



Software Engineering Analysis & Design Project

Elementary School Management System

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1. Introduction

1.1 Project Overview

The *Elementary School Management System* is a comprehensive platform designed to streamline the academic, administrative, and communication processes within an elementary school environment. The system is tailored to support the four primary user roles — Parents, Pupils, Teachers, and the Principal — each having unique access, responsibilities, and workflows. It facilitates class creation, assignment management, performance tracking, communication between stakeholders, and administrative oversight.

This project applies software engineering principles and design methodologies to ensure a robust, scalable, and user-friendly solution that supports digital transformation in schools.

1.2 Purpose

The purpose of this project is to design and document a software system that:

- Improves academic engagement between teachers, pupils, and parents.
- Enables parents to track their child's academic activity and progress.
- Allows teachers to manage their classes, distribute materials, grade work, and communicate.
- Provides the principal with administrative tools to monitor the school ecosystem.
- Ensures secure, role-based access for all users with verification steps.

1.3 Scope

This system includes, but is not limited to, the following core functionalities:

- **Authentication & Access Control** for different user types.
- **Parent-Child Linkage**: Parents must log in and verify to access their dashboard, while pupils access their pages under parental control.
- **Class Management**: Teachers can create classes subject to principal approval.
- **Assignment & Quiz Distribution**: Teachers upload materials and assessments.
- **Grading & Feedback**: Teachers provide grades and feedback; pupils submit work.
- **Parental Oversight**: Parents view pupil grades, attendance, and messages.
- **Administrative Tools**: The principal can manage all users and make announcements.

The system focuses on delivering a secure and easy-to-use interface with responsive designs and features applicable to real-world school scenarios.

1.4 Target Users

- **Pupils:** Access class content, submit assignments, take quizzes.
- **Parents:** Monitor pupil progress, communicate with teachers, view updates.
- **Teachers:** Manage academic content, interact with pupils and parents.
- **Principal:** Oversee the platform, approve classes, manage staff and students.

1.5 Technologies Used

- **Diagram Tools:** Draw.io, Lucidchart
- **Design:** Figma, Uizard

1.6 Objectives

The primary objectives of the *Middle School Management System* project are:

- **Enhance Communication:** Provide clear, direct communication channels between teachers and parents to improve academic collaboration.
- **Digitize School Operations:** Replace paper-based and manual administrative processes with a centralized digital platform.
- **Support Role-Based Access:** Ensure secure and appropriate functionality for different user roles — pupils, parents, teachers, and the principal.
- **Facilitate Learning:** Allow pupils to access materials, submit assignments, and receive feedback easily.
- **Parental Monitoring:** Equip parents with real-time insights into their child's academic life including grades, attendance, and interactions.
- **Empower Teachers and Admins:** Give teachers tools to manage classes efficiently and give the principal oversight and control over school-wide activities.
- **Ensure Scalability and Usability:** Design the system to be intuitive, visually clean, and expandable for future features.

2. Requirements

2.1 Functional Requirements

2.1.1 User Authentication and Access Control

FR1.1: The system shall allow **parents** to create and log into their accounts using a secure login system.

FR1.2: Upon successful login, parents shall be required to verify their identity through a second verification step (e.g., OTP or security question) before accessing their own dashboard.

FR1.3: After a parent's initial login, the system shall allow access to the **pupil's dedicated page**.

FR1.4: **Teachers** and the **principal** shall be able to log in and be redirected to their respective dashboards without a second verification step.

2.1.2 Parent Portal

FR2.1: The parent dashboard shall display the pupil's attendance records, grades, submitted assignments, and quiz performance.

FR2.2: Parents shall be able to view detailed feedback given by teachers.

FR2.3: Parents shall be able to send and receive messages to/from teachers.

FR2.4: Parents shall have access to school-wide announcements.

2.1.3 Pupil Portal

FR3.1: Pupils shall be able to access all their enrolled classes through their dashboard.

FR3.2: Pupils shall be able to view/download learning materials (PDFs, videos, images, etc.) if allowed by the teacher.

FR3.3: Pupils shall be able to complete and submit assignments and quizzes.

FR3.4: Pupils shall be able to receive feedback and grades for their submissions.

FR3.5: Pupils shall see a list of all their classes, clearly showing due assignments, upcoming quizzes, and announcements.

2.1.4 Teacher Portal

FR4.1: Teachers shall be able to create class proposals which require **principal approval** before becoming active.

FR4.2: Teachers shall be able to assign pupils to their classes once approved.

FR4.3: Teachers shall be able to upload learning materials in multiple formats (PDF, DOC, MP4, etc.).

FR4.4: Teachers shall be able to create and manage assignments and quizzes.

FR4.5: Teachers shall be able to take attendance for their classes.

FR4.6: Teachers shall be able to grade pupil work and provide individual feedback.

FR4.7: Teachers shall be able to send and receive messages with parents and pupils.

2.1.5 Principal Portal

FR5.1: The principal shall have access to all user accounts (pupils, parents, and teachers).

FR5.2: The principal shall be able to create, update, or delete any user account.

FR5.3: The principal shall review and approve class creation requests from teachers.

FR5.4: The principal shall monitor teacher performance (based on class engagement, grading, feedback frequency, etc.).

FR5.5: The principal shall be able to post school-wide announcements visible to all users.

2.2 Non-Functional Requirements

2.2.1 Performance

NFR1.1: The system shall support concurrent access by at least 500 users without performance degradation.

NFR1.2: The system shall load user dashboards within 3 seconds on average.

2.2.2 Security

NFR2.1: The system shall implement secure login using hashed passwords.

NFR2.2: Parent accounts shall implement a second-factor authentication system before full access.

NFR2.3: All user data shall be transmitted over HTTPS to ensure encryption in transit.

NFR2.4: Different roles (parent, pupil, teacher, principal) shall have properly restricted access based on permissions.

2.2.3 Usability

NFR3.1: The system interface shall be user-friendly and accessible to non-technical users.

NFR3.2: The system shall support responsive design to be usable on tablets and smartphones.

NFR3.3: Pupils and parents shall be able to access all relevant information in no more than three clicks.

2.2.4 Maintainability

NFR4.1: The system shall be modular and support future feature additions with minimal disruption.

NFR4.2: The system codebase shall be documented to allow for easier updates and debugging.

2.2.5 Reliability

NFR5.1: The system shall be available 99.5% of the time during school hours.

NFR5.2: The system shall auto-save pupil submissions to prevent data loss.

2.2.6 Data Integrity

NFR6.1: The system shall validate all data inputs (e.g., dates, grades) before saving to the database.

NFR6.2: The system shall log all changes to pupil records, including who made the change and when.

3. Stakeholders

This section identifies the key stakeholders involved in the Middle School Management System project. Stakeholders are individuals or groups who are directly or indirectly affected by the system and have an interest in its success or outcome.

3.1 Stakeholders Identification Table

The table below lists all identified stakeholders, their role in the system, their level of influence, and their expectations or needs. This helps clarify who must be considered throughout the system's development and delivery.

Stakeholder	Stakeholder Role/Responsibility	Importance	Influence	Interests/ Positive Impacts	Concerns
School Administrators (Principals)	Oversee school operations, decision-making, and policy enforcement. Use the system for reporting, scheduling, and administration.	High	High	Streamlined administration, improved reporting, better decision-making.	Data security, system reliability, training requirements.
Teachers	Use the system for grading, attendance tracking, lesson planning, and communication with students and parents.	High	High	Efficiency in record-keeping, easier communication, better student tracking.	System usability, training, reliability, potential workload increase.
Pupils	Access assignments, grades, schedules, and school notices.	Medium	Low	Easier access to academic resources, improved communication with teachers.	Privacy concerns, ease of use, accessibility.
Parents/ Guardians	Monitor their child's progress, communicate with	High	Medium	Better engagement with school, timely updates on child's progress.	Data security, system complexity,

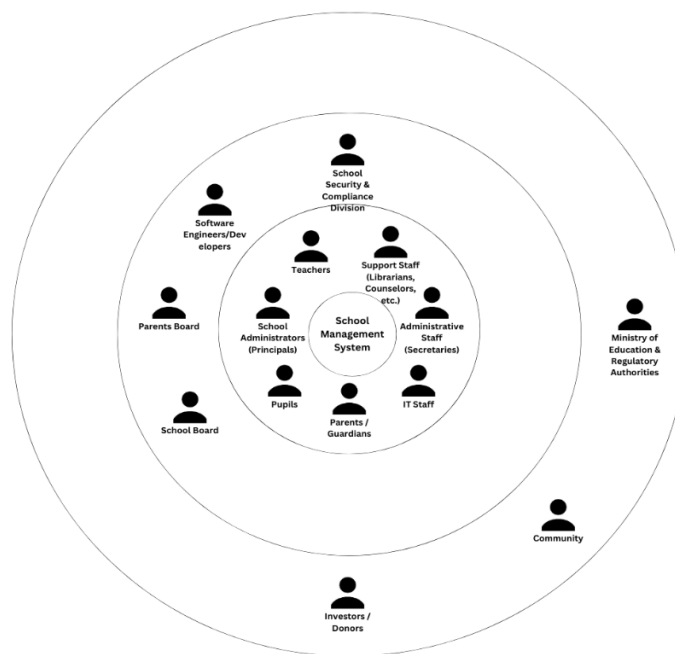
	teachers, receive school updates.				usability concerns.
IT Staff	Maintain, troubleshoot, and ensure system security and functionality.	High	High	System efficiency, robust security, reduced maintenance workload.	Security threats, system downtime.
School Board	Oversee school policies and performance, use the system for analytics and decision-making.	High	High	Data-driven decision-making, better transparency.	Data accuracy, access control, compliance with regulations.
Support Staff (Librarians, Nurses, Counselors, etc.)	Use the system for managing student services, health records, library management.	Medium	Low	Streamlined operations, improved student support.	System integration with existing tools, ease of use.
Administrative Staff (Secretaries)	Use the system for scheduling and school communication.	High	High	Efficient scheduling, reduced paperwork.	Training needs, system bugs, data security.

Software Engineers/ Developers	Develop, maintain, and improve the system.	High	High	Technical advancements, seamless performance.	System complexity, debugging, user requirements alignment.
Ministry of Education & Regulatory Authorities	Ensure compliance, monitor school performance.	High	High	Improved compliance tracking, better data analytics for education policies.	Regulatory compliance, data protection, access control.
Investors/Donors	Provide financial support and funding. Use the system for tracking school performance.	Medium	Medium	Better transparency, impact tracking.	ROI, transparency, financial accountability.
Community	Engage in school activities, support initiatives.	Low	Low	Better school-community collaboration.	System accessibility, relevance to local needs.

School Security & Compliance Division	Ensure student and staff safety, manage compliance.	High	High	Better monitoring, improved security protocols.	Data privacy, security vulnerabilities.
Parents Board	Represent parents, provide feedback on system usability.	High	Medium	Stronger school-parent relationships, better communication.	Usability issues, data security concerns, accessibility.

3.2 Onion Diagram

The onion diagram below visually represents stakeholders in concentric layers based on their level of interaction with the core system. At the center are the system users with the highest interaction, while external stakeholders are placed in outer layers.



4. User Stories

User stories help define the system requirements from the perspective of end users. They describe what different types of users (roles) want to achieve using the system, usually following the format:

As a [user role], I want to [action] so that [goal/result].

These stories help keep development user-focused and ensure that all features have clear value.

Pupils

A Pupil can search for course materials by keywords, subject, or teacher name.

A Pupil can access materials

- A Pupil can view course materials online.

- A Pupil can download course materials for offline access.

A Pupil can search assignments

- A Pupil can search for assignments by course, due date, or keywords.

- A Pupil can filter assignments by status (pending, submitted, graded).

A Pupil can access assignments

- A Pupil can view assignment details, including instructions, due date, and attached files.

- A Pupil can download assignment files for offline access.

A Pupil can submit assignments

- A Pupil can upload completed assignments to submit them.

- A Pupil can attach multiple files to an assignment submission.

- A Pupil can add comments or explanations while submitting an assignment.

- A Pupil can replace a submitted assignment before the deadline.

- A Pupil can receive a confirmation notification after submitting an assignment.

A Pupil can keep track of assignments

- A Pupil can check the submission status of an assignment.

- A Pupil can receive reminders for upcoming deadlines.

- A Pupil can view teacher feedback and grades on submitted assignments.

A Pupil can request a re-evaluation of a graded assignment if needed.

A Pupil can search attendance records:

A Pupil can search for attendance records by date, subject, or teacher.

A Pupil can filter attendance records by present, absent, or late status.

A Pupil can view attendance records:

A Pupil can view their daily, weekly, and monthly attendance summary.

A Pupil can see detailed attendance records for each subject.

A Pupil can check attendance trends (e.g., percentage of attendance over time).

A Pupil can receive attendance notifications:

A Pupil can receive a notification if they are marked absent.

A Pupil can get attendance warnings if their attendance falls below a certain threshold.

A Pupil can receive announcements sent to the whole class.

A Pupil can view feedbacks:

A Pupil can view teacher feedback on assignments.

A Pupil can see feedback for quizzes and exams.

A Pupil can check feedback history for past assignments.

A Pupil can access detailed explanations and corrections provided by the teacher.

A Pupil can keep track of the feedbacks:

A Pupil can receive a notification when new feedback is available.

A Pupil can track which assignments have received feedback.

A Pupil can see pending feedback for submitted assignments.

A Pupil can search and filter scores:

A Pupil can search for scores by subject, assignment, or date.

A Pupil can filter scores by type (assignments, quizzes, exams, overall grade).

A Pupil can view scores:

A Pupil can view individual scores for assignments, quizzes, and exams.

A Pupil can see a breakdown of their overall grade per subject.

A Pupil can check class average scores for comparison.

A Pupil can track and analyze scores:

A Pupil can view score trends over time (e.g., progress charts).

A Pupil can see their highest and lowest scores.

A Pupil can receive recommendations based on score performance

A Pupil can receive a notification when a new score is available.

A Pupil can get alerts if their scores drop below a certain threshold.

A Pupil can download or print their score report for future reference.

Teachers

A Teacher can manage class records.

A Teacher can create class records.

A Teacher can edit class records (e.g., class name, subject, assigned teacher).

A Teacher can delete class records.

A Teacher can organize students into groups within a class name, subject, or assigned teacher.

A Teacher can organize students into groups within a class.

A Teacher can manage attendance.

A Teacher can take daily pupil attendance.

A Teacher can update attendance records if errors are found.

A Teacher can correct attendance records for individual pupils.

A Teacher can view attendance summaries by class, date, or pupil.

A Teacher can filter attendance records (present, absent, late).

A Teacher can download or print attendance sheets.

A Teacher can receive notifications about attendance anomalies (e.g., frequent absences).

A Teacher can manage assignments.

A Teacher can create and publish assignments.

A Teacher can set assignment details (instructions, due date, attachments).

A Teacher can edit or delete assignments.

A Teacher can view submissions from pupils.

A Teacher can grade assignments.

A Teacher can add feedback to assignments.

A Teacher can return graded assignments to pupils.

A Teacher can mark assignments as reviewed.

A Teacher can download submitted assignments for offline grading.

A Teacher can filter submissions by status (submitted, graded, pending).

A Teacher can communicate with Parents/Guardians.

A Teacher can send messages to parents/guardians individually.

A Teacher can send class-wide announcements to parents.

A Teacher can receive messages from parents/guardians.

A Teacher can search parent communications by pupil, date, or keyword.

A Teacher can schedule parent-teacher meetings.

A Teacher can send meeting invitations to parents.

A Teacher can confirm or reschedule parent-teacher meetings.

A Teacher can communicate with Pupils.

A Teacher can send messages to pupils.

A Teacher can receive messages from pupils.

A Teacher can create group discussions for specific groups or classes.

A Teacher can send assignment-related notifications.

A Teacher can send reminders about deadlines.

A Teacher can provide feedback directly via messages.

A Teacher can report to administrators.

- A Teacher can generate reports on pupil performance.
 - A Teacher can highlight pupils who need additional support.
 - A Teacher can export reports in PDF or Excel formats.
 - A Teacher can share reports directly with administrators.
 - A Teacher can submit progress reports periodically.
 - A Teacher can recommend intervention programs for struggling pupils.
- A Teacher can review pupil progress.
- A Teacher can access grade history for each pupil.
 - A Teacher can view attendance history for each pupil.
 - A Teacher can track assignment submissions and performance trends.
 - A Teacher can compare pupil progress across different periods.
 - A Teacher can identify pupils at risk based on performance and attendance data.

Parents/Guardians

- A Parent/Guardian tracking academic progress.
- A Parent/Guardian can view their child's grades.
 - A Parent/Guardian can access report cards.
 - A Parent/Guardian can view subject-wise progress summaries.
 - A Parent/Guardian can compare current and past performance.
 - A Parent/Guardian can download or print progress reports.
- A Parent/Guardian can communicate with teachers and administrators.
- A Parent/Guardian can send direct messages to teachers.
 - A Parent/Guardian can send messages to school administrators.
 - A Parent/Guardian can receive messages from teachers and administrators.
 - A Parent/Guardian can search messages by teacher name, subject, or keyword.
 - A Parent/Guardian can filter messages by unread, urgent, or archived.
 - A Parent/Guardian can schedule meetings with teachers or administrators.

A Parent/Guardian can confirm or reschedule meeting appointments.

A Parent/Guardian can receive announcements and updates.

A Parent/Guardian can receive school-wide announcements.

A Parent/Guardian can receive class-specific announcements.

A Parent/Guardian can view upcoming school events and deadlines.

A Parent/Guardian can receive notifications about policy changes.

A Parent/Guardian can access the school calendar for important dates.

A Parent/Guardian can opt-in or opt-out of specific communication channels.

A Parent/Guardian can monitor attendance.

A Parent/Guardian can view their child's attendance records.

A Parent/Guardian can check daily, weekly, and monthly attendance summaries.

A Parent/Guardian can receive absence notifications.

A Parent/Guardian can receive alerts if attendance falls below a threshold.

A Parent/Guardian can view attendance trends (e.g., frequent absences).

A Parent/Guardian can discuss attendance concerns directly with teachers.

A Parent/Guardian can stay informed about school life.

A Parent/Guardian can access information about school events.

A Parent/Guardian can receive invitations to parent-teacher conferences.

A Parent/Guardian can get reminders for meetings and school activities.

A Parent/Guardian can view newsletters and official notices.

A Parent/Guardian can participate in surveys or feedback forms sent by the school.

School Administrators (Principals, Directors)

A School Administrator can manage teachers and pupils.

A School Administrator can add new teacher records.

A School Administrator can update teacher records (personal info, assigned classes).

A School Administrator can remove teacher records.

A School Administrator can add new pupil records.

A School Administrator can update pupil records (personal info, class assignments).

A School Administrator can remove pupil records.

A School Administrator can assign pupils to specific classes.

A School Administrator can assign teachers to specific classes.

A School Administrator can manage classes.

A School Administrator can create new classes.

A School Administrator can edit class details (name, subject, assigned teacher).

A School Administrator can delete classes.

A School Administrator can monitor class enrollment status.

A School Administrator can view teacher and pupil distribution across classes.

A School Administrator can view reports and analytics.

A School Administrator can view school-wide performance reports.

A School Administrator can access analytics on student grades, attendance, and teacher performance.

A School Administrator can generate custom reports based on selected criteria (time period, classes, grade levels).

A School Administrator can download or export reports.

A School Administrator can identify trends and problem areas (e.g., declining grades, high absenteeism).

A School Administrator can highlight pupils or classes needing intervention.

A School Administrator can manage communications.

A School Administrator can send school-wide announcements.

A School Administrator can send targeted messages to specific classes, teachers, or parents.

A School Administrator can publish urgent notices and alerts.

A School Administrator can manage official communication channels (email, SMS, in-app).

A School Administrator can monitor communication logs.

A School Administrator can organize and schedule school events.

A School Administrator can manage curriculum and resources.

A School Administrator can oversee curriculum updates.

A School Administrator can modify and approve course materials.

A School Administrator can approve or reject new teaching resources.

A School Administrator can organize teaching materials by subject and grade level.

A School Administrator can monitor resource usage by teachers and students.

5. User Scenarios

User scenarios are narrative descriptions of how users interact with the system to achieve a specific goal. These scenarios help visualize how features are used in real life and provide insights into system behavior, user expectations, and edge cases.

ID	Role	Title	Description
1	Parent	Parent Logs In	A parent opens the login page, enters credentials, and gains access to their dashboard. If credentials are incorrect, an error is displayed and the login fails.
2	Parent	Switch to Pupil View	After logging in, a parent chooses to switch to their child's (pupil's) view, gaining access to limited features such as viewing assignments and grades.
3	Parent	View Pupil's Grades	Parent views grade records for their child, sorted by subject and teacher, with an option to download a grade report.
4	Parent	View Attendance	Parent checks the pupil's attendance history, including details on absences and late arrivals.

5	Parent	Message Teacher	Parent composes a message to a specific teacher about academic concerns. The teacher is notified and can reply.
6	Parent	Read Teacher Reply	Parent opens and reads the teacher's reply. The message is marked as read with a timestamp.
7	Parent	Receive Notifications	Parent receives alerts for absences, new grades, assignment submissions, or teacher messages.
8	Teacher	Teacher Logs In	Teacher logs in using school credentials. Their dashboard loads with class and material management tools.
9	Teacher	Create a Class	Teacher opens a form to create a new class, enters the details (subject, grade, etc.), and submits it for approval.
10	Teacher	Add Pupils to Class	Teacher assigns pupils to an approved class either by selecting from a list or adding them manually.
11	Teacher	Upload Material	Teacher uploads materials (PDFs, videos, etc.) for a class. Pupils and parents are notified.
12	Teacher	Create Quiz or Assignment	Teacher creates a quiz or assignment, adds instructions, a deadline, and optionally uploads files.
13	Teacher	Grade Submissions	Teacher reviews pupil submissions, gives grades, and provides feedback. Parents are notified of results.
14	Teacher	Mark Attendance	Teacher marks daily attendance for each pupil in a class. Absences trigger notifications to parents.
15	Teacher	Message Parent	Teacher sends messages to one or more parents, viewable in their inbox. Replies are tracked.
16	Teacher	View Class Overview	Teacher views analytics about class performance, grade distribution, and attendance patterns.
17	Principal	Principal Logs In	Principal logs into the system and accesses school-wide management tools and reports.
18	Principal	Approve Class Request	Principal reviews and either approves or denies class creation requests submitted by teachers.
19	Principal	Manage Accounts	Principal edits, deactivates, or deletes user accounts (teachers, parents, pupils) and can reset passwords.

