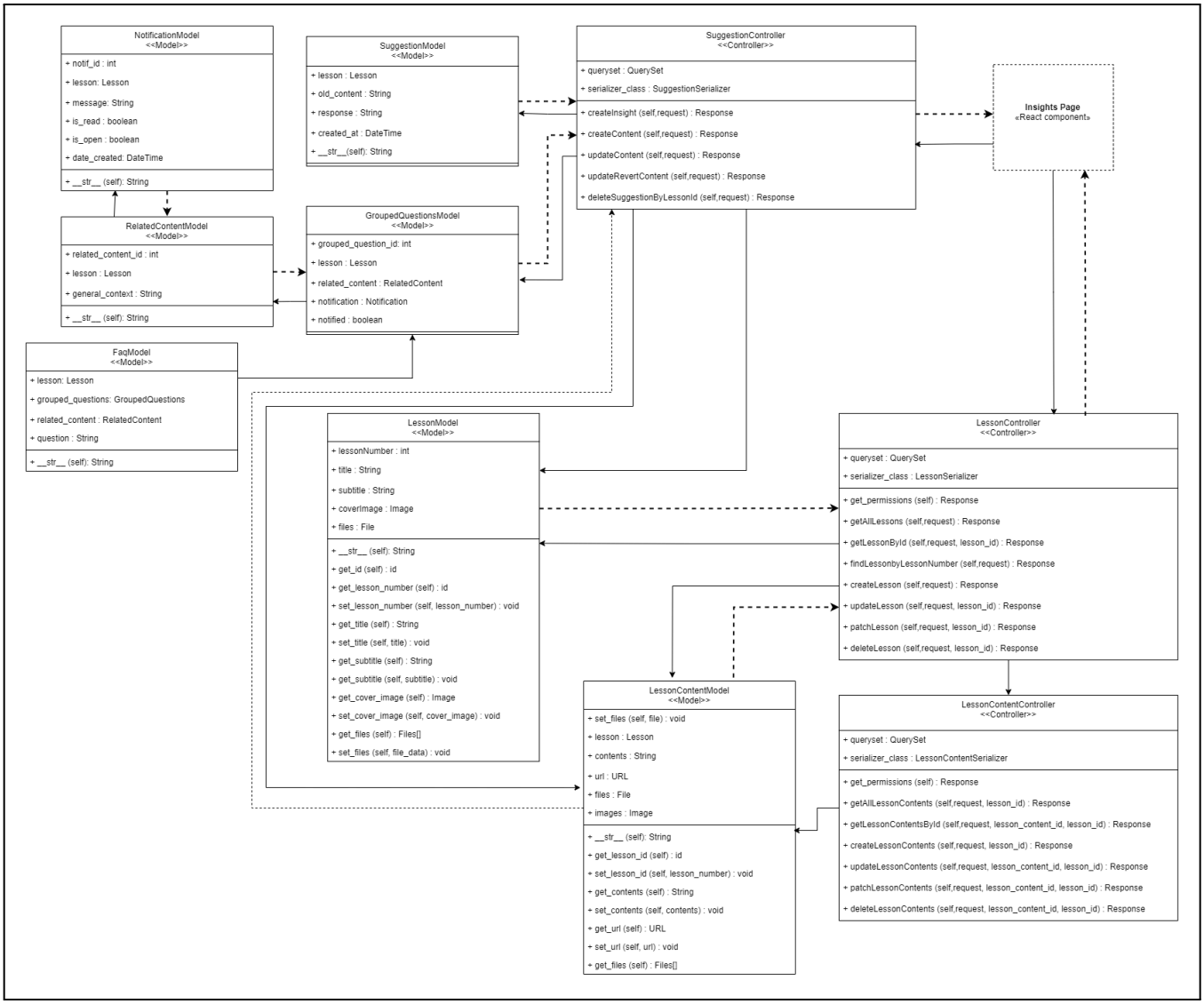
6.1.6. Module 6: Insights Page

6.1.6.1. Activity Diagram

Suggesting Content