20	Principal	View Teacher Performance	Principal views a performance dashboard for teachers, including pupil grades, feedback, and attendance.
21	Principal	Send Announcement	Principal sends announcements to all users or specific roles. Messages appear pinned in the dashboard.
22	Pupil	View Assignments	Pupil (accessing through parent account) views a list of upcoming and past assignments with deadlines.
23	Pupil	Download Materials	Pupil downloads study materials shared by the teacher for review and preparation.
24	Pupil	Take Quiz	Pupil selects and completes a quiz online before the submission deadline. Results are stored.
25	Pupil	Submit Assignment	Pupil uploads their completed assignment for the teacher to review and grade.
26	Pupil	View Grades	Pupil views their grades and teacher feedback for past assignments and quizzes.
27	Pupil	View Messages	Pupil reads messages sent by the teacher if messaging is enabled for them.

6. Use Cases

Use cases describe how different users (actors) interact with the system to achieve specific goals. Each use case is defined in detail, including the steps, preconditions, and outcomes. This section includes both a **use case table** and a **use case diagram**.

6.1 Use Case Table

Use Case Nr	Title	Description
01	Login	Allows all user types (parents, pupils, teachers, principals) to securely access the system using their credentials. Ensures appropriate access levels based on role.

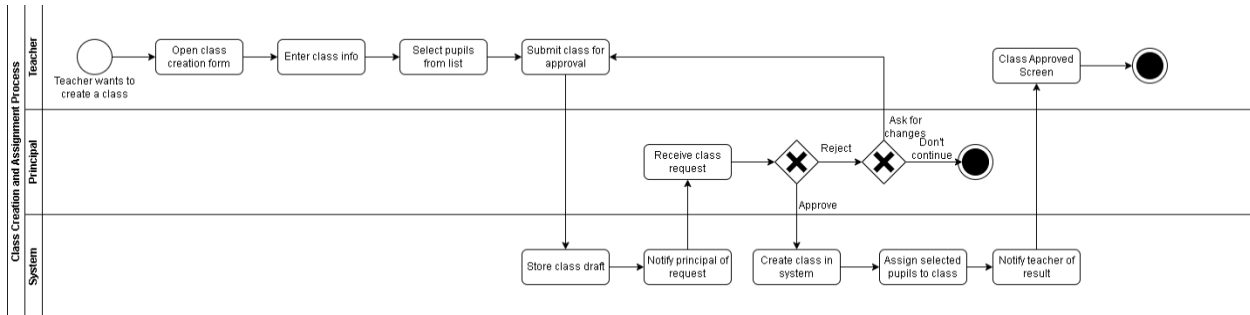
02	Choose Role	After logging in, parents are prompted to select whether they want to access the system as themselves or on behalf of their child, enabling separate user experiences.
03	View Pupil Grades	Enables parents to view their child's grades, sorted by subject and teacher, with an option to download a detailed grade report.
04	View Attendance	Allows parents to access their child's attendance records, including dates and reasons for absences or late arrivals.
05	Message Teacher	Lets parents compose and send messages to teachers to discuss academic concerns. Triggers a notification for the teacher.
06	Read Teacher Reply	Parents can read replies from teachers in the messaging system. Messages are marked as read with timestamps for tracking.
07	Receive Notifications	Parents receive real-time notifications for absences, new grades, submitted assignments, or teacher messages.
08	Teacher Login	Enables teachers to log in using school credentials and access class management tools from their dashboard.
09	Create Class	Teachers can initiate a new class by entering subject, grade, and other details, and submit it for principal approval.
10	Add Pupils to Class	Teachers can assign pupils to a class by selecting from existing users or manually entering new ones.
11	Upload Materials	Teachers upload PDFs, videos, or other resources to a class. Pupils and parents are notified when materials are added.
12	Create Assignment/Quiz	Teachers create quizzes or assignments with instructions, deadlines, and optional attachments.
13	Grade Submissions	Teachers review, grade, and leave feedback on pupil submissions. Parents are notified once grades are published.
14	Mark Attendance	Teachers record attendance daily, flagging absences or tardiness. Triggers notifications to parents.

15	Message Parent	Teachers can initiate communication with parents through the system's inbox. All messages and replies are tracked.
16	View Class Overview	Teachers view analytics for their classes, including grade trends and attendance summaries.
17	Principal Login	Enables principals to access high-level administrative tools, reports, and management options.
18	Approve Class Request	Principals review new class requests submitted by teachers and approve or deny them.
19	Manage Accounts	Principals can edit, deactivate, or delete user accounts and reset passwords when needed.
20	View Teacher Performance	Principals access dashboards showing teacher performance, based on student grades, feedback, and attendance.
21	Send Announcement	Principals send important announcements to all or specific user groups. Messages are pinned on user dashboards.
22	View Assignments	Pupils can view all assignments, both upcoming and completed, including deadlines and submission status.
23	Download Materials	Pupils download teacher-provided materials to aid with study and assignment preparation.
24	Take Quiz	Pupils access and complete quizzes online. Their submissions are stored for teacher review.
25	Submit Assignment	Pupils upload completed assignments to the system. Submissions are timestamped and linked to teacher accounts.
26	View Grades	Pupils can see grades and teacher feedback for submitted assignments and completed quizzes.
27	View Messages	Pupils read messages sent by teachers if messaging permissions are enabled for their account.

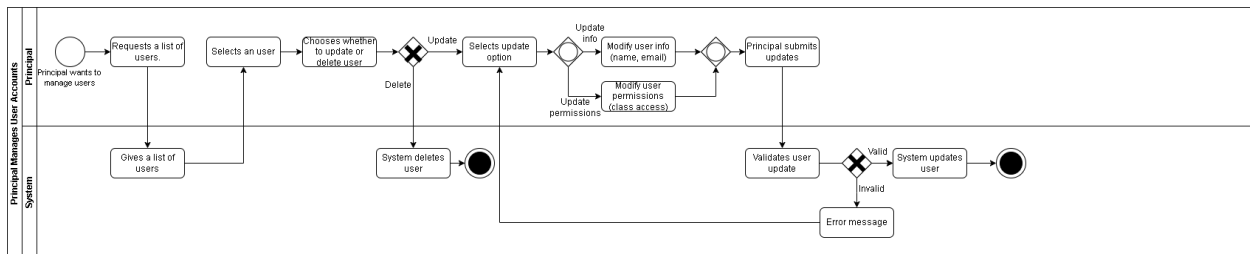
7. BPMN Diagrams

BPMN (Business Process Model and Notation) diagrams are used to represent the business workflows in a graphical form that is understandable to both technical and non-technical stakeholders. They illustrate the sequential flow of tasks, decisions, and interactions among different actors in a process.

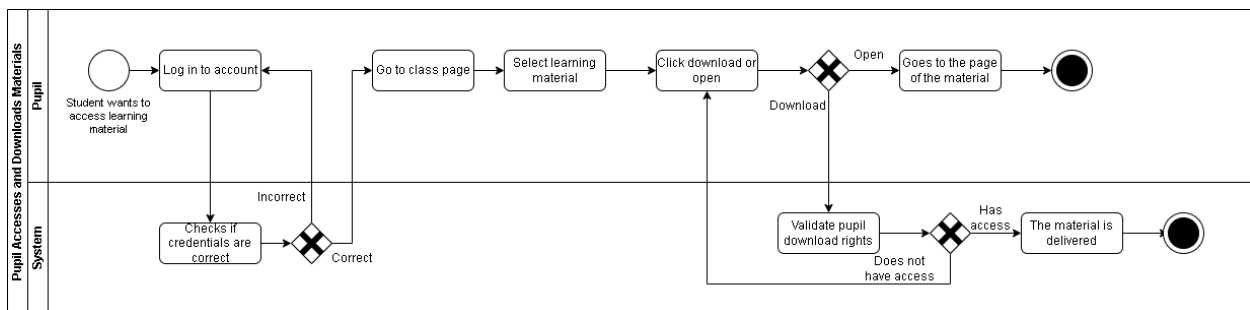
Class Creation



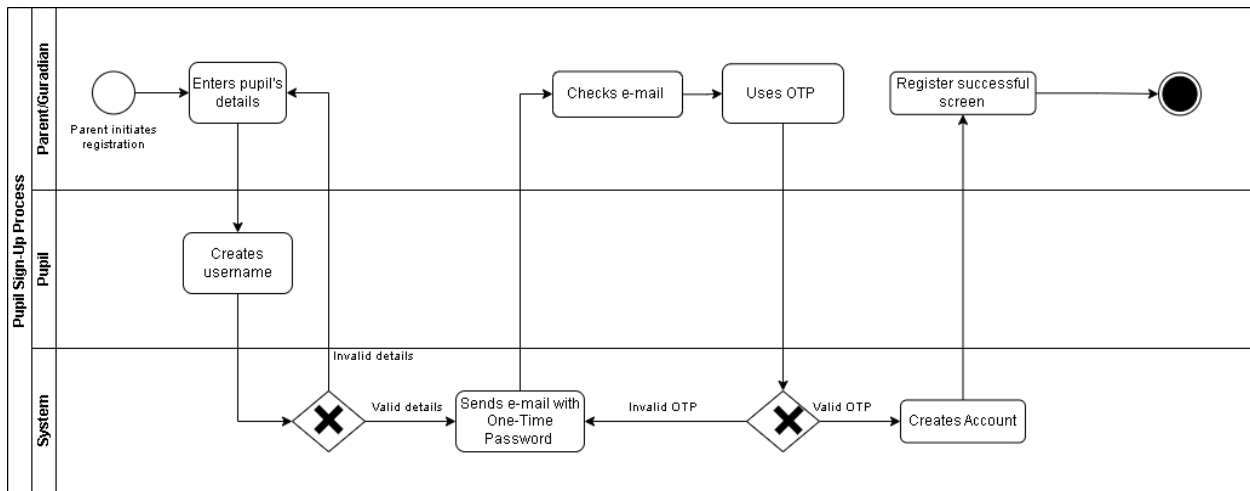
Principal User Management



Pupil Material Access



Parent Registration

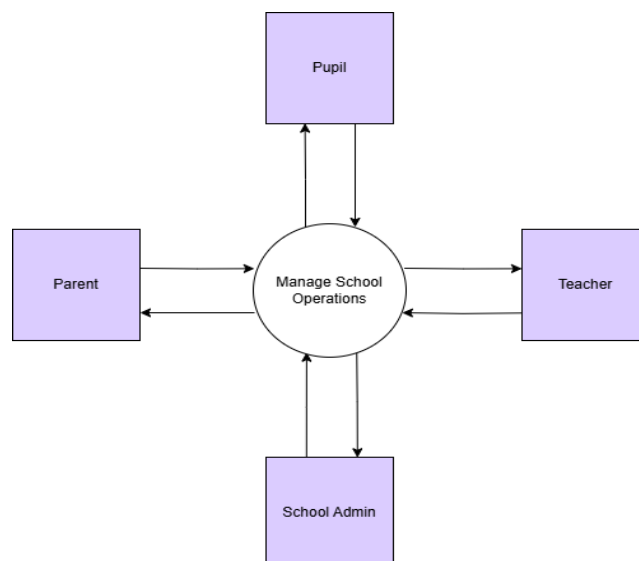


8. Data Flow Diagrams

Data Flow Diagrams illustrate how data moves through the system, focusing on processes, data stores, external entities, and data flows. They help understand the inputs, outputs, and transformations of data within the middle school management system.

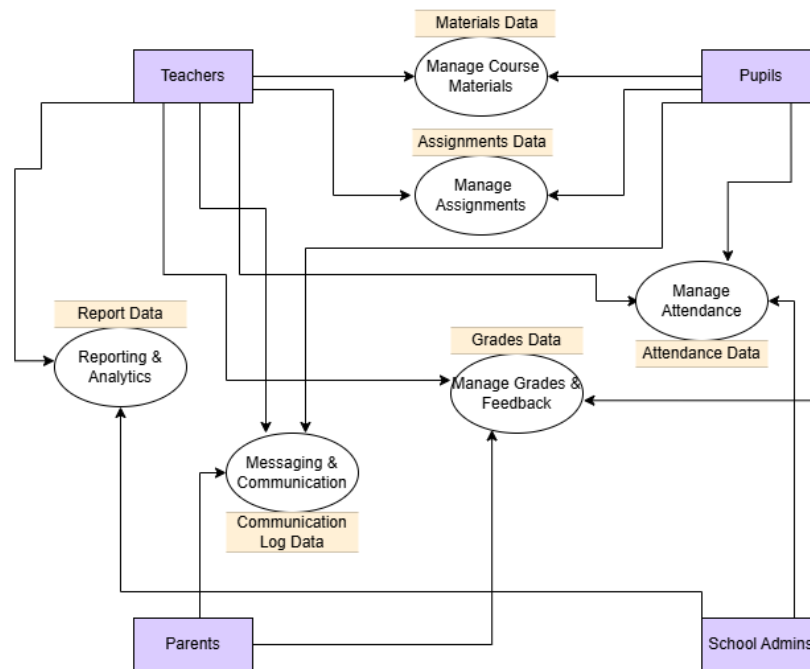
8.1 Level 0 DFD

This high-level diagram shows the entire system as a single process interacting with external entities such as Parents, Pupils, Teachers, and Principals. It highlights the main data exchanges like login credentials, assignments, grades, and messages.



8.2 Level 1 DFD

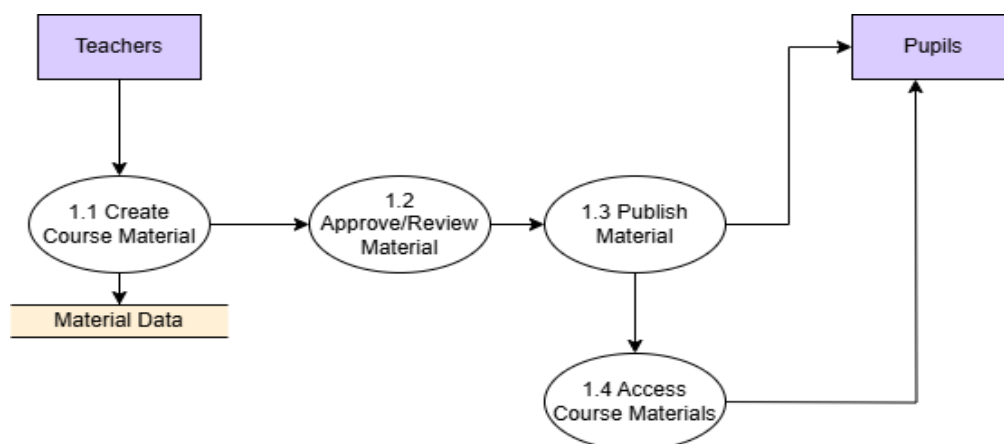
This diagram decomposes the system into major subprocesses such as Authentication, Class Management, Assignment Handling, Messaging, and Reporting. It shows the flow of data between these subprocesses and external entities.



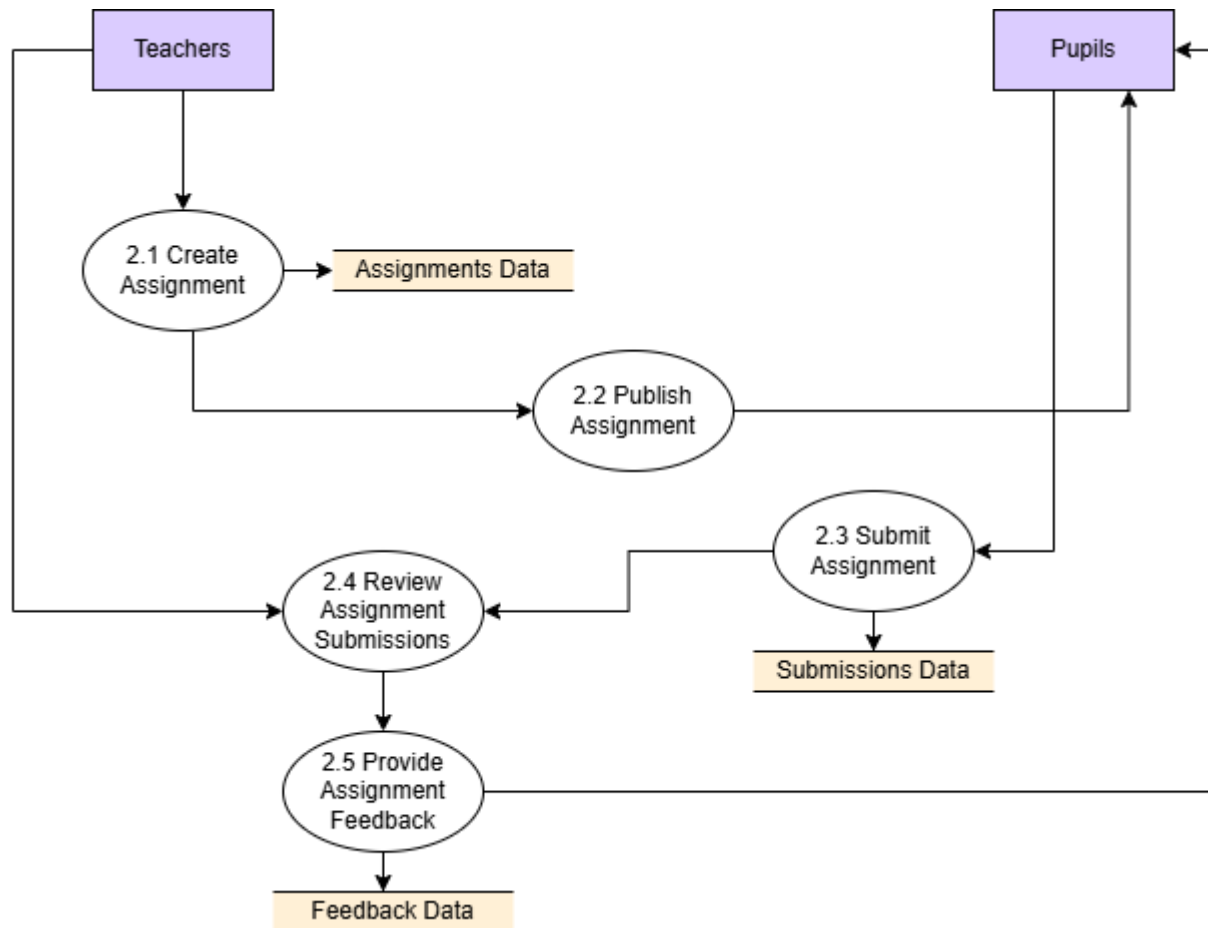
8.3 Level 2 DFD

Level 2 DFD to breaks down some of the key Level 1 processes (e.g., Assignment Submission) into more detailed subprocesses showing finer data movements and storage.

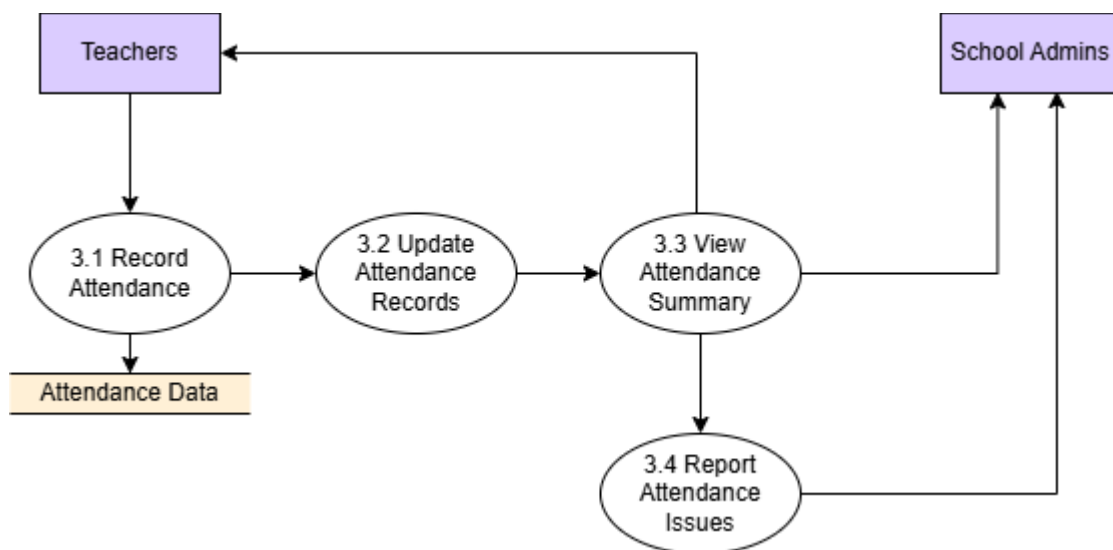
Manage Materials



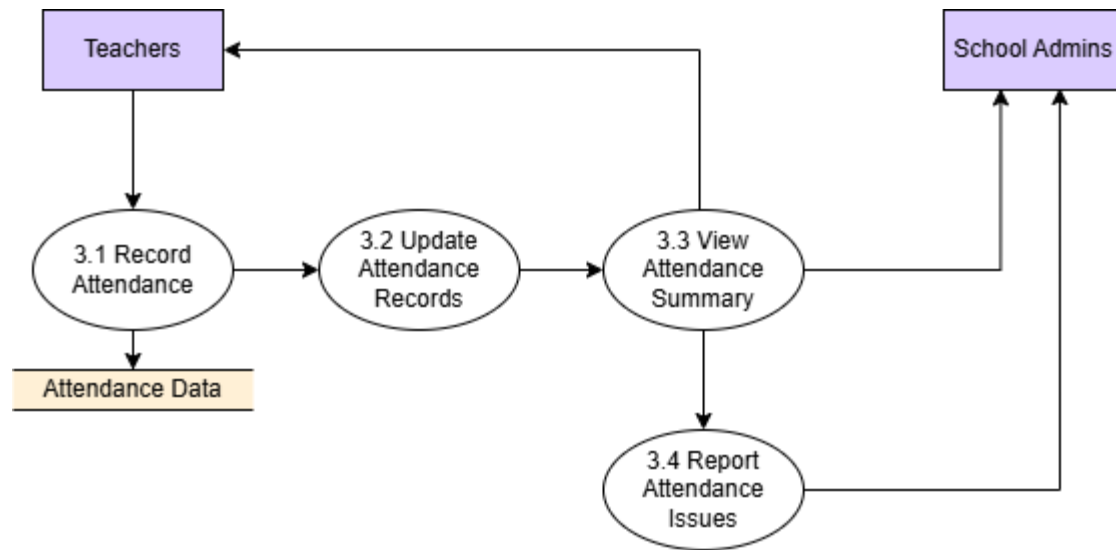
Manage Assignments



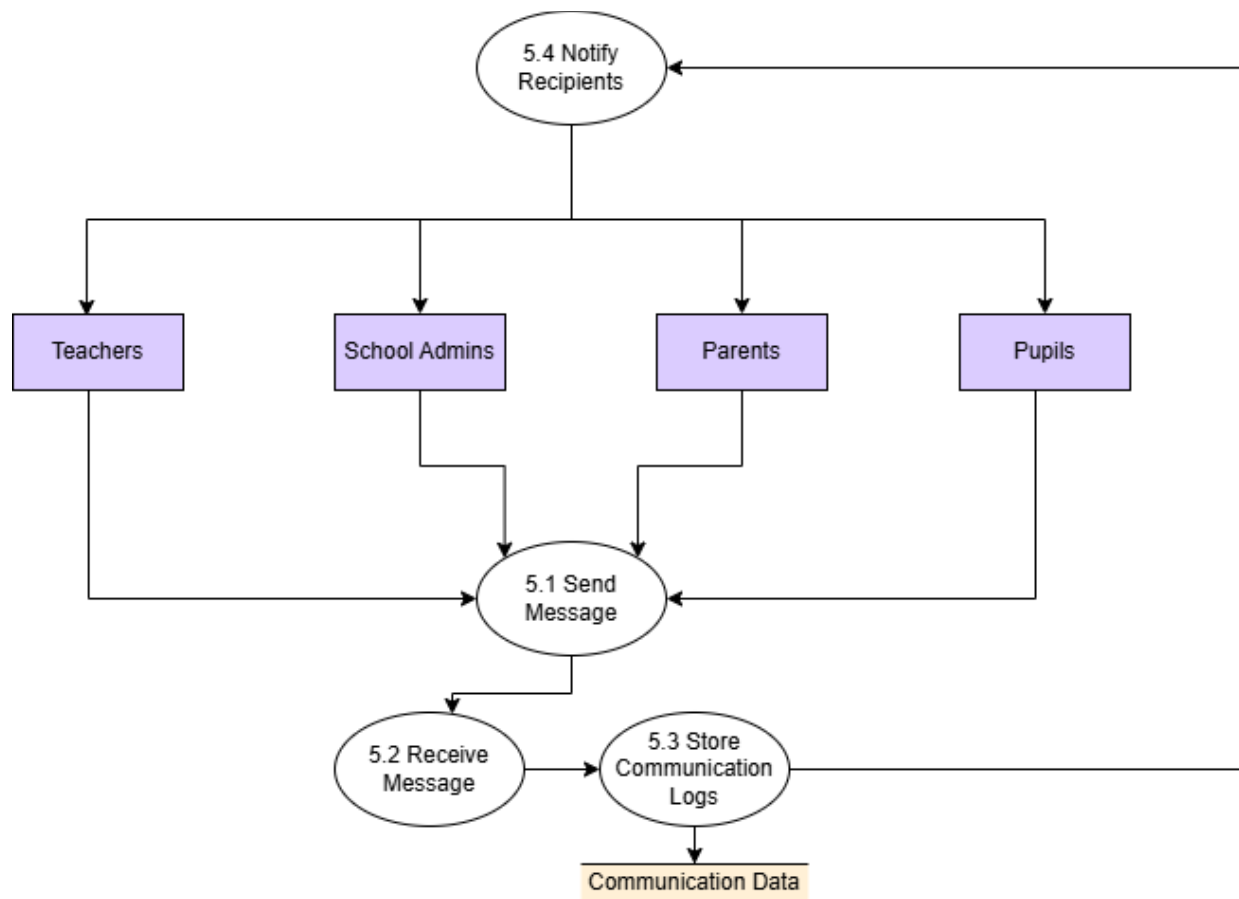
Manage Attendance



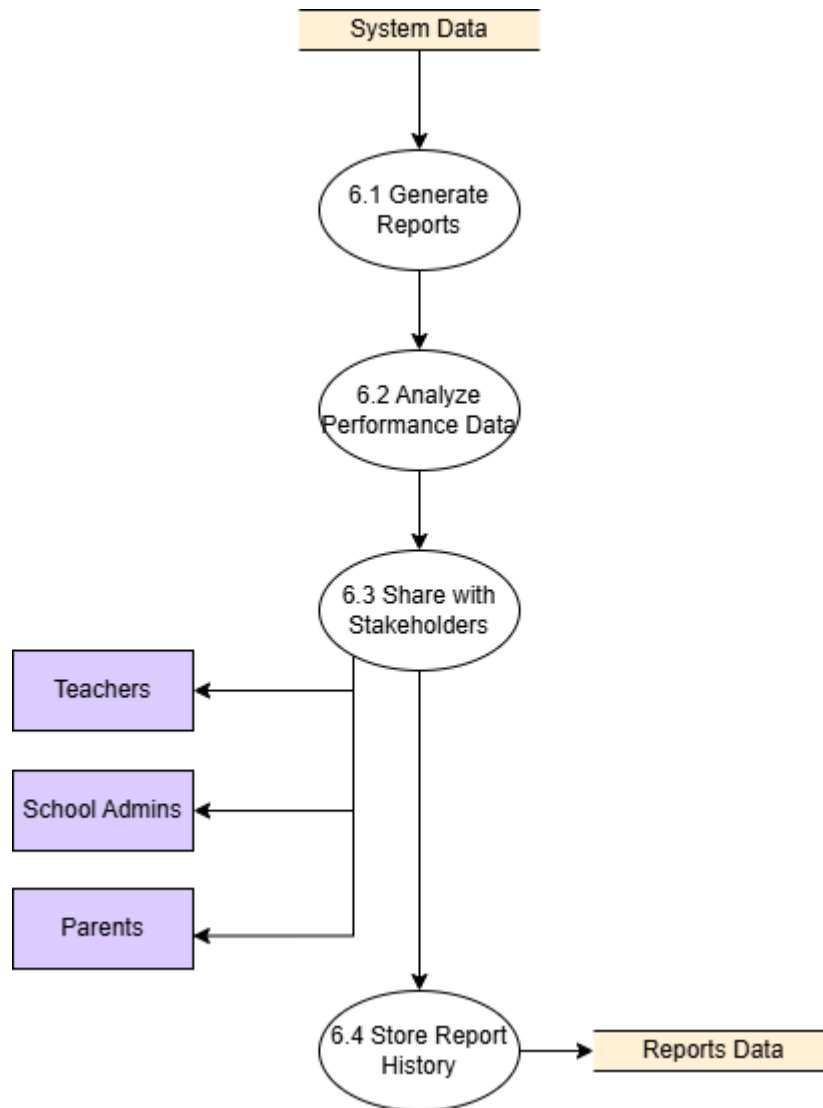
Manage Grades



Messaging and Communication

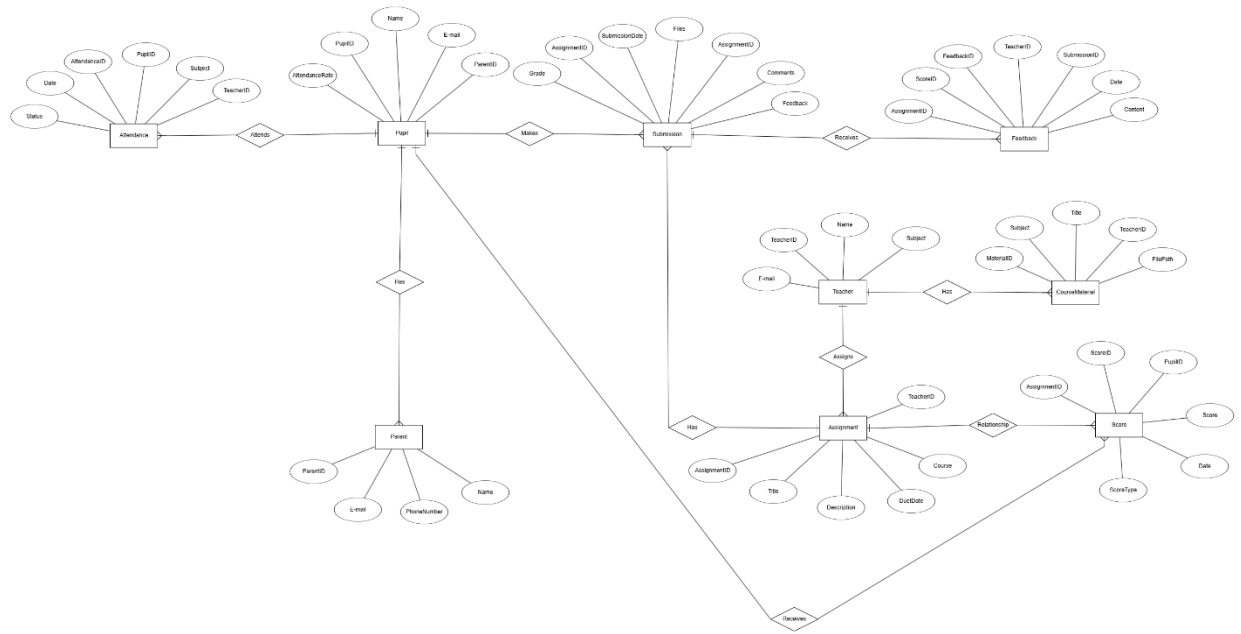


Reporting & Analytics



9. Entity-Relationship Diagram

The ERD models the database structure of the middle school management system by depicting entities, their attributes, and the relationships among them. This diagram is crucial for database design and shows how different objects like Pupils, Parents, Teachers, Classes, Assignments, and Grades are connected.

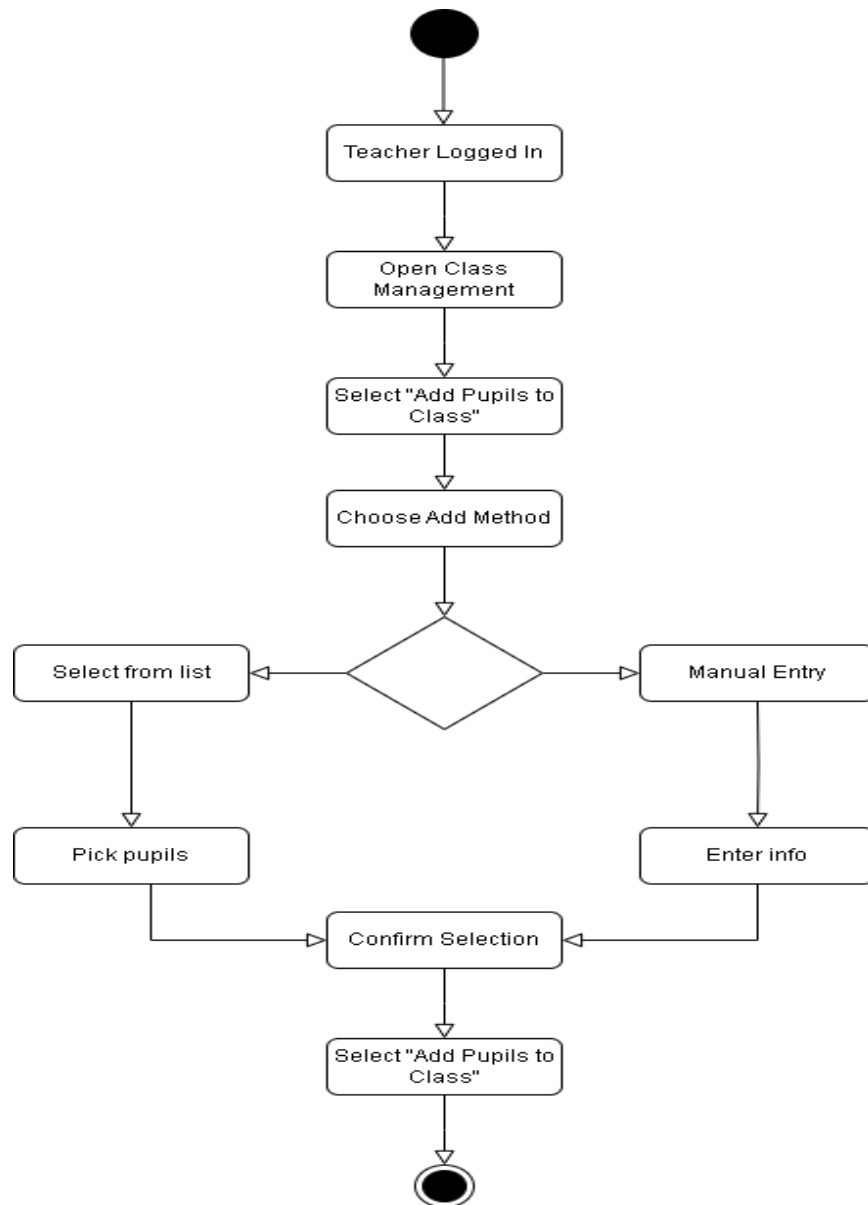


10. UML Diagrams

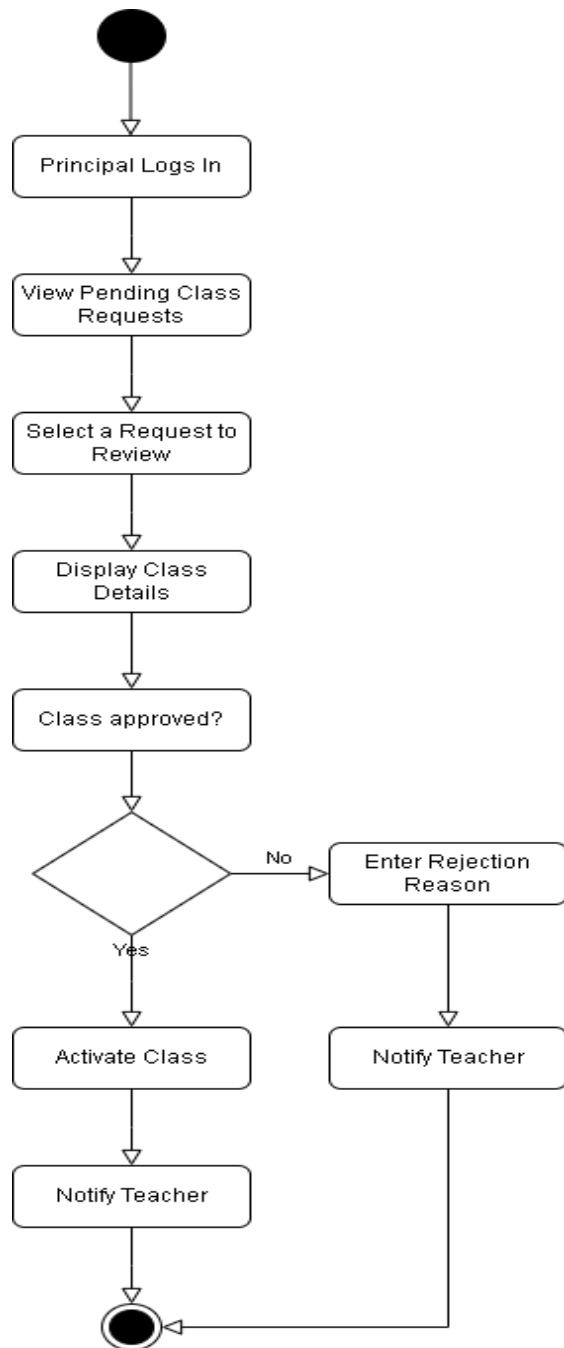
10.1 Activity Diagrams

Activity Diagrams model the workflow or the dynamic aspects of the system by showing the sequence of activities, decisions, and parallel processes. In our middle school management system, activity diagrams illustrate processes such as user login, assignment submission, and class creation workflow.