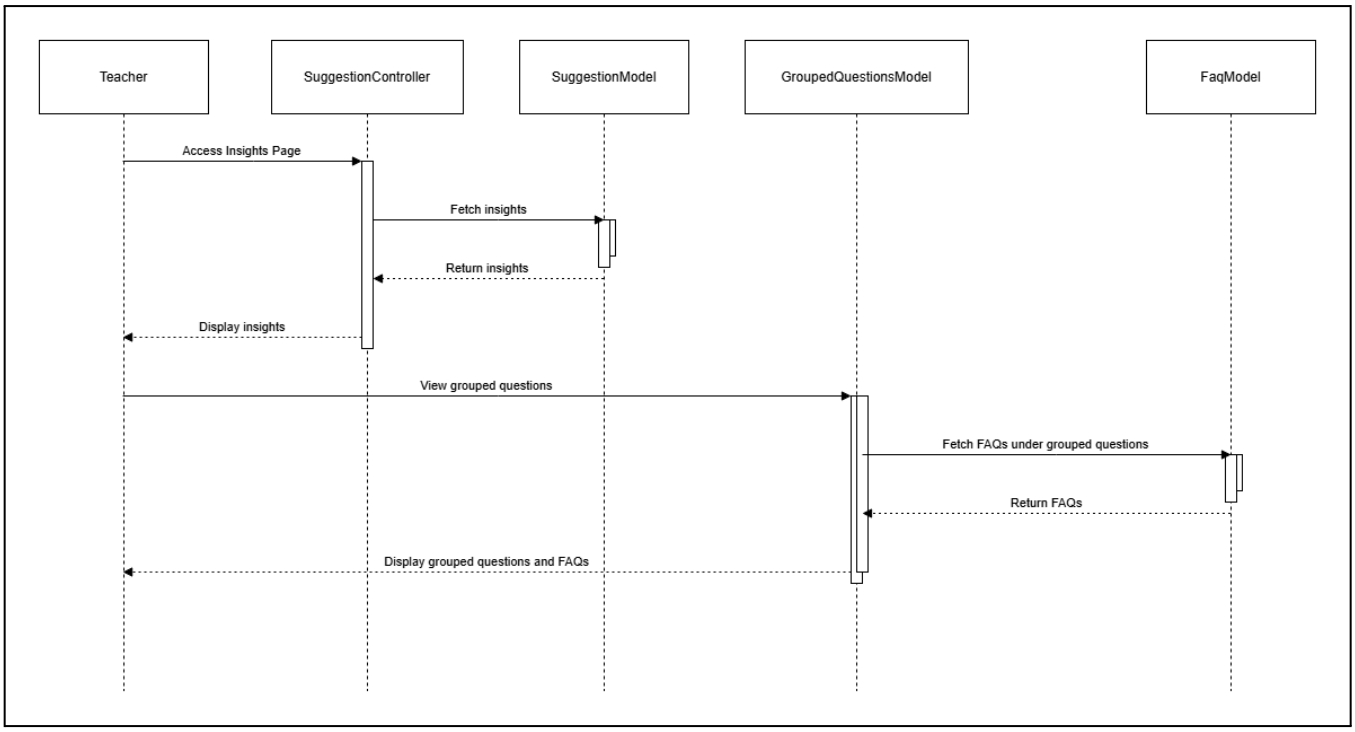


6.1.6.2. Class Diagram



Class Diagram of Insights Page

6.1.6.3. Sequence Diagram

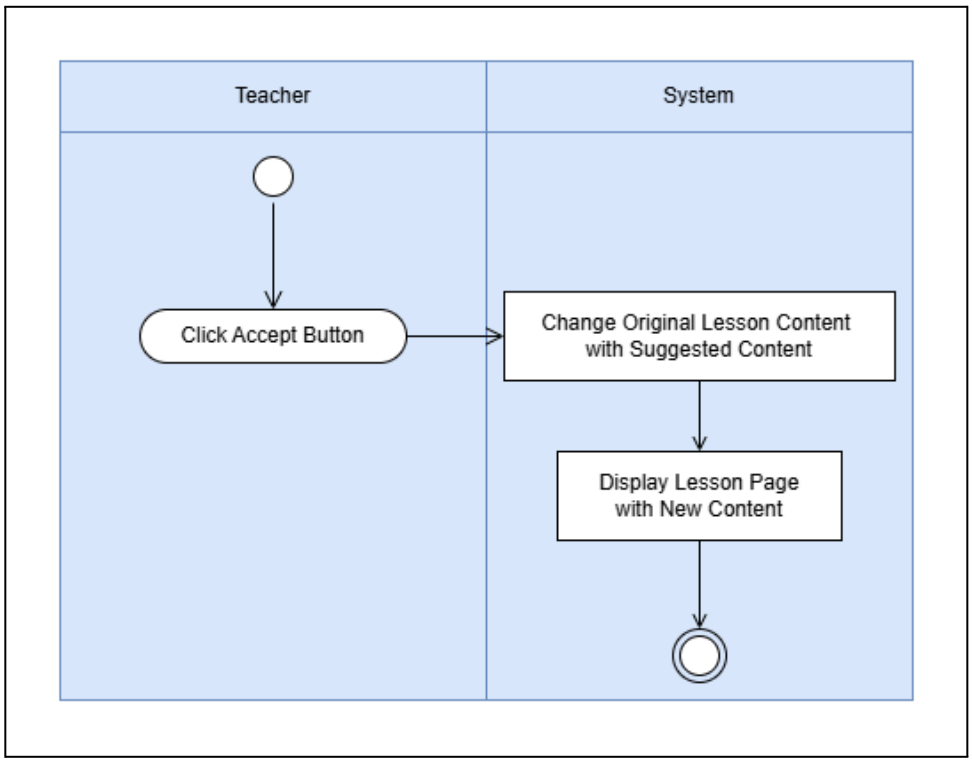