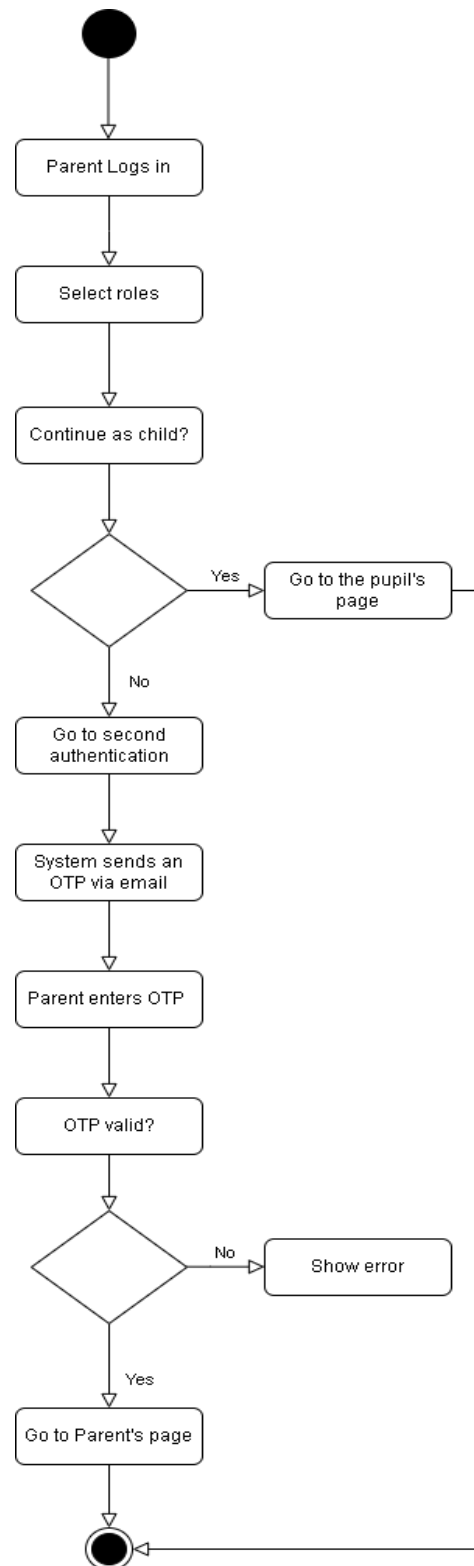
Add Pupil to Class



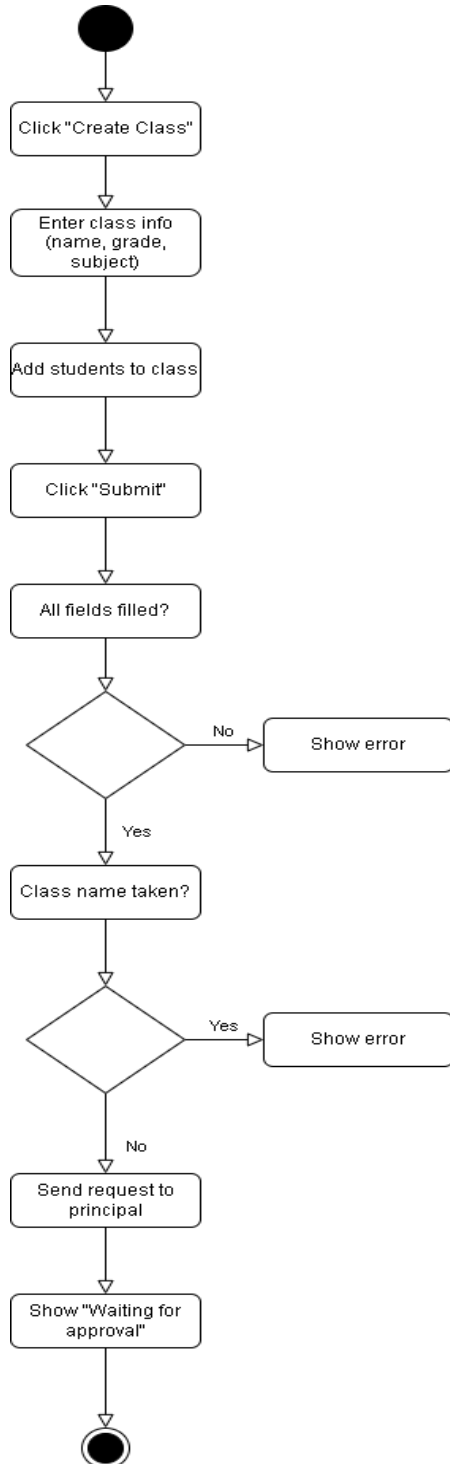
Approve Class Request



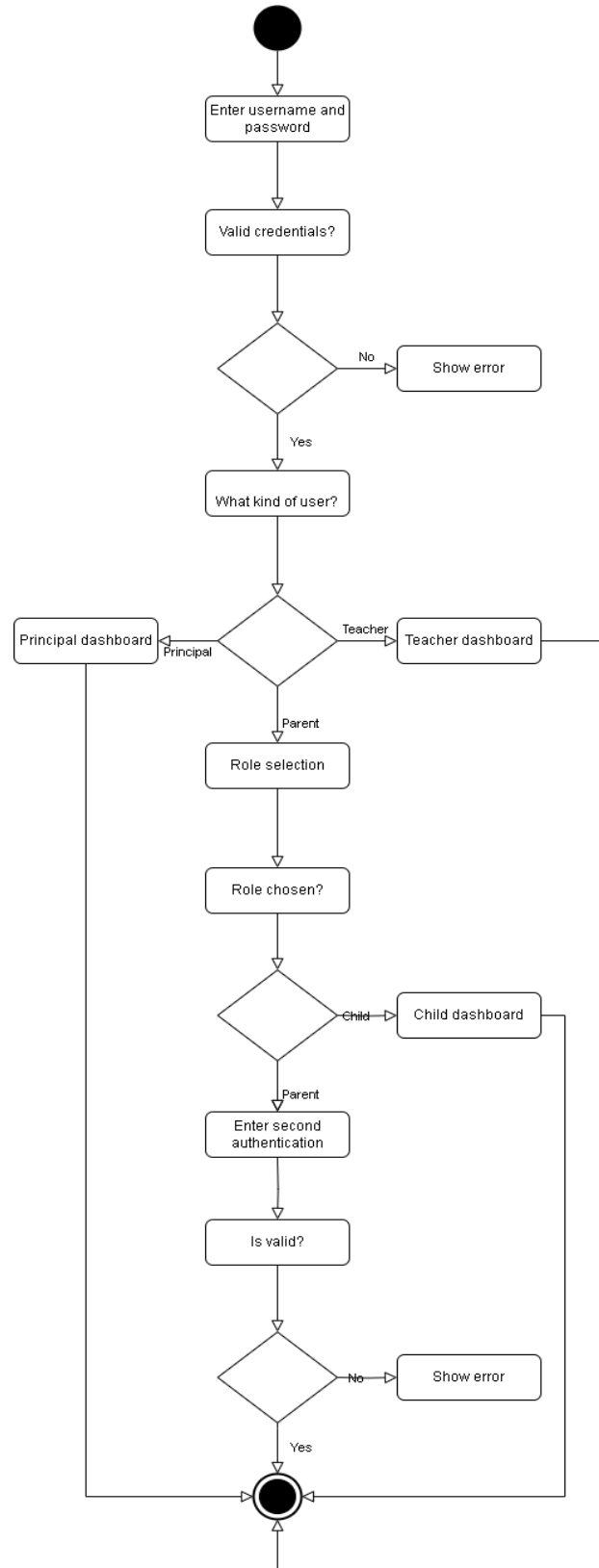
Choose Role



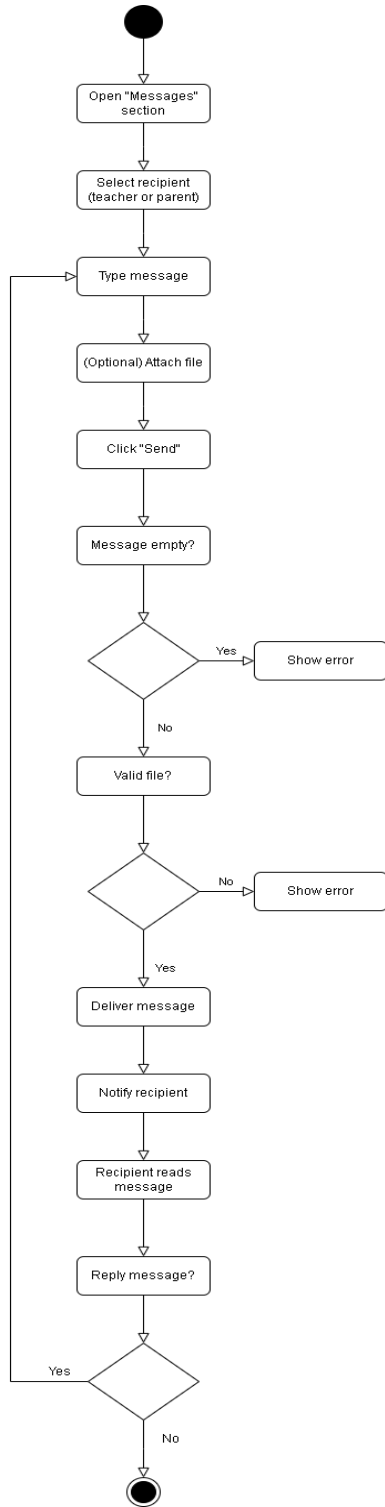
Class Creation



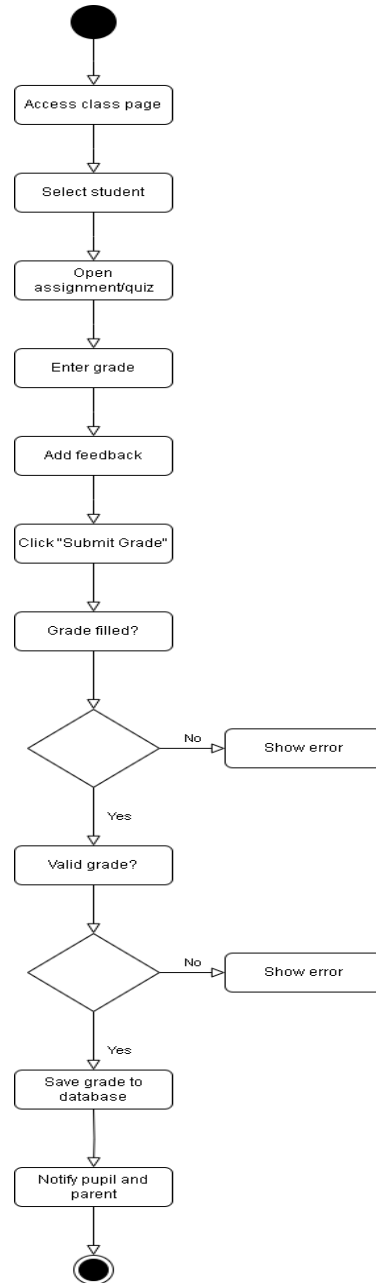
Log in



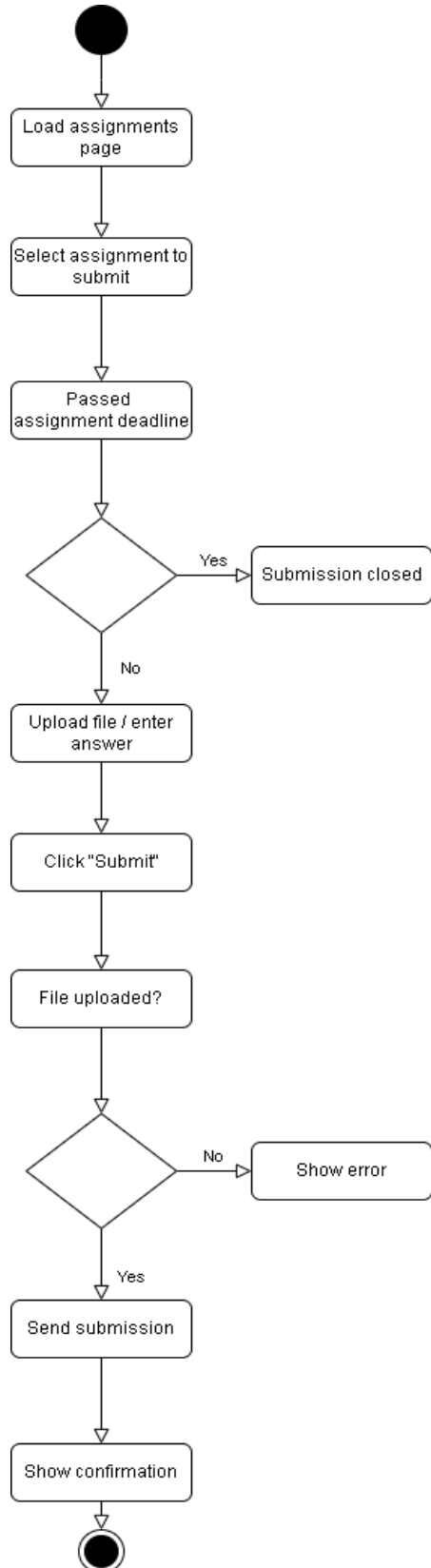
Messaging



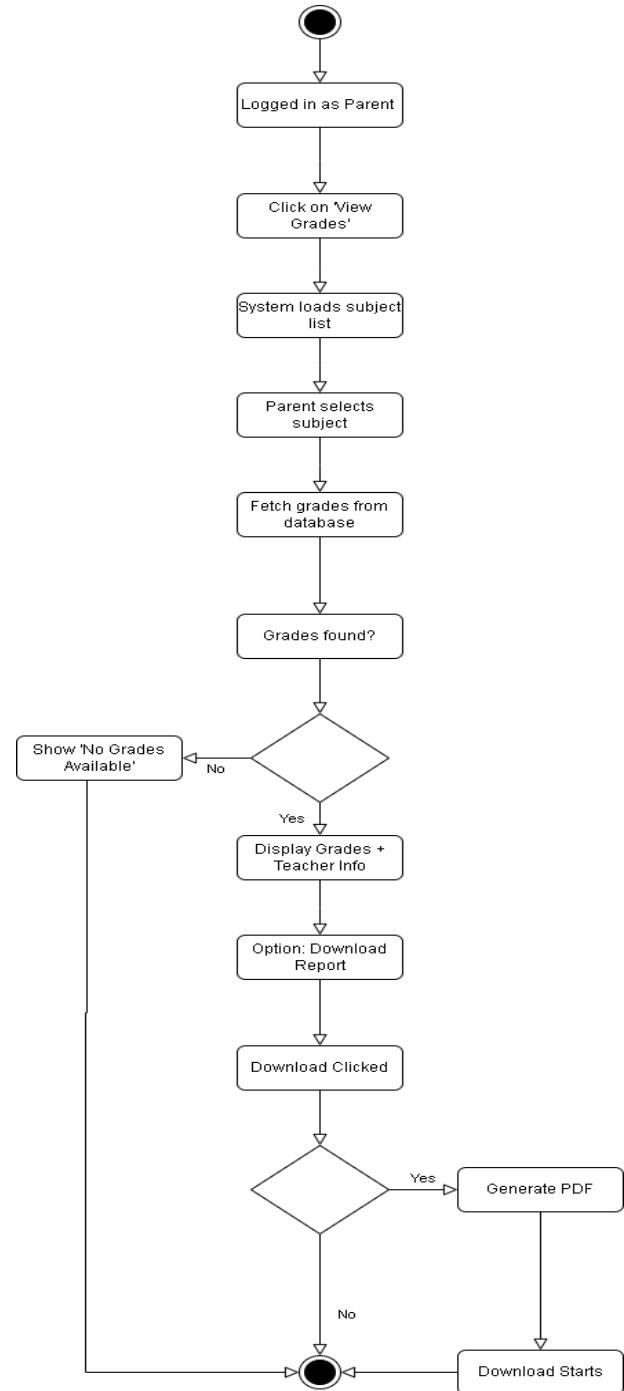
Student Grading



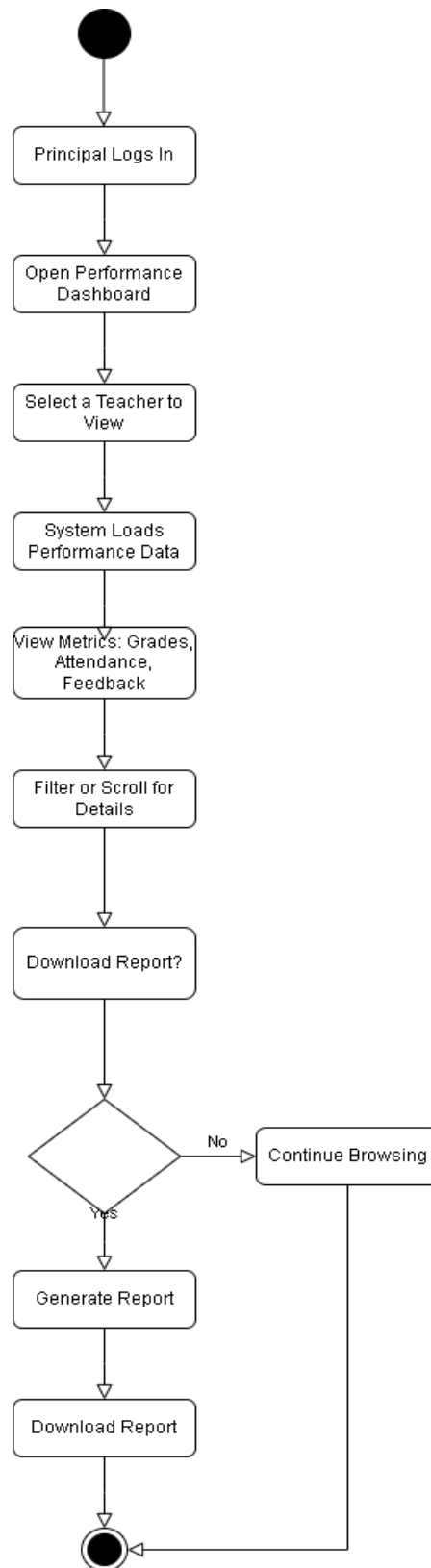
Submit Assignment



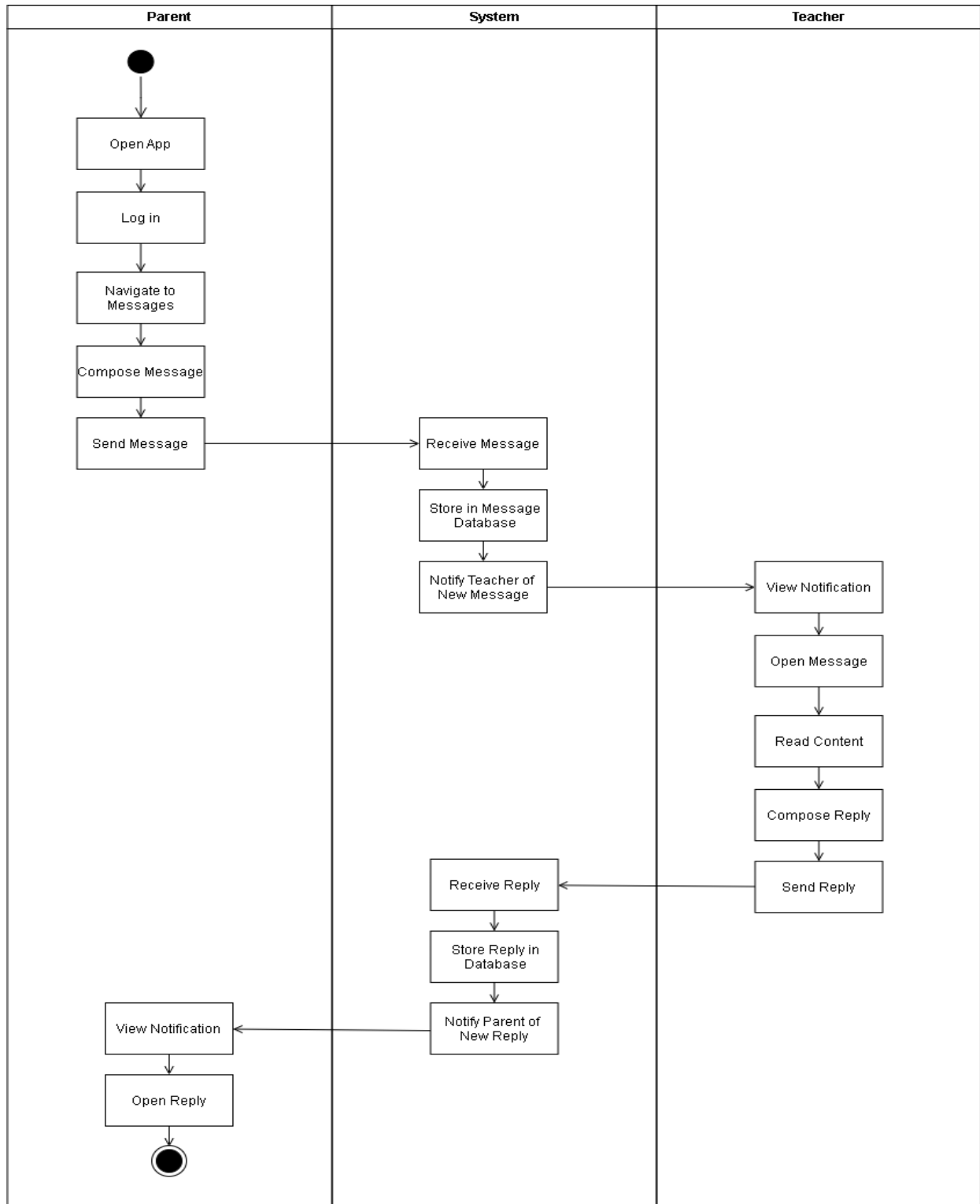
View Pupil Grade



View Teachers Performance

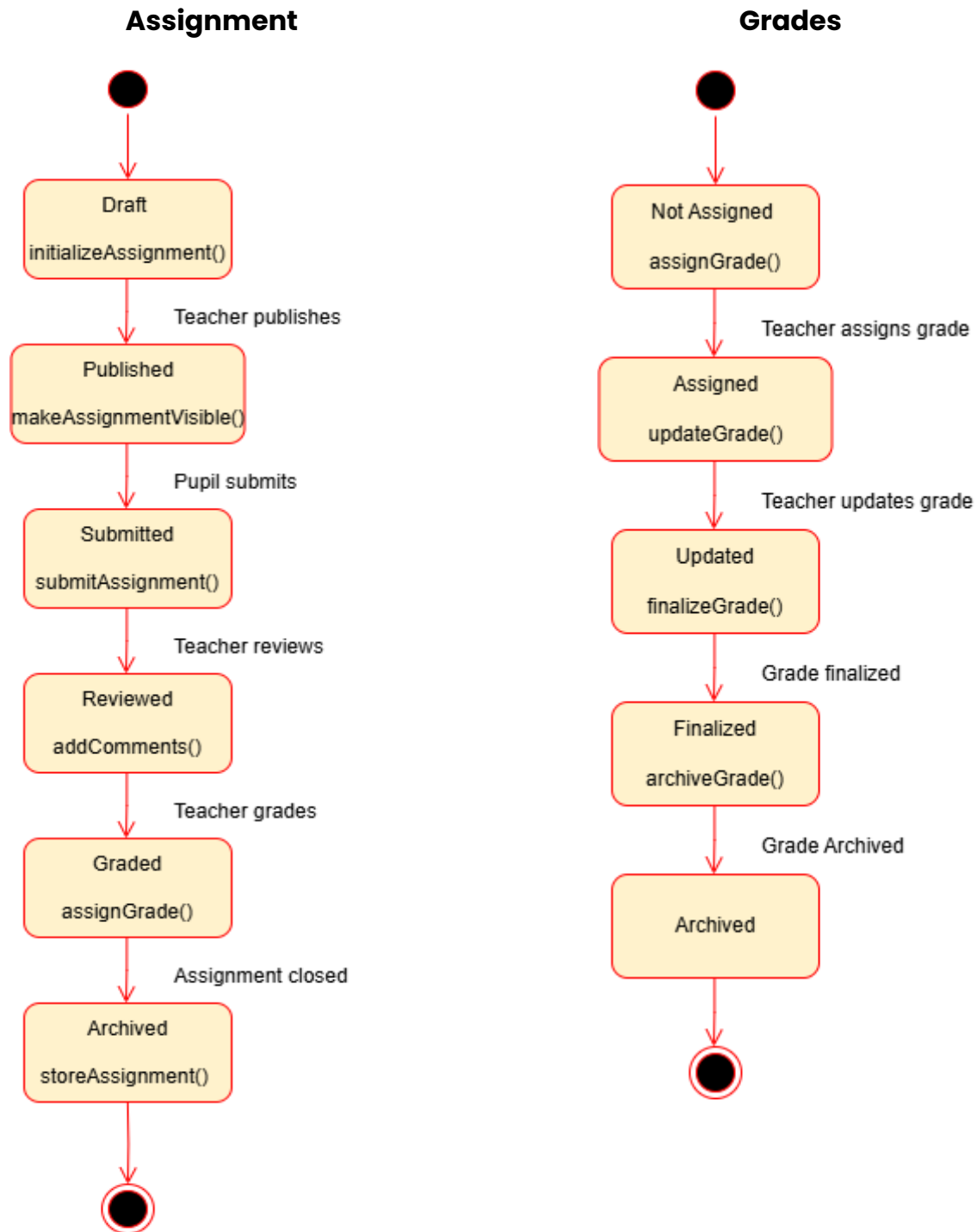


Messaging Swim Lane

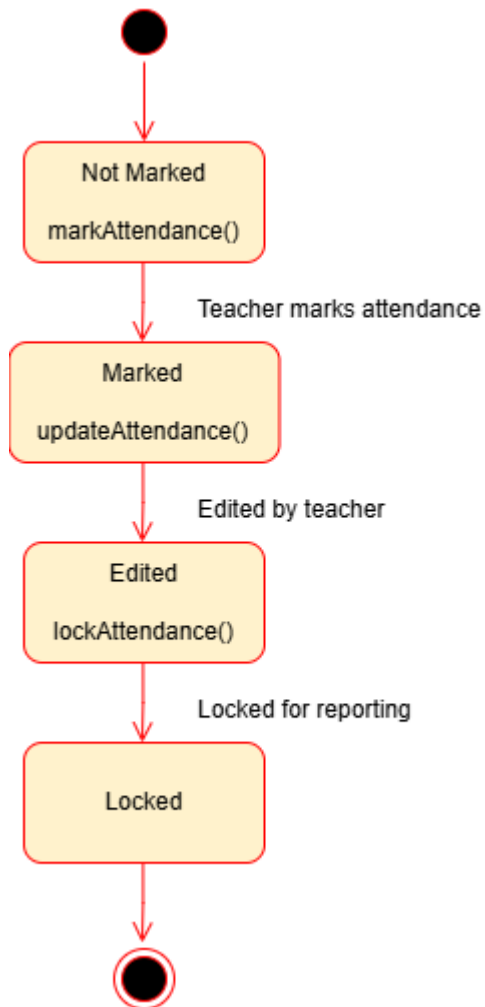


10.2 State Diagrams

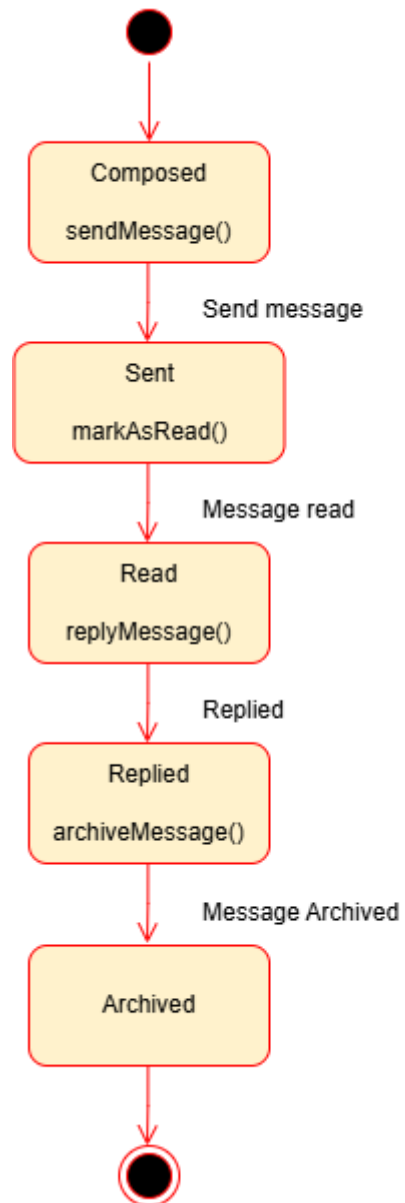
State Diagrams describe the states of a particular object or entity and how it transitions between those states based on events or conditions. For example, the lifecycle of an assignment (Created → Assigned → Submitted → Graded) or a class (Proposed → Approved → Active → Closed).



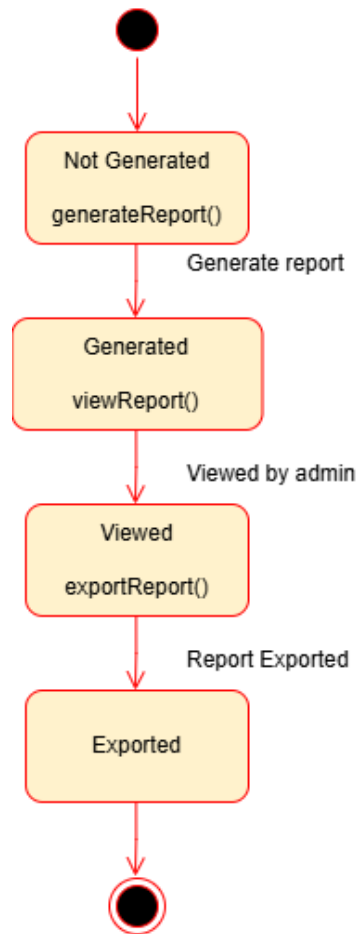
Attendance



Messages



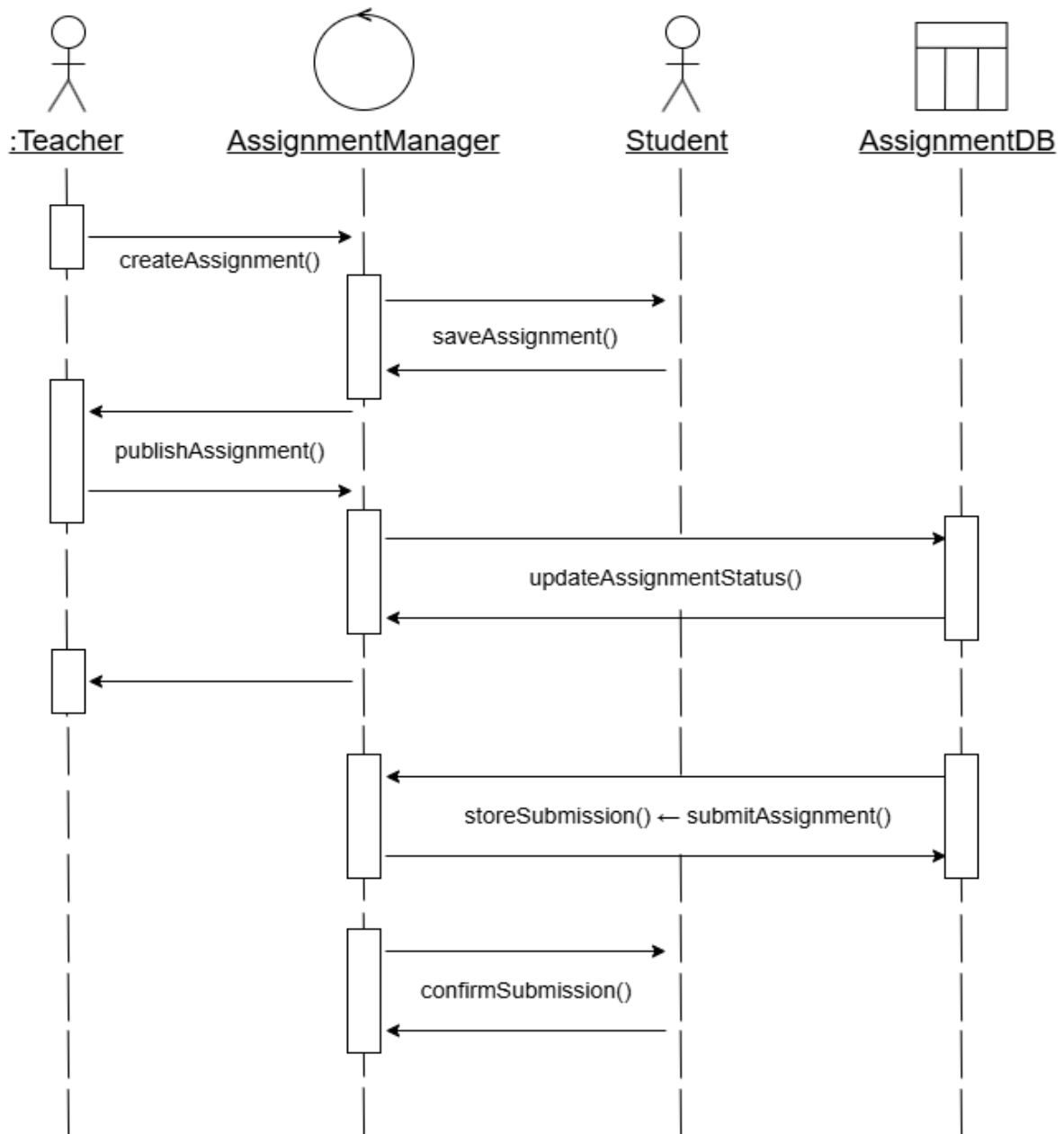
Reports



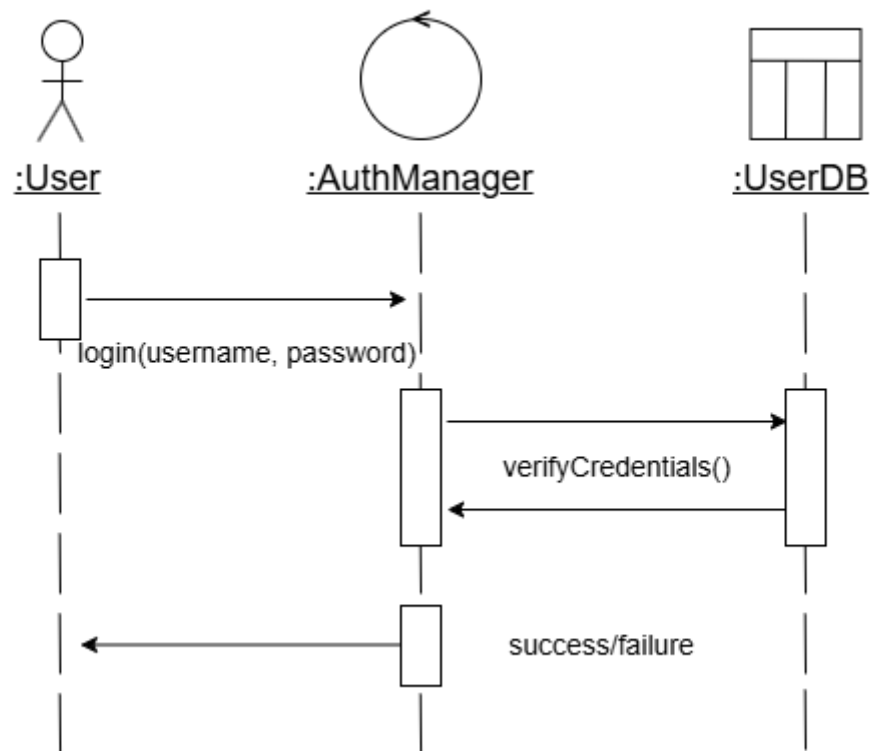
10.3 Sequence Diagrams

Sequence Diagrams depict how objects interact in a time-ordered sequence. They show the messages exchanged between system components or users for specific scenarios such as submitting an assignment or approving a class.

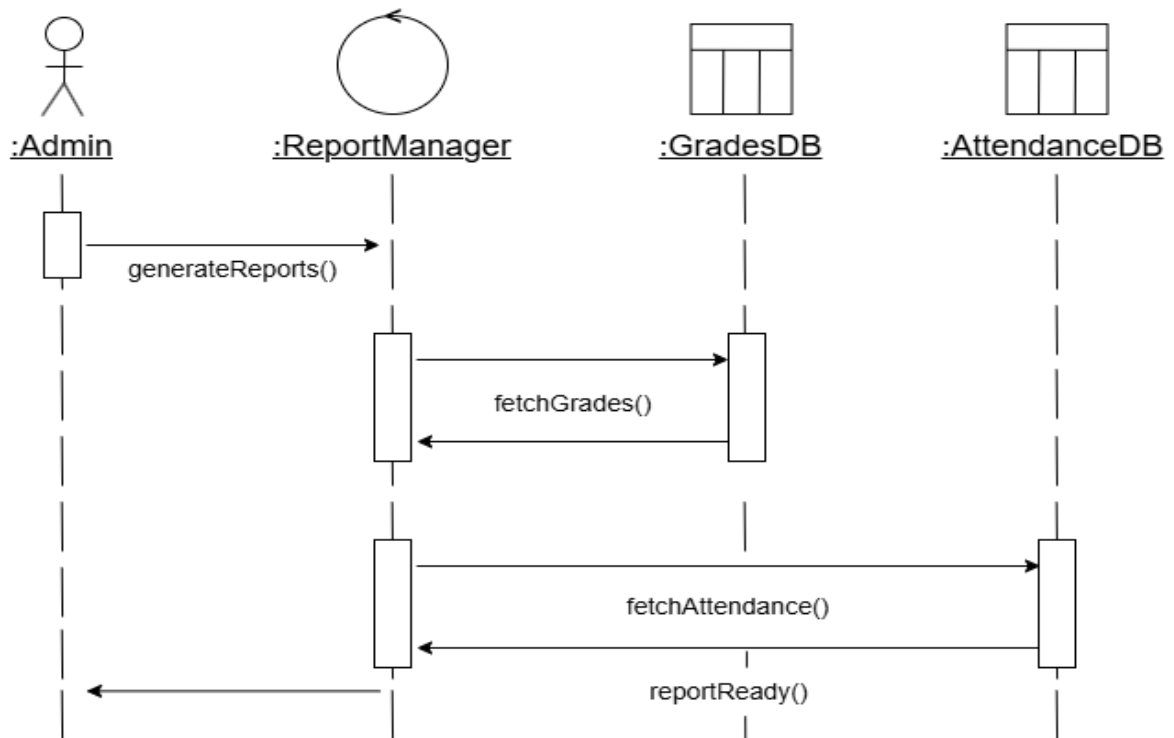
Assignment Submission



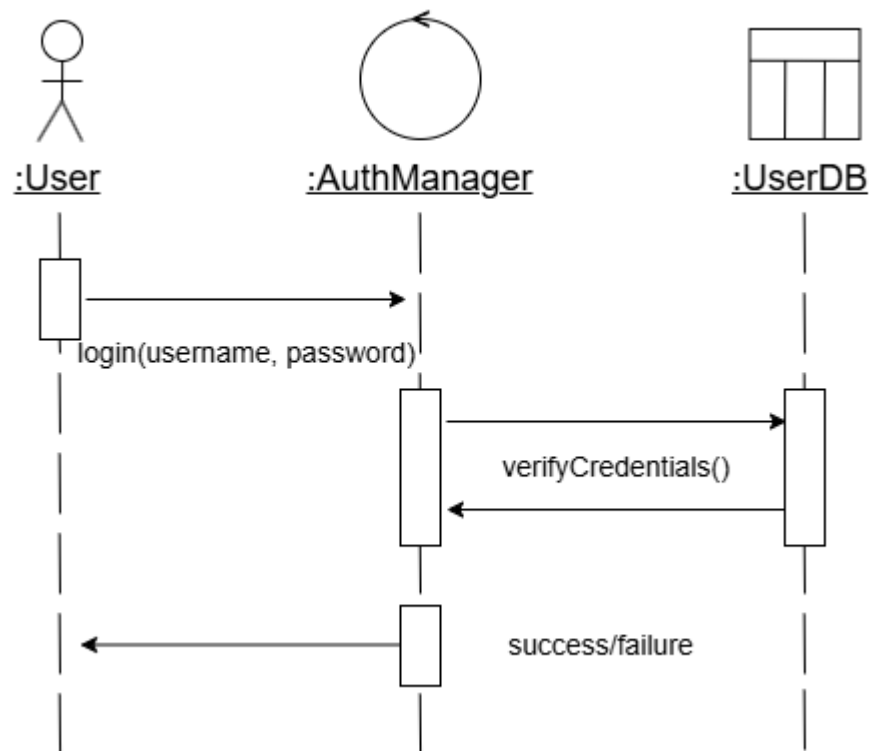
Grading Process



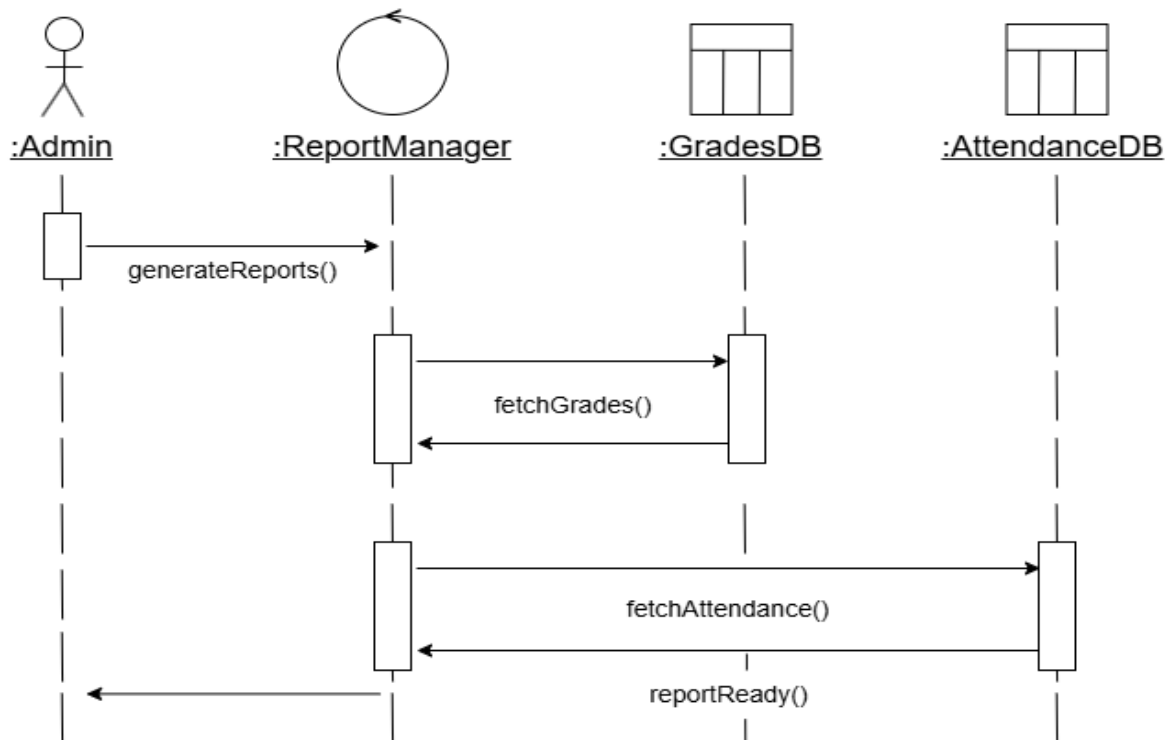
Attendance Tracking



Login & Authentication

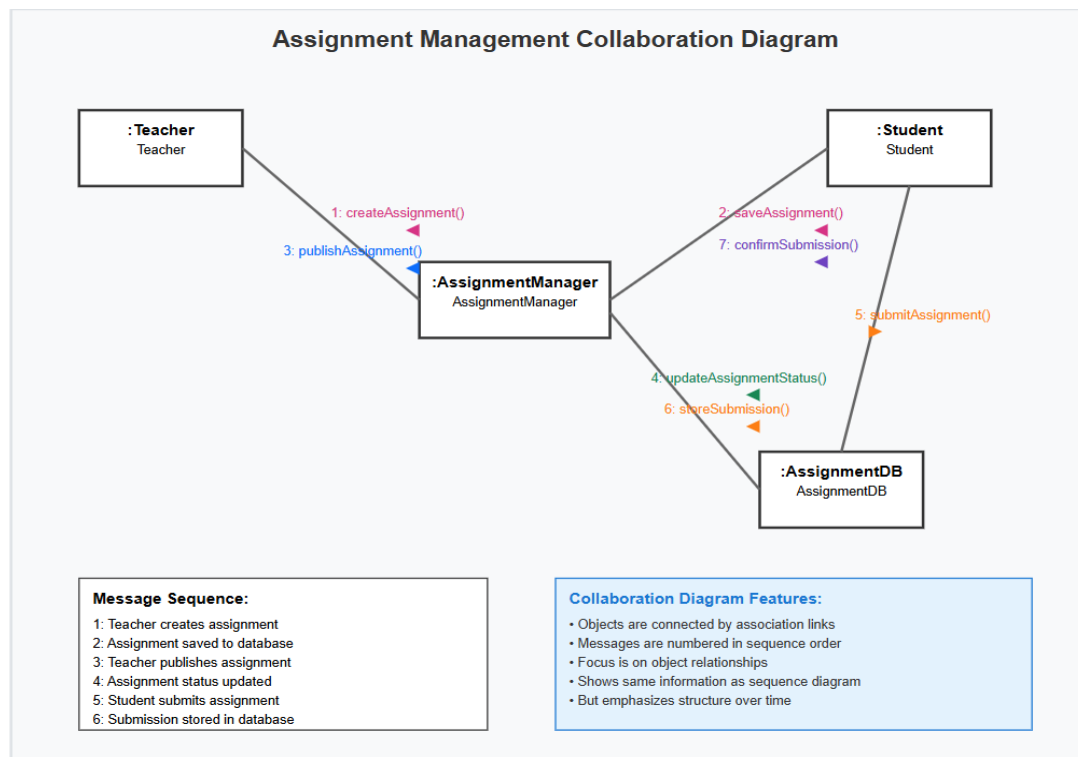
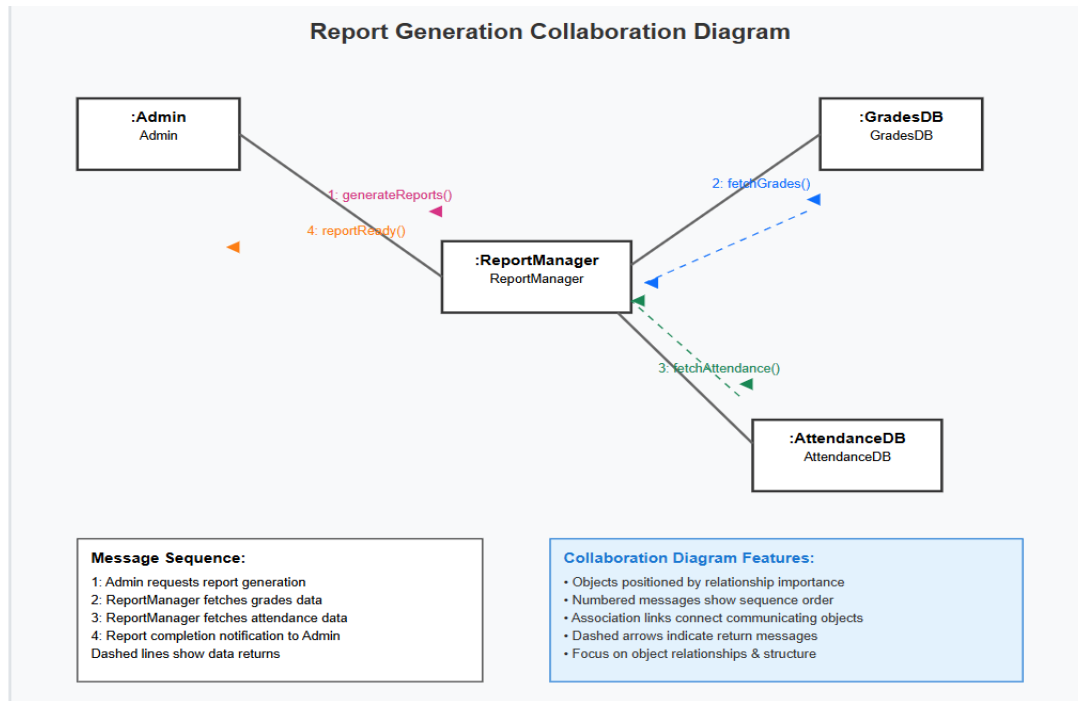


Report Generation

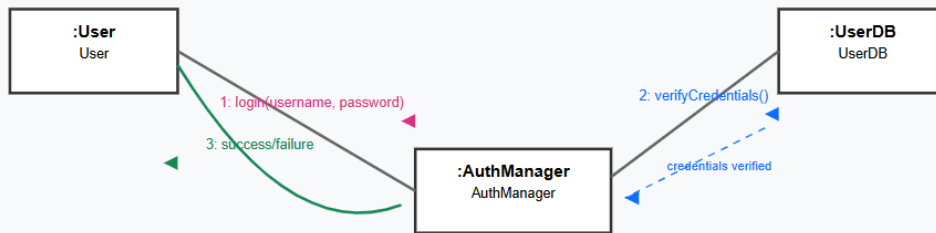


10.4 Communication Diagrams

Communication Diagrams emphasize the structural organization of objects and their interactions. Similar to sequence diagrams but focusing more on the relationships between objects and the messages passed to accomplish tasks.