Sequence Diagram of Insights Page

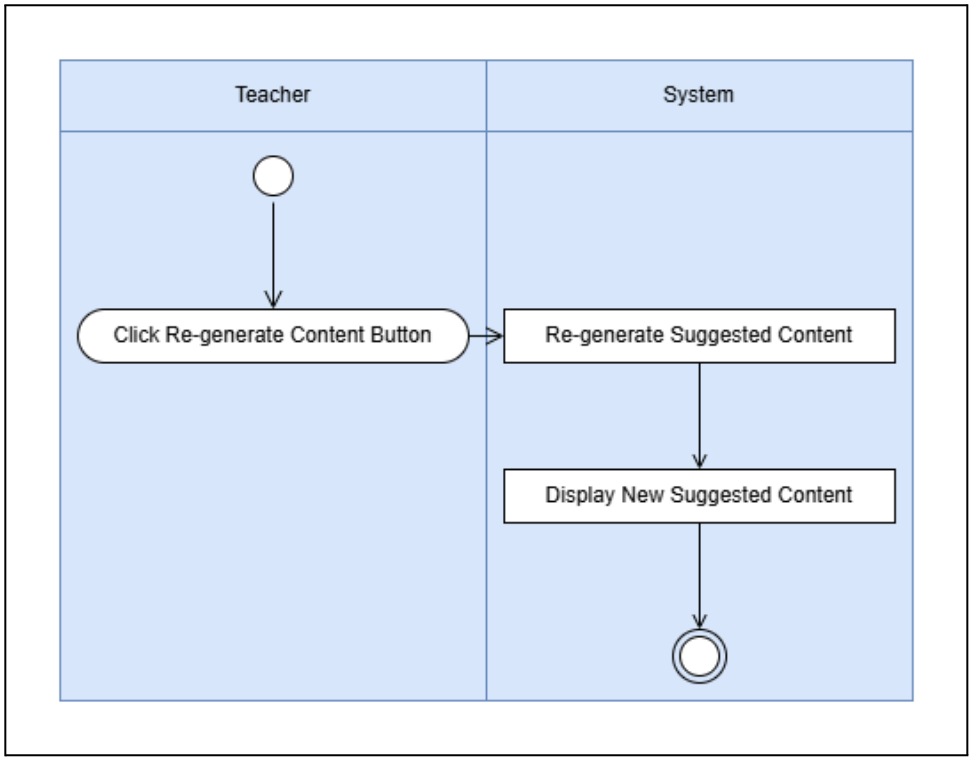
6.1.7. Module 7: Accept/Ignore Content Page