User Authentication Collaboration Diagram



Message Sequence:

- 1: User provides login credentials
- 2: AuthManager verifies with database
- 3: Authentication result returned to user

Legend:

- Solid lines: Method calls
- Dashed lines: Return values/data
- Numbers indicate sequence order

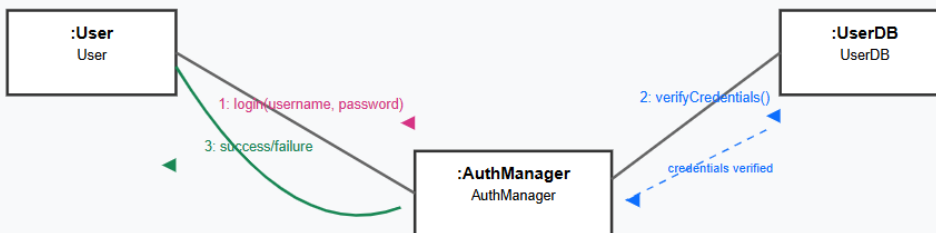
Authentication Flow:

- User initiates login with credentials
- AuthManager processes authentication
- UserDB validates credentials
- Result propagated back to user

Collaboration Features:

- Objects connected by associations
- Messages numbered in sequence

User Authentication Collaboration Diagram



Message Sequence:

- 1: User provides login credentials
- 2: AuthManager verifies with database
- 3: Authentication result returned to user

Legend:

- Solid lines: Method calls
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- Numbers indicate sequence order

Authentication Flow:

- User initiates login with credentials
- AuthManager processes authentication
- UserDB validates credentials
- Result propagated back to user

Collaboration Features:

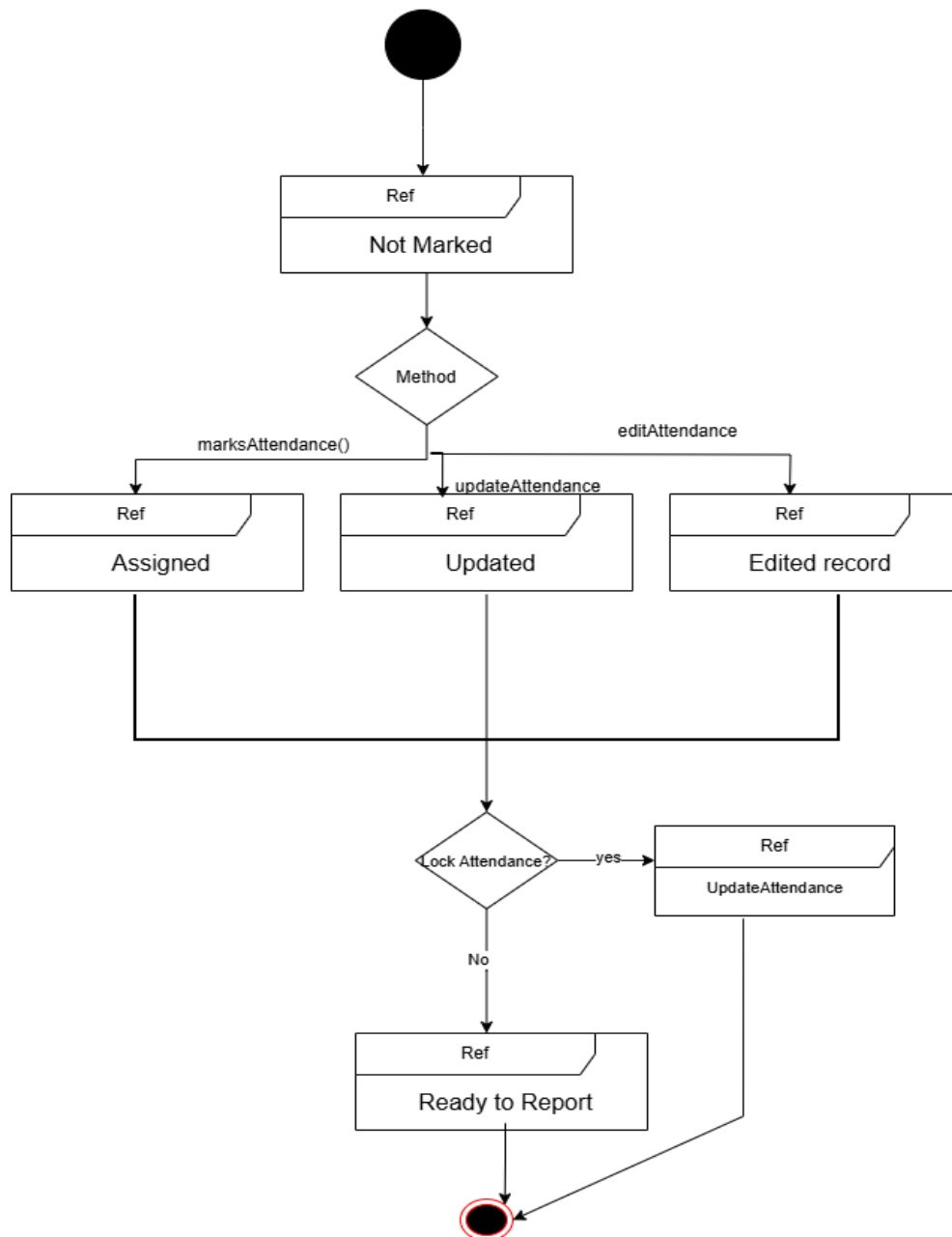
- Objects connected by associations
- Messages numbered in sequence

10.5 Interaction Overview Diagrams

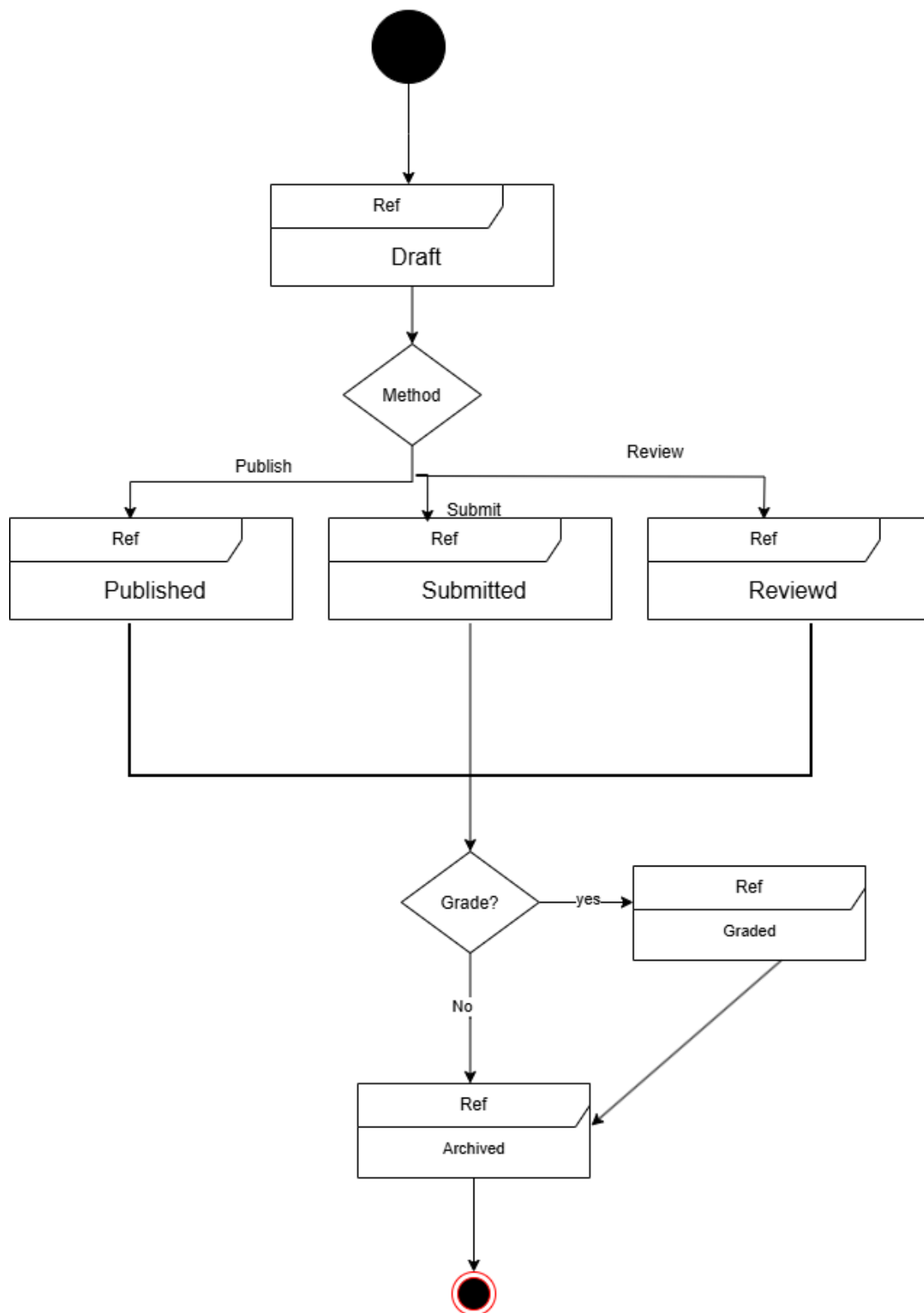
Interaction Overview Diagrams combine aspects of activity and sequence diagrams. They provide an overview of control flow between different interactions (or sequence diagrams), useful for complex scenarios involving multiple steps, such as the entire process of class creation from proposal to approval and enrollment.

Attendance

Attendance System IOD



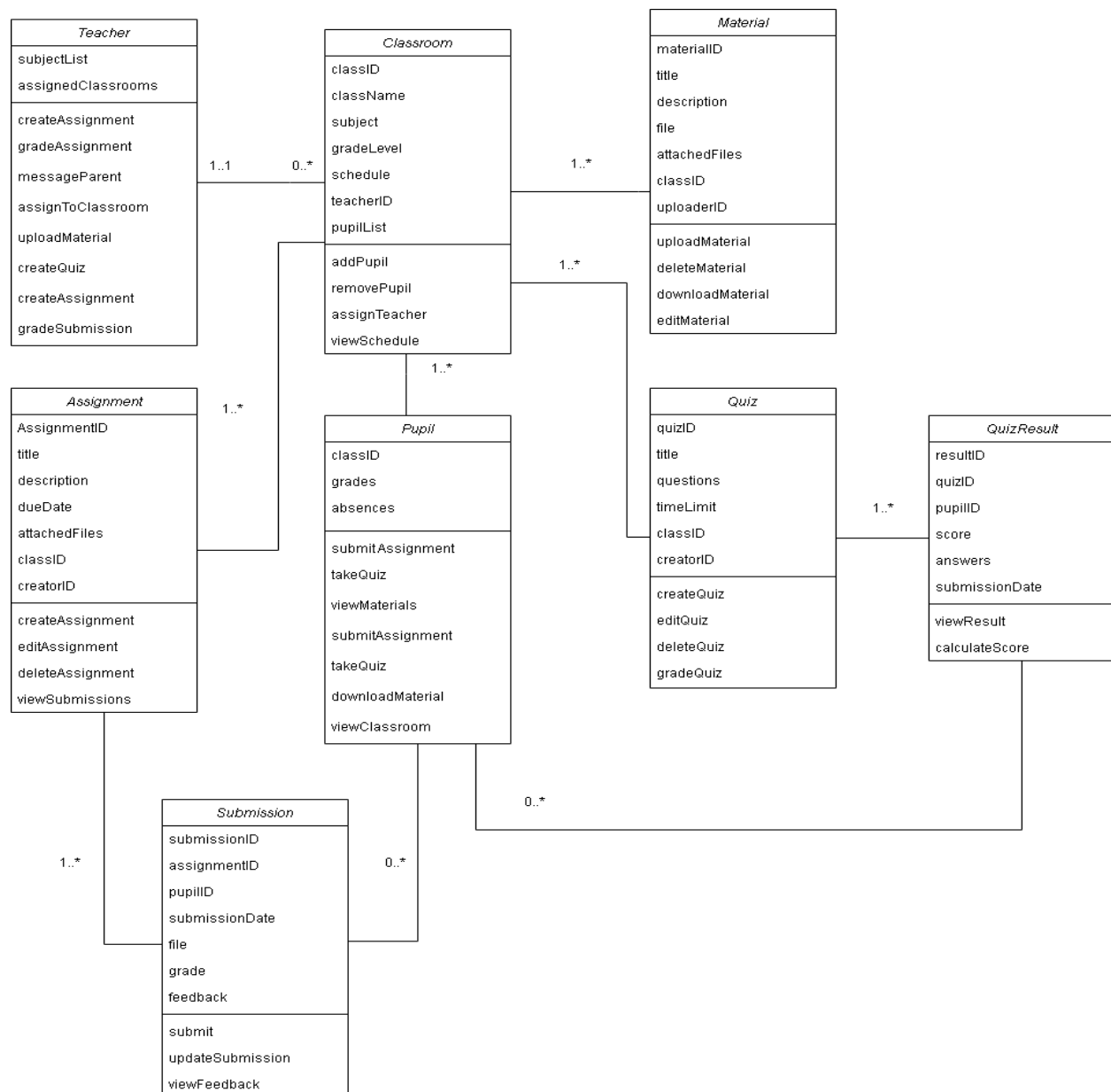
Grade



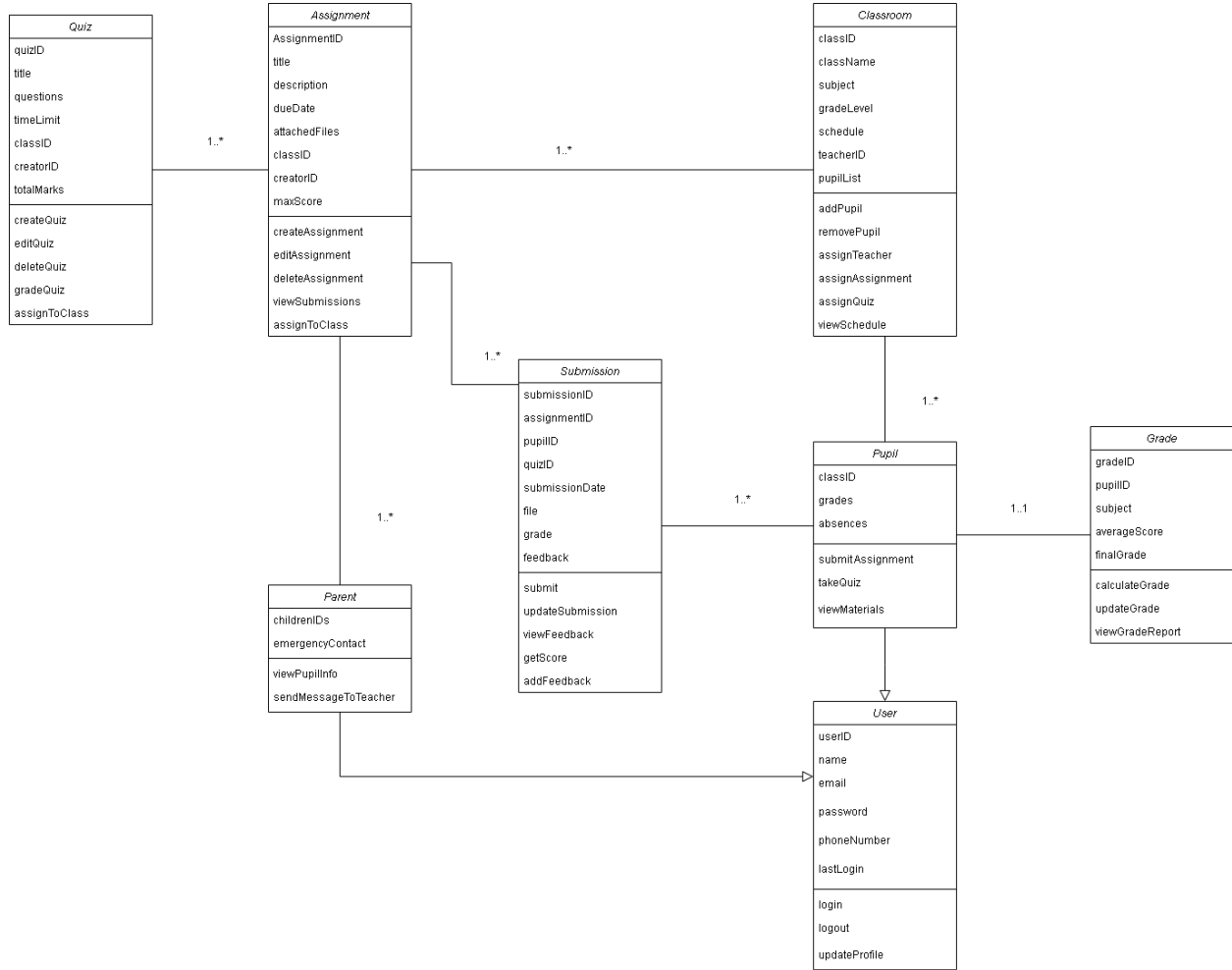
10.6 Class Diagrams

Class Diagrams represent the static structure of the system by showing classes, their attributes, methods, and relationships such as inheritance, associations, and aggregations. This diagram forms the foundation of the system design, detailing how users, classes, assignments, and other entities relate.

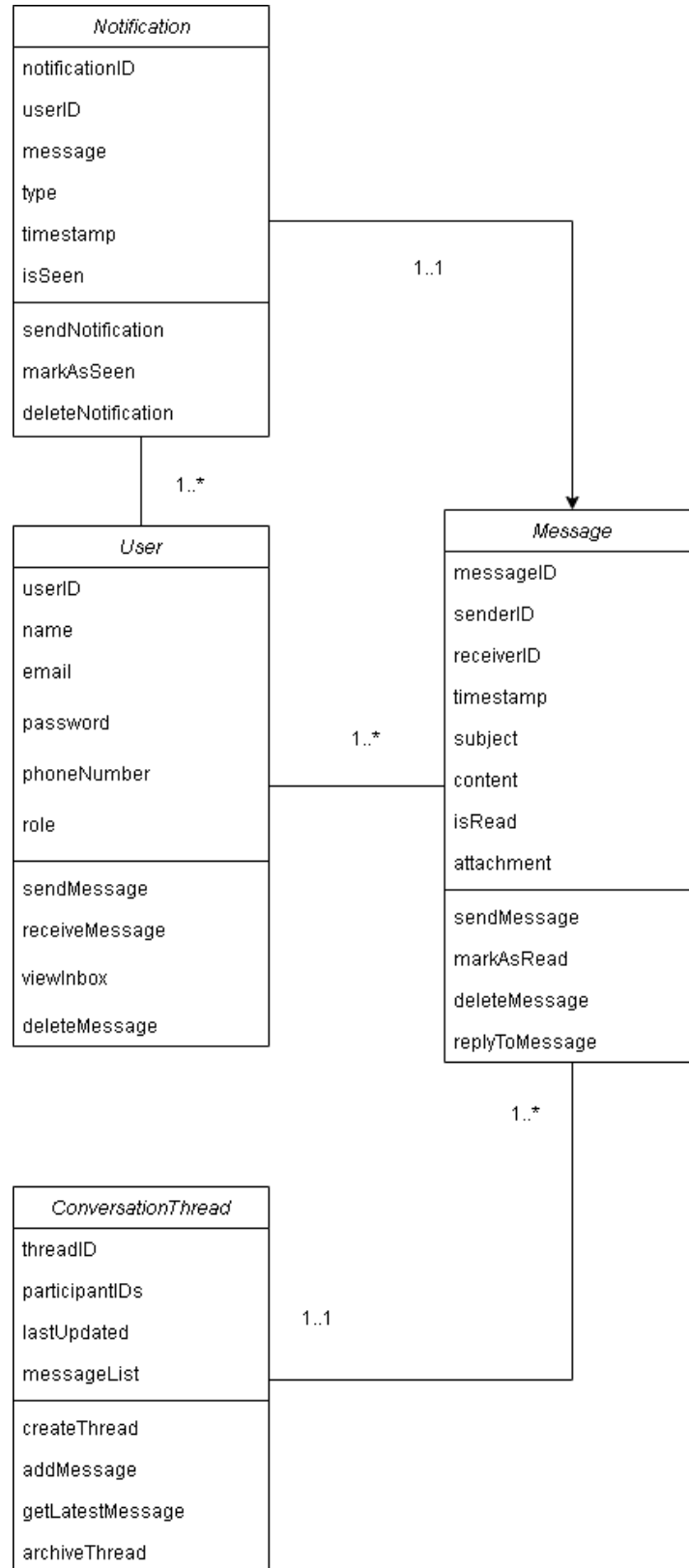
Classroom Management



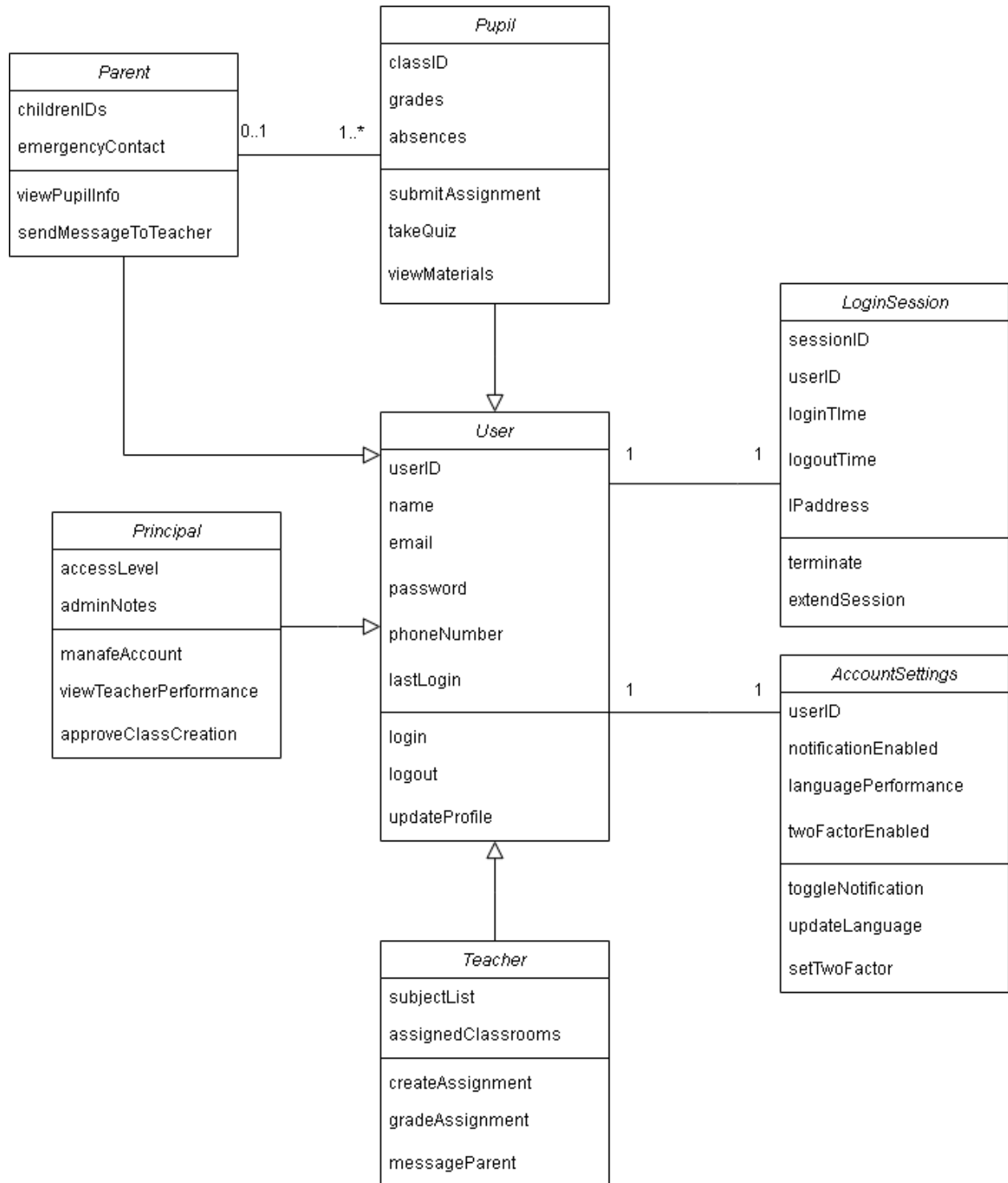
Grade Performance



Messaging System



User Management system



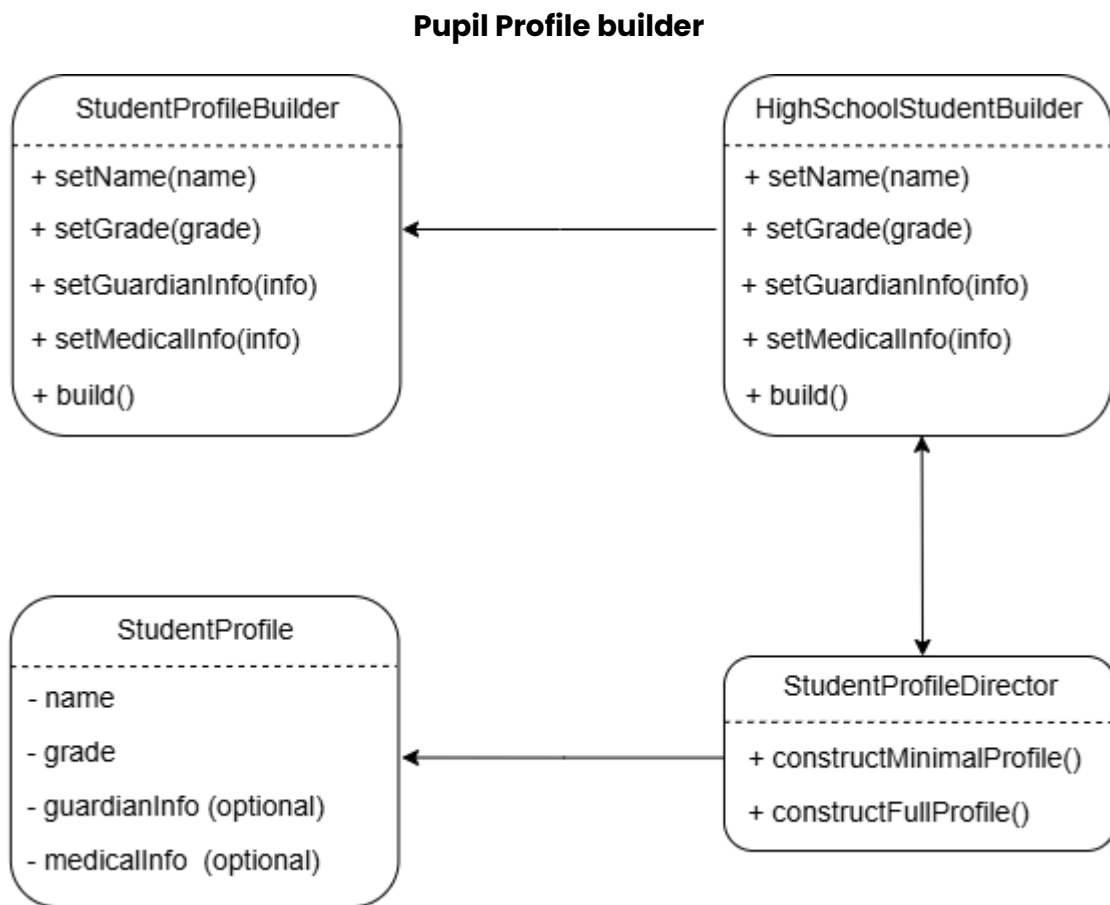
11. Design Patterns

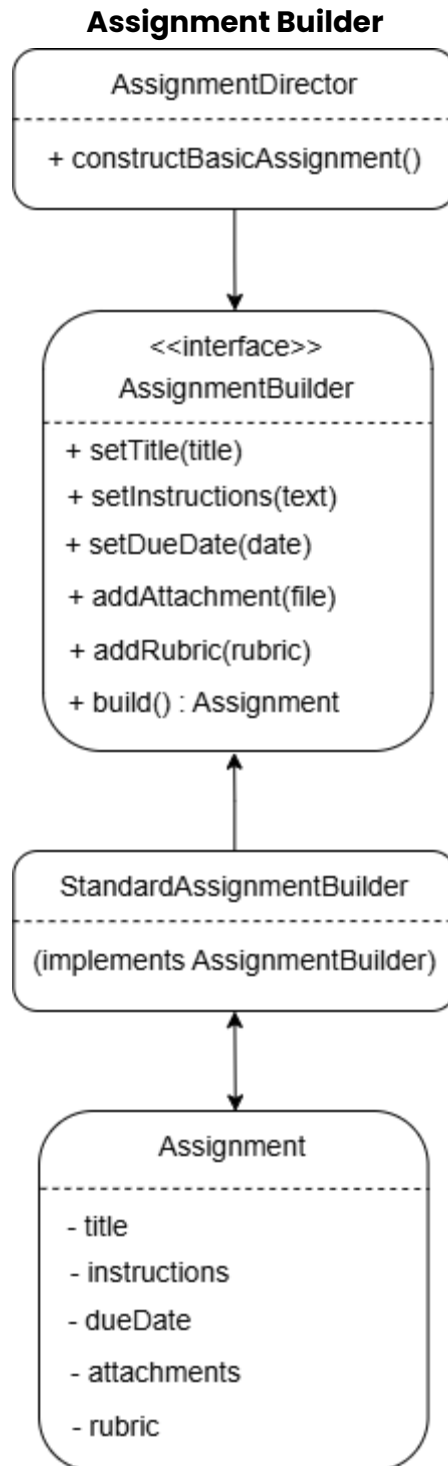
11.1 Creational Patterns

Creational patterns focus on object creation mechanisms, trying to create objects in a manner suitable to the situation. They increase flexibility and reuse of existing code.

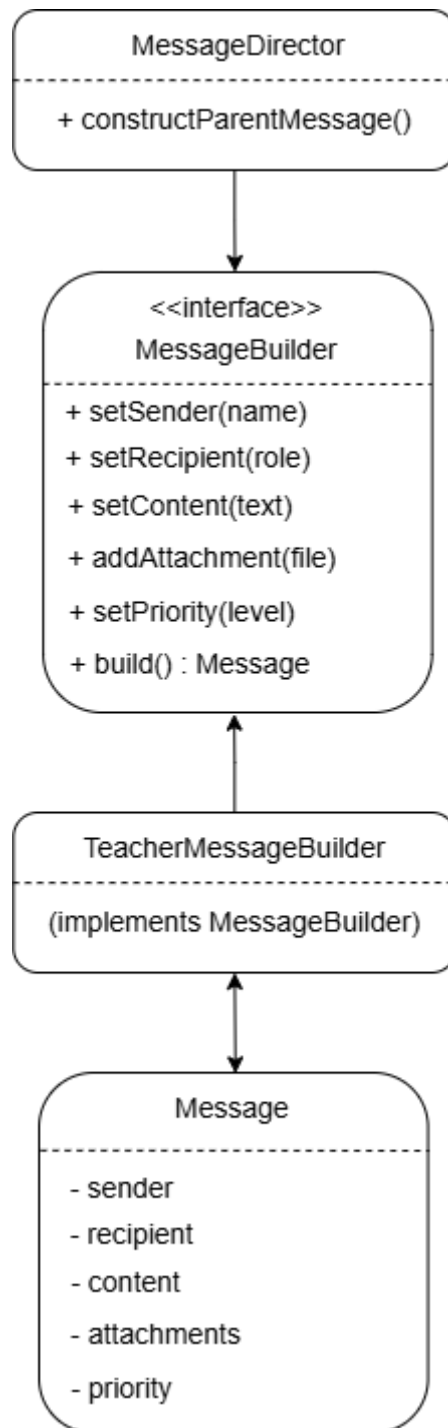
11.1.1 Builder

Separates the construction of a complex object from its representation so that the same construction process can create different representations.

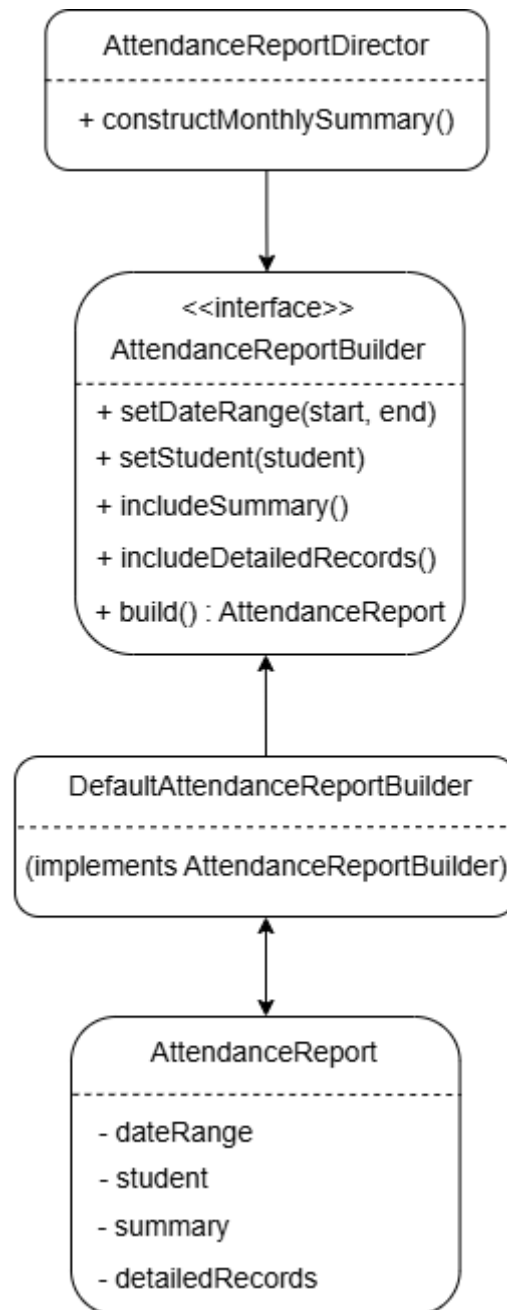




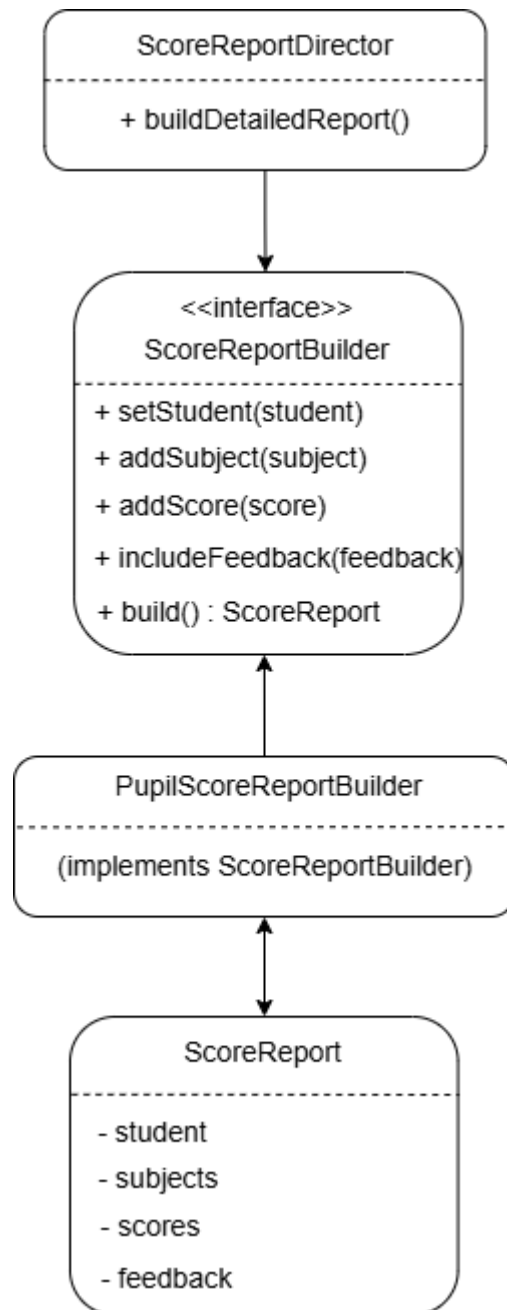
Message Builder



Attendance Report Builder



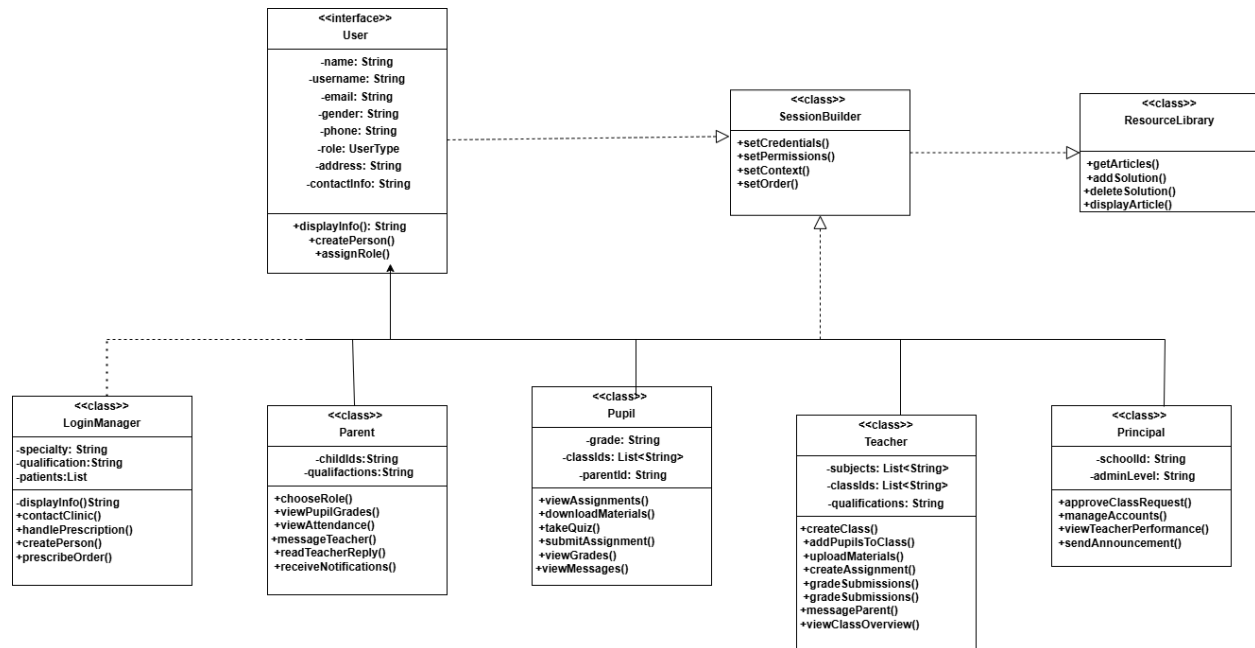
Score Report Builder



11.1.2 Factory Method

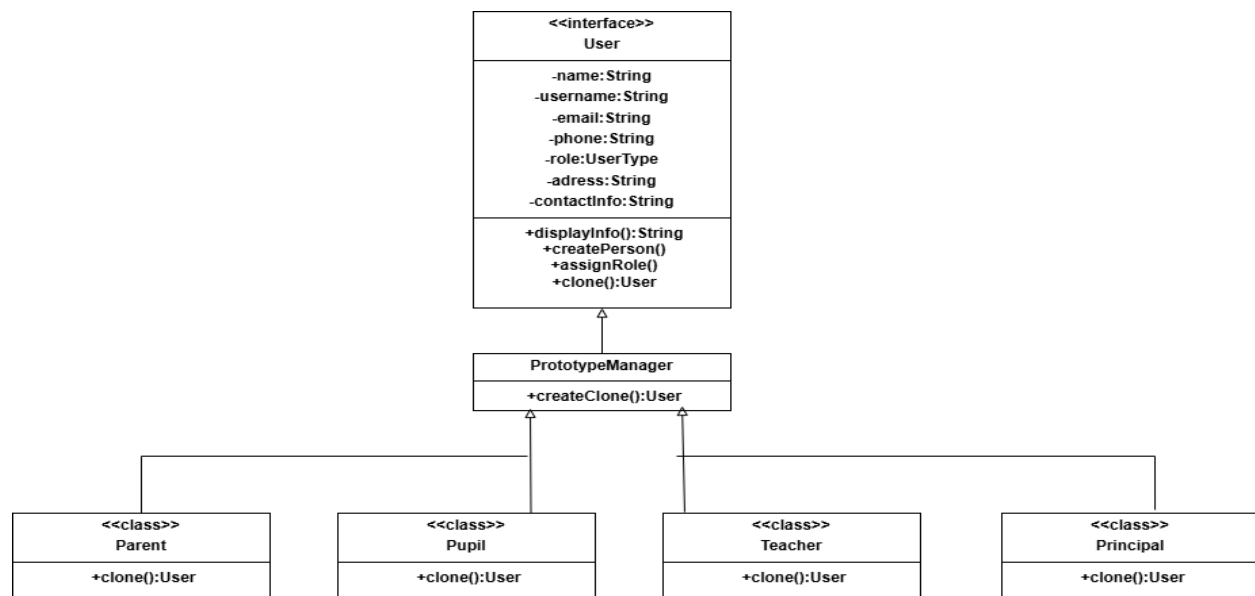
Defines an interface for creating an object but lets subclasses decide which class to instantiate.

Creational Design Pattern



11.1.3 Prototype

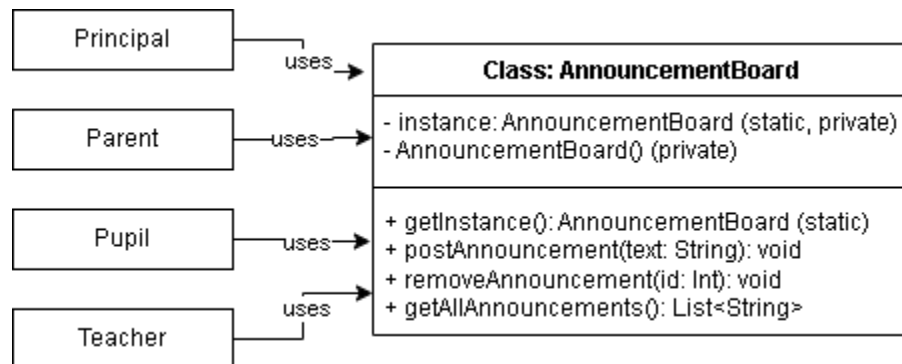
Specifies the kinds of objects to create using a prototypical instance, and creates new objects by copying this prototype.



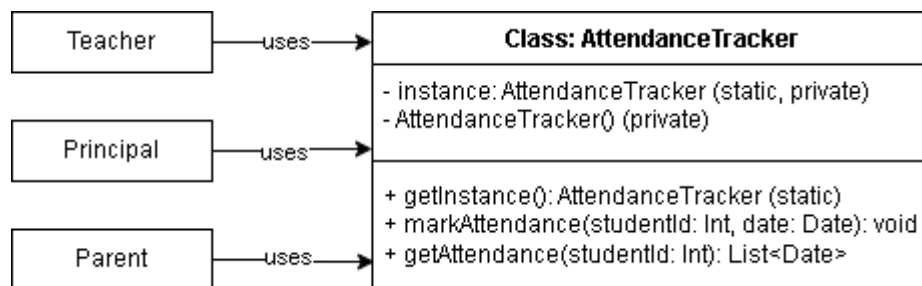
11.1.4 Singleton

Ensures a class has only one instance and provides a global point of access to it.