6.1.7.1. Activity Diagram

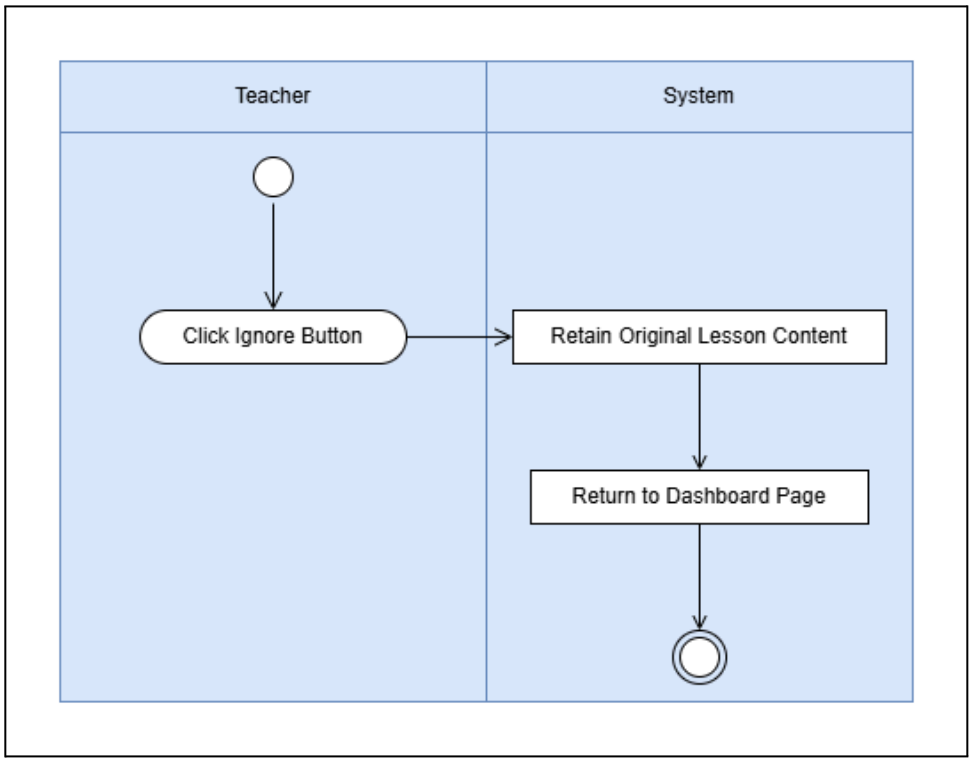
Accepting Suggested Content



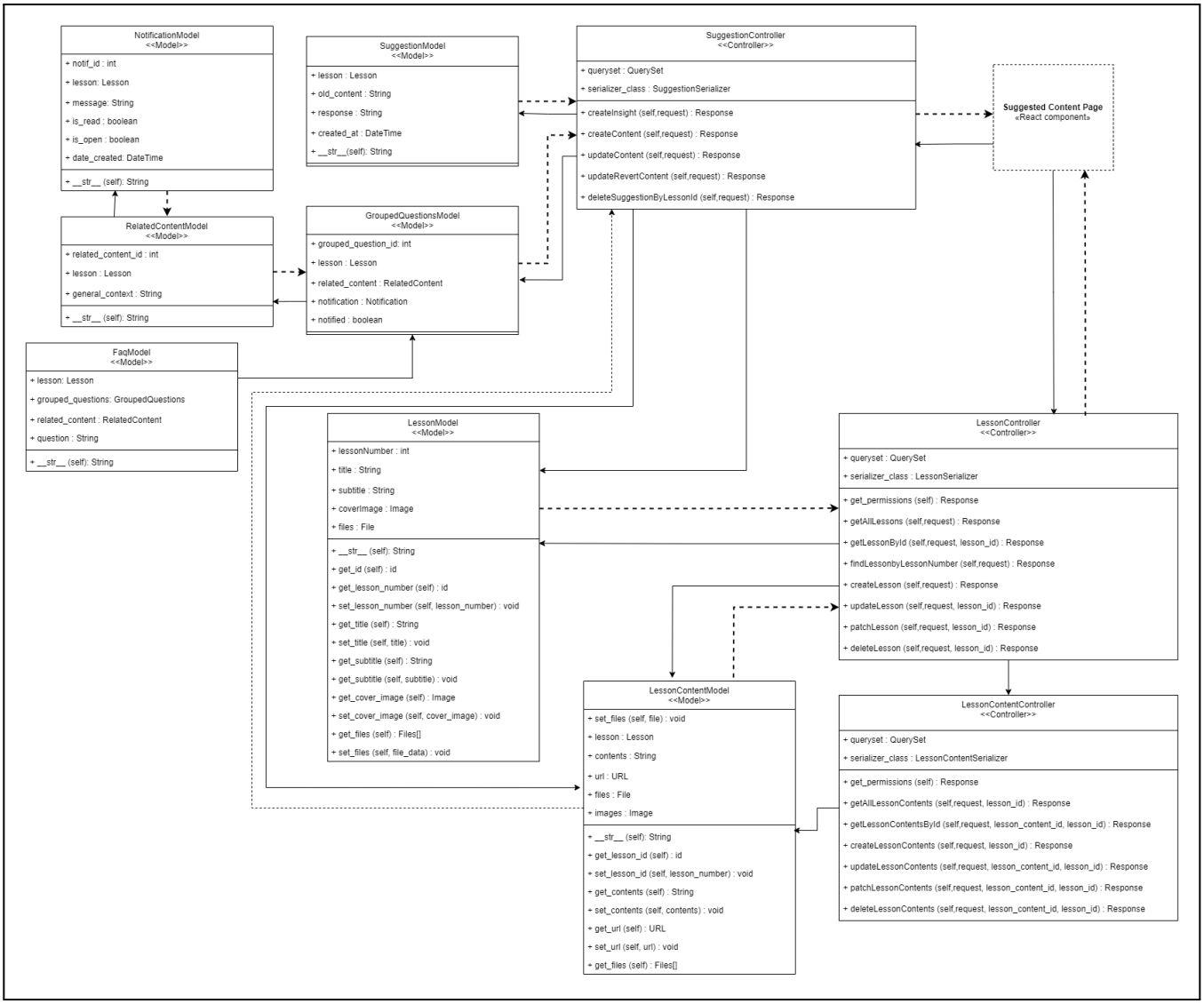
Re-generating Suggested Content



Ignoring Suggested Content

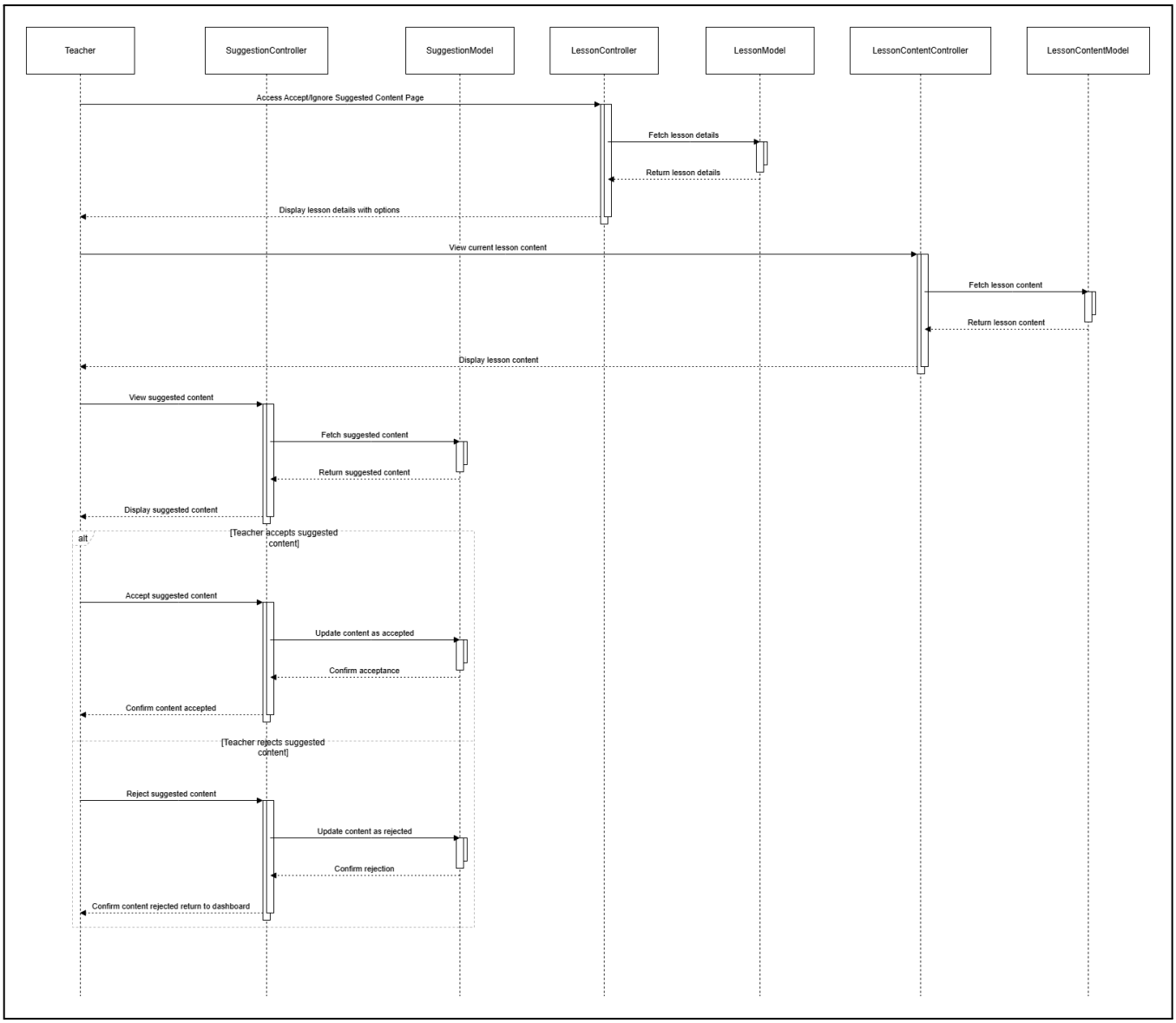


6.1.7.2. Class Diagram



Class Diagram of Accept/Ignore Suggested Content Page

6.1.7.3. Sequence Diagram

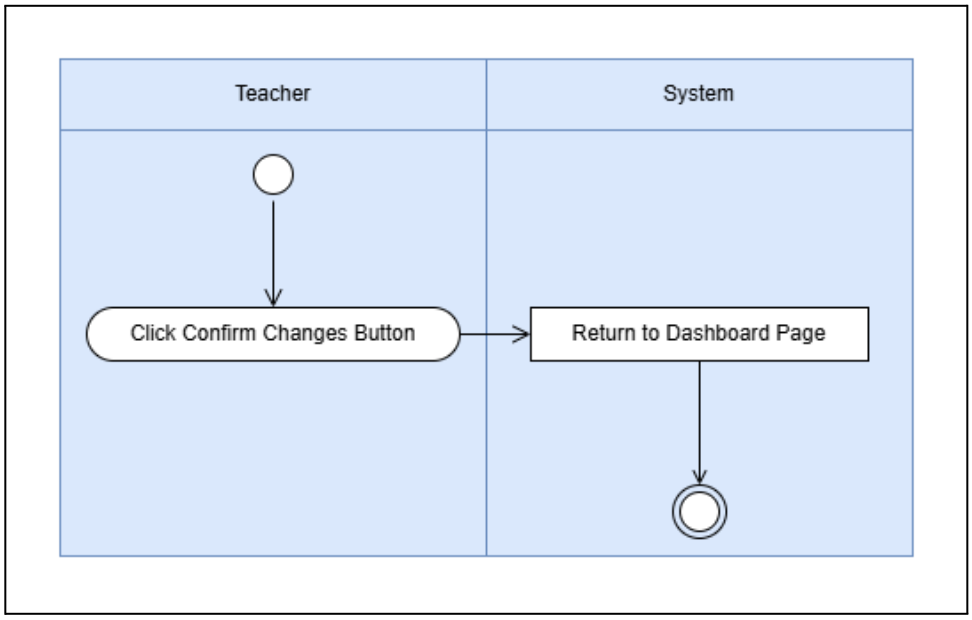


Sequence Diagram of Accept/Ignore Suggested Content Page

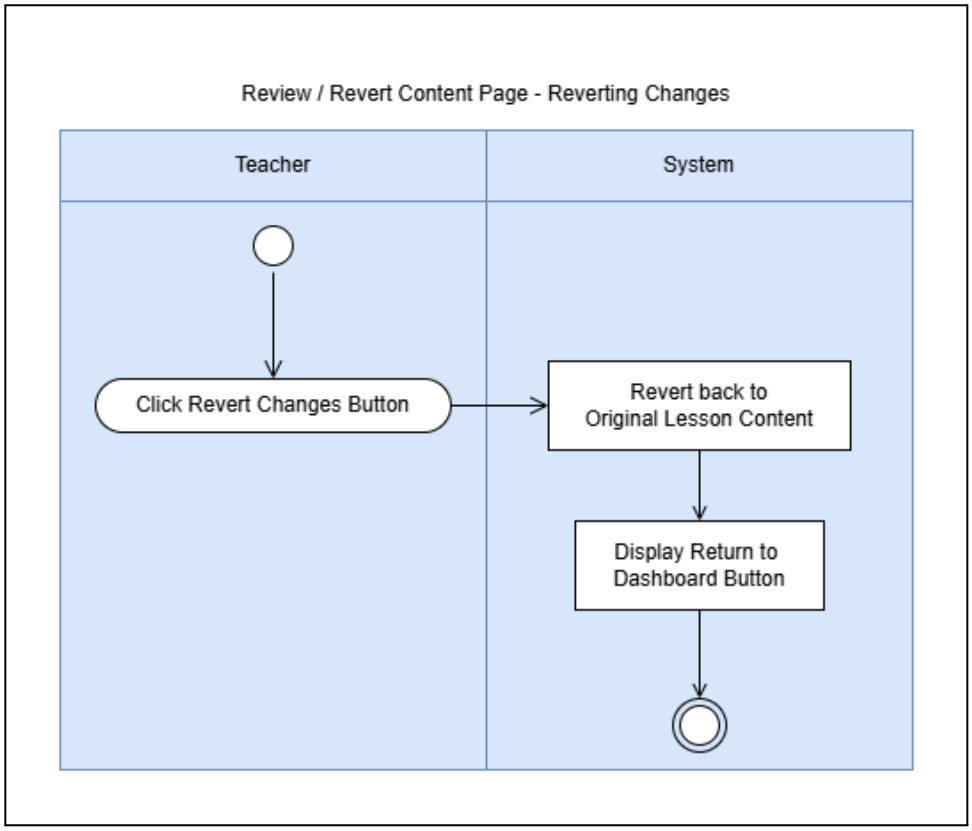
6.1.8. Module 8: Revert Content Page

6.1.8.1. Activity Diagram

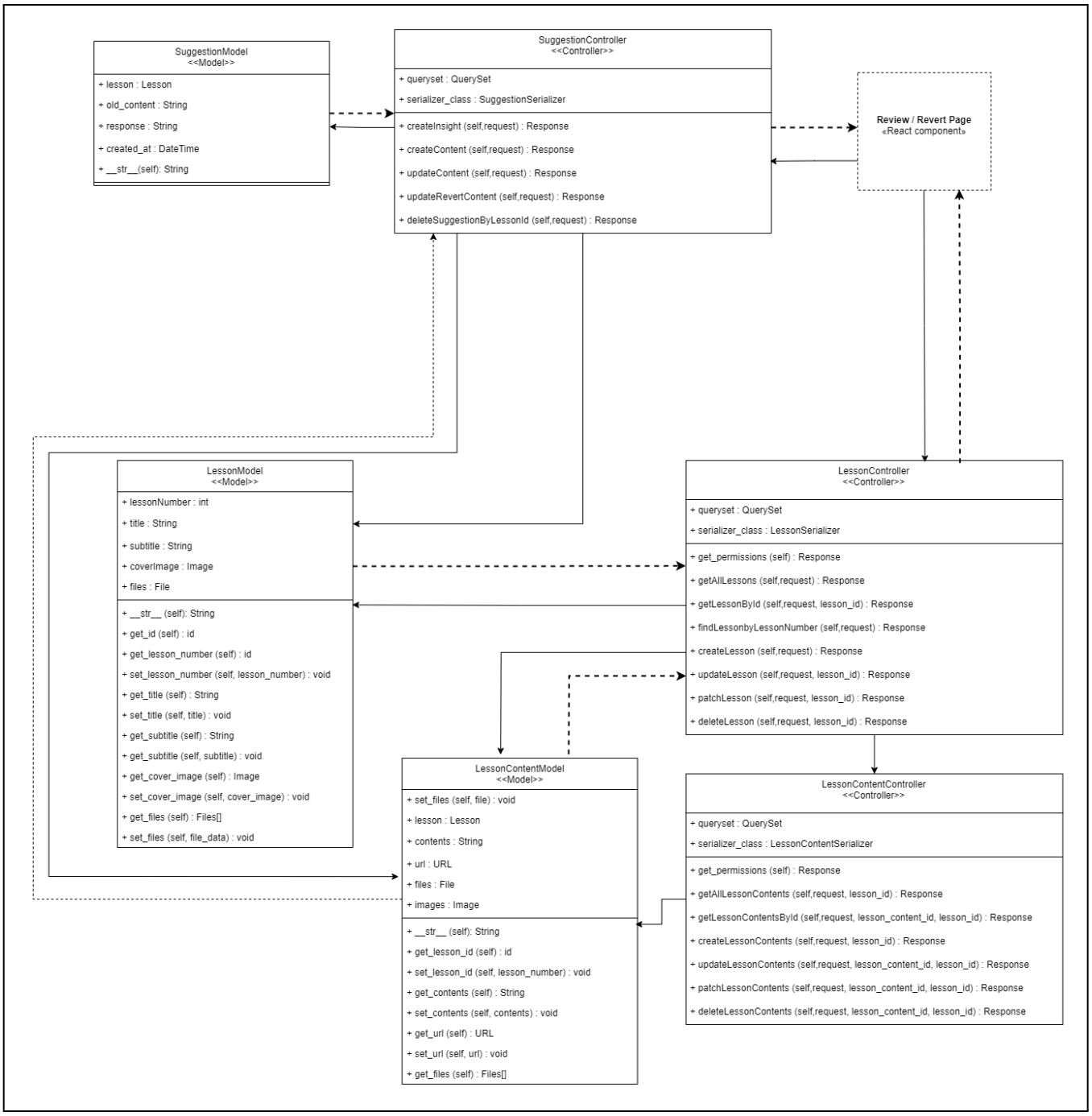
Finalizing Changes



Reverting Changes

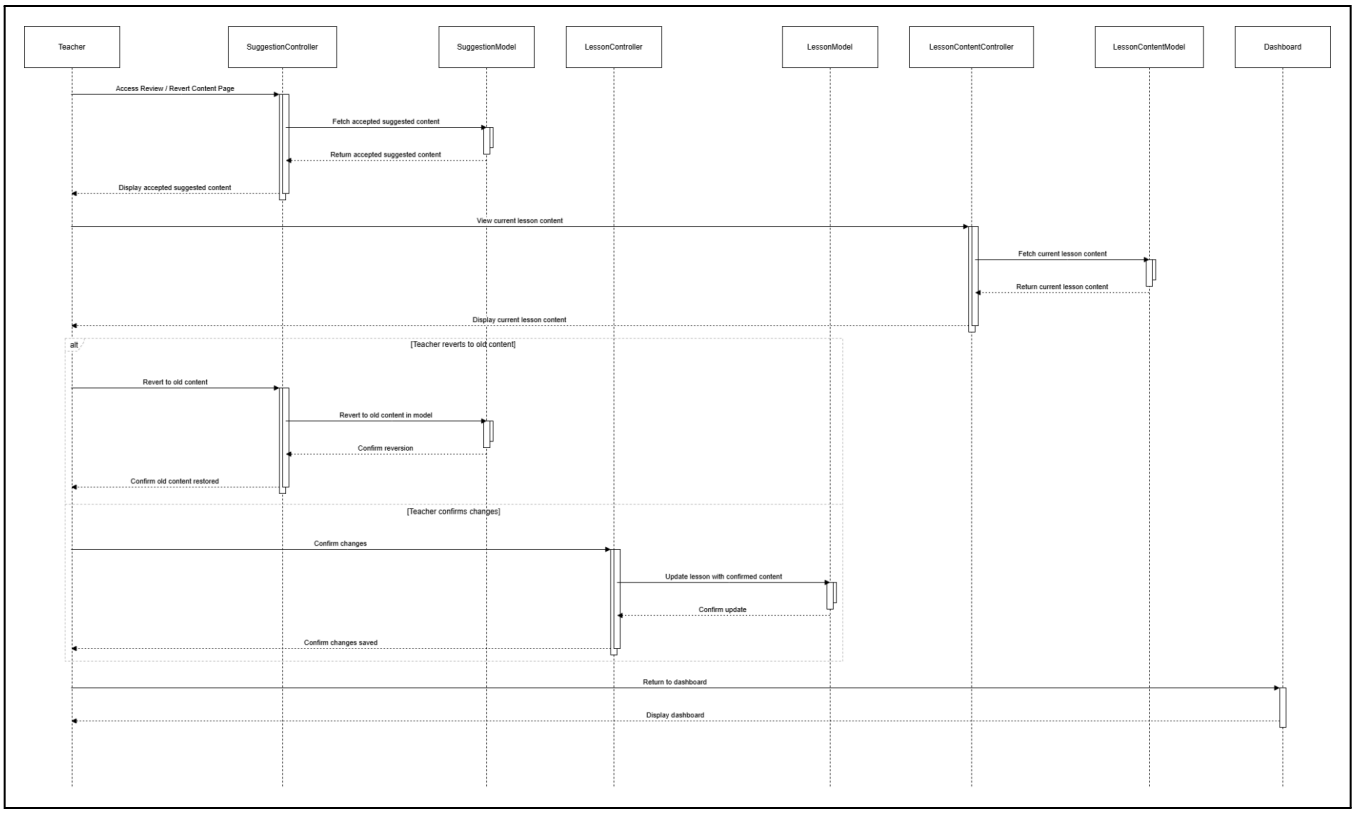


6.1.8.2. Class Diagram



Class Diagram of Accept/Ignore Suggested Content Page

6.1.8.3. Sequence Diagram



Sequence Diagram of Accept/Ignore Suggested Content Page

6.2. Data Detailed Design

6.2.1. Database Entity Relationship Diagram