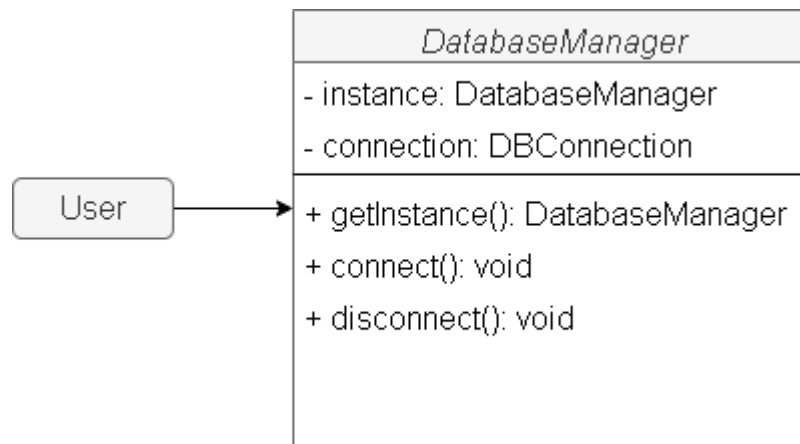
Announcement Board



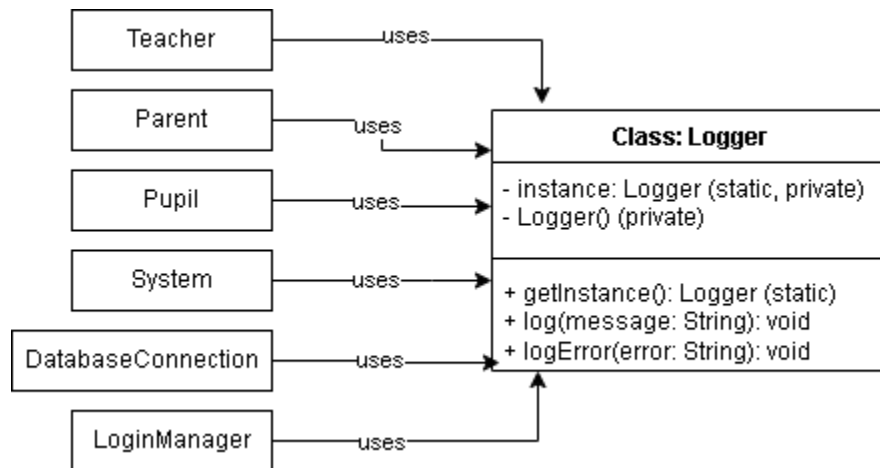
Attendance Tracker



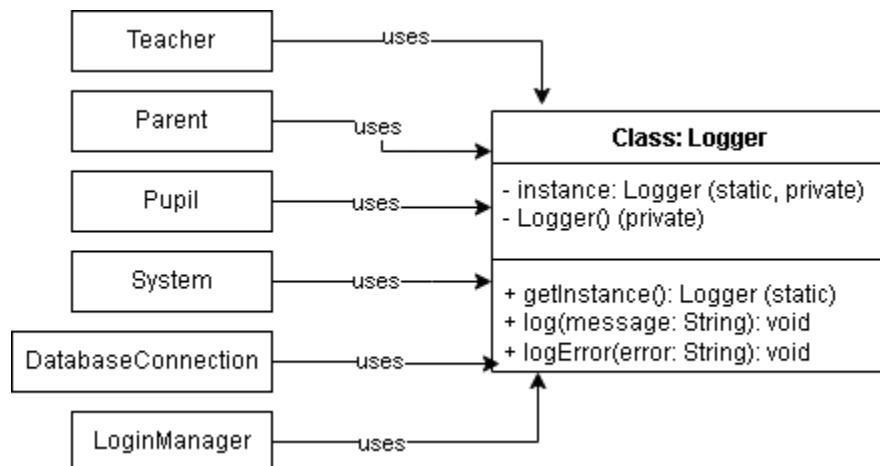
Database Manager



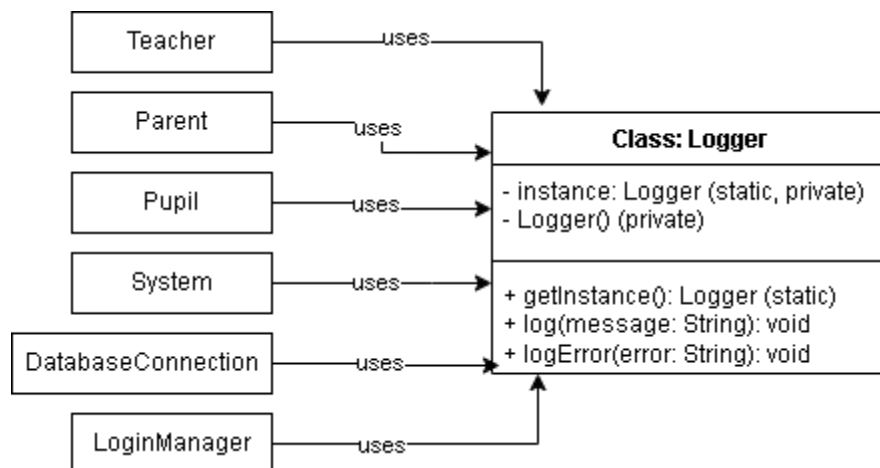
Logger



Principal

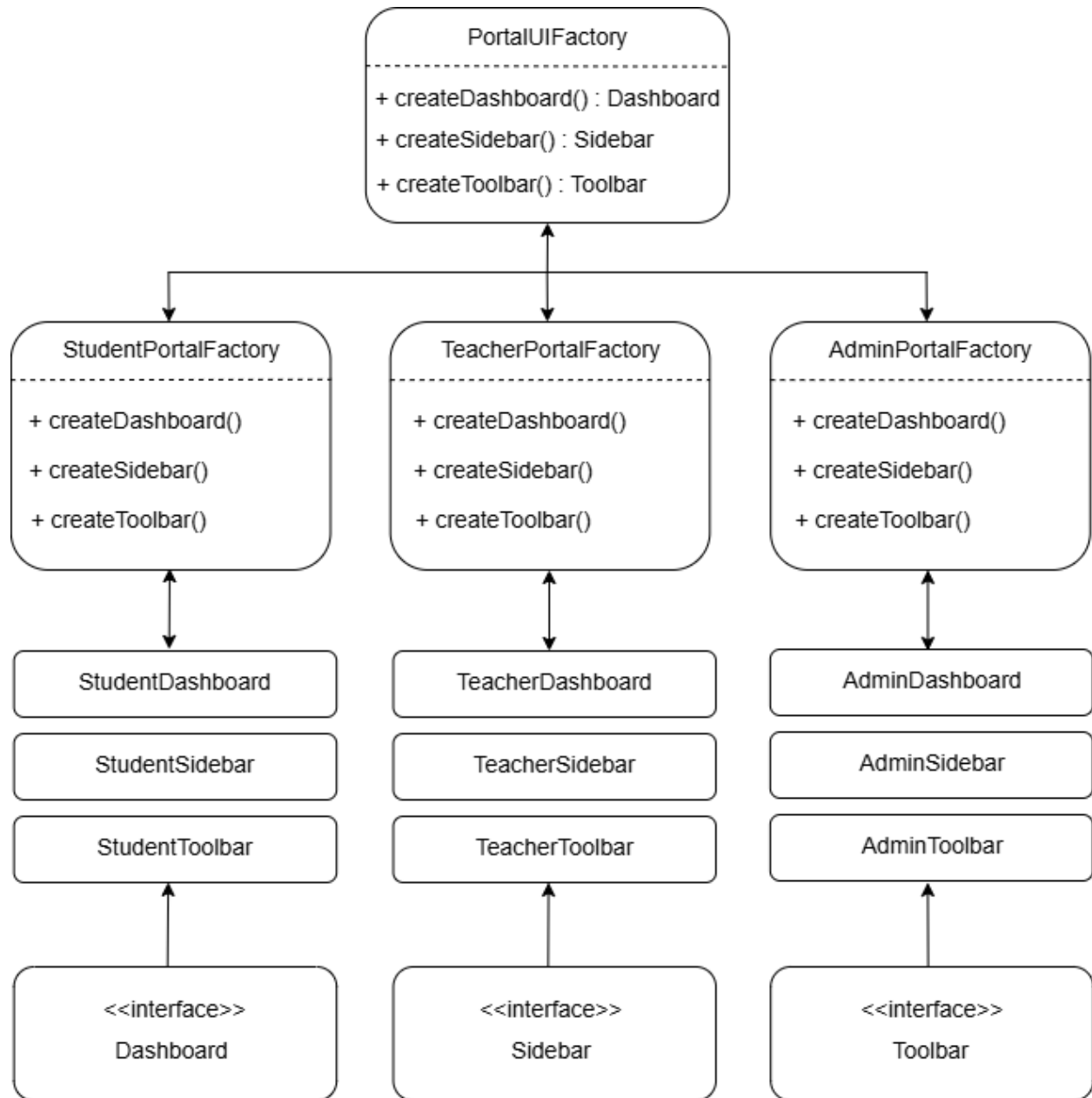


System Configuration-Management



11.1.6 Abstract Factory

Provides an interface for creating families of related or dependent objects without specifying their concrete classes.

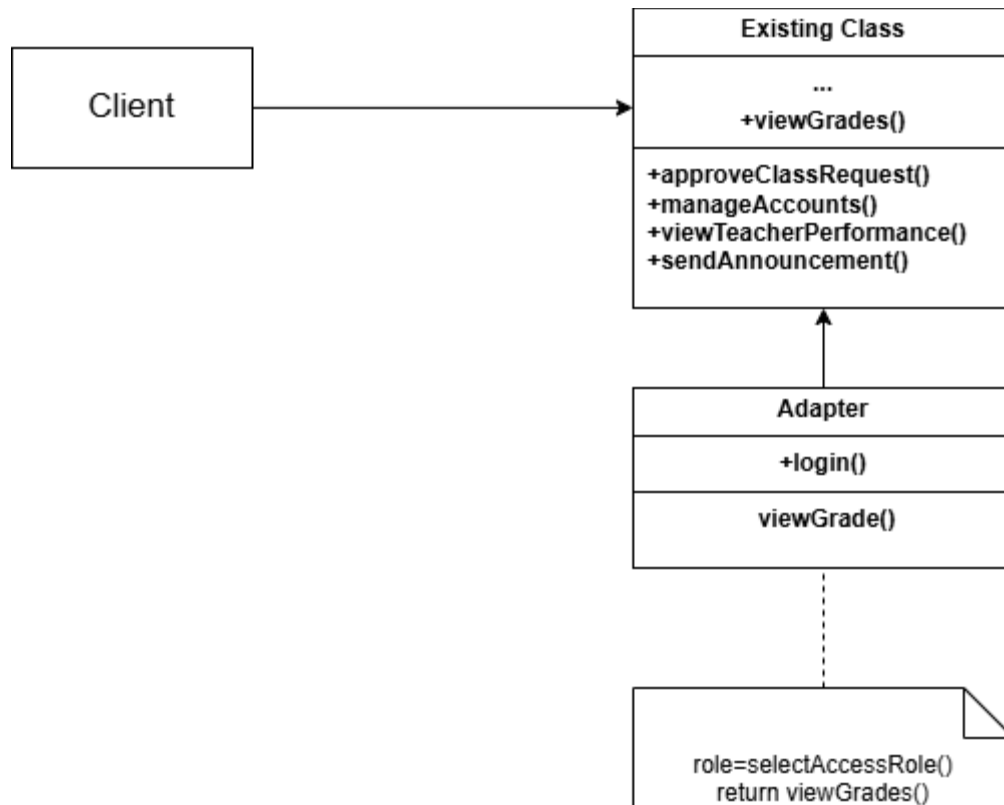


11.2 Structural Patterns

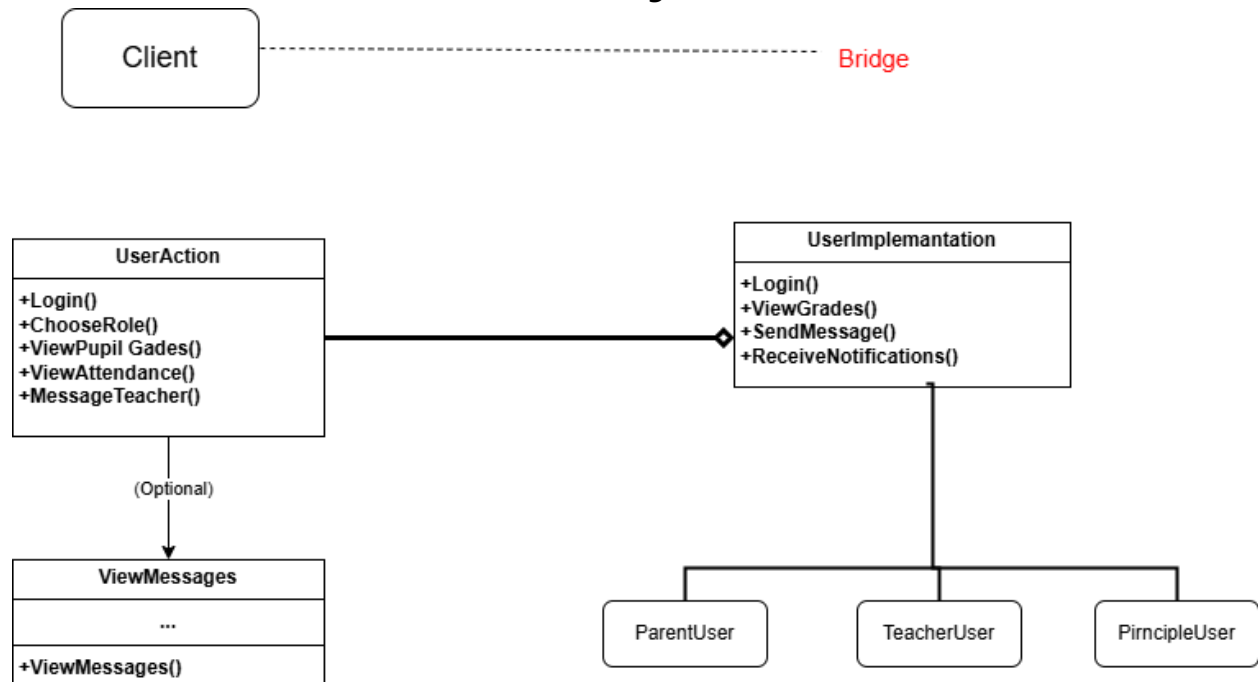
Structural patterns deal with object composition, describing ways to combine objects to form larger structures while keeping these structures flexible and efficient.

The diagrams in this section demonstrate how system components like interfaces, classes, and objects are organized to form the middle school management system's architecture.

Adapter



Bridge

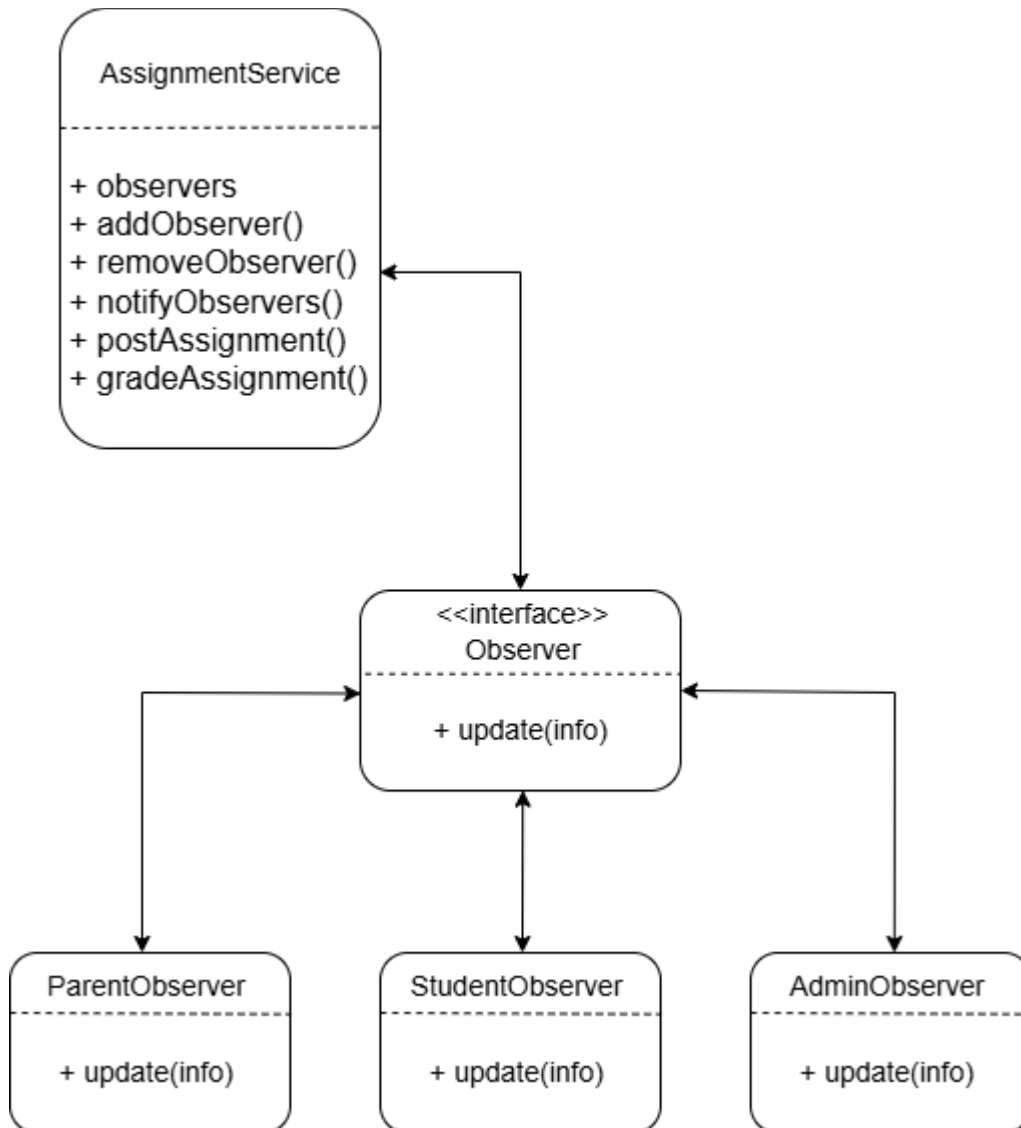


11.3 Behavioral Patterns

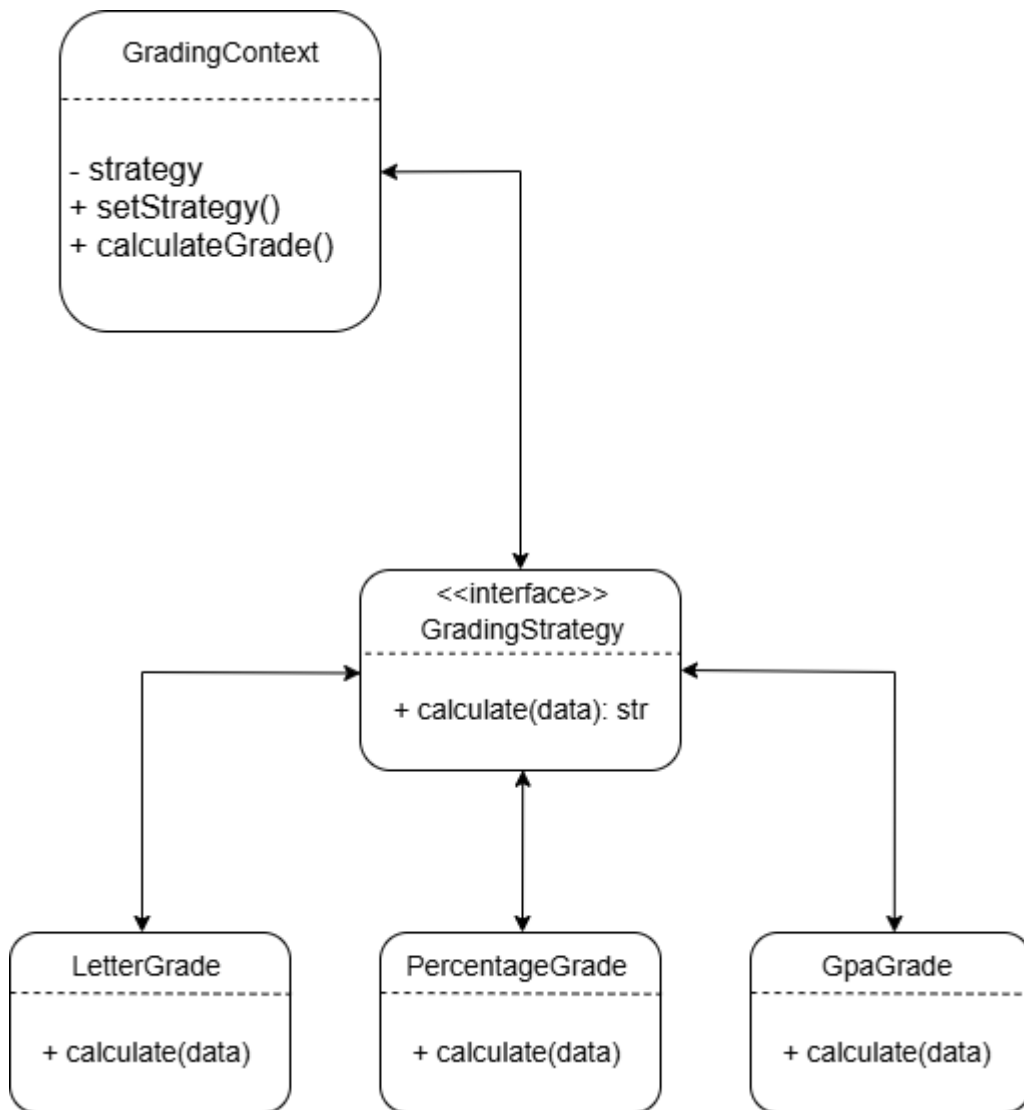
Behavioral patterns focus on communication between objects, how responsibilities are distributed, and how objects interact and collaborate to fulfill system tasks.

This section presents diagrams that capture the dynamic interactions within the system, such as message passing and algorithm implementations.

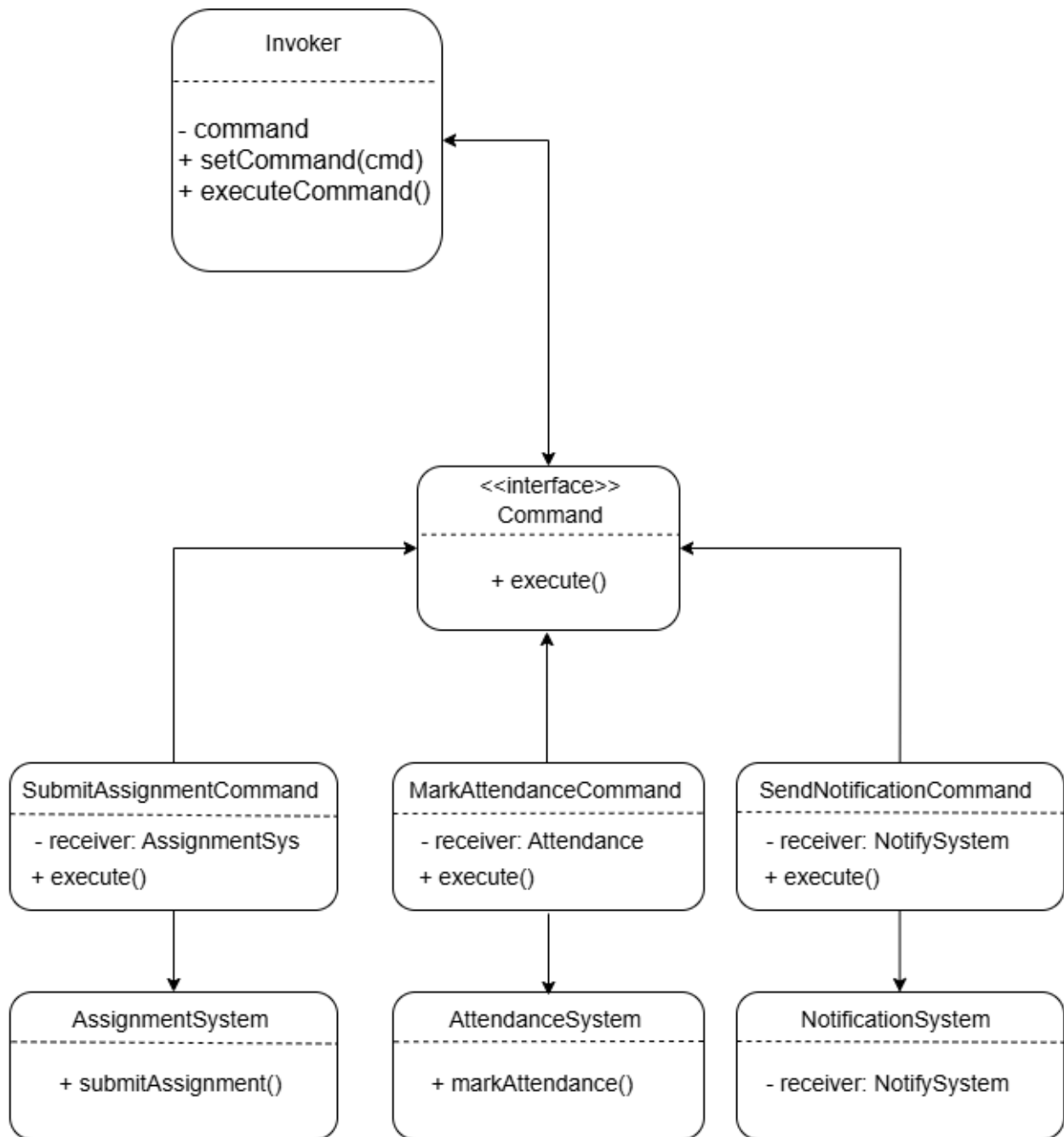
Observer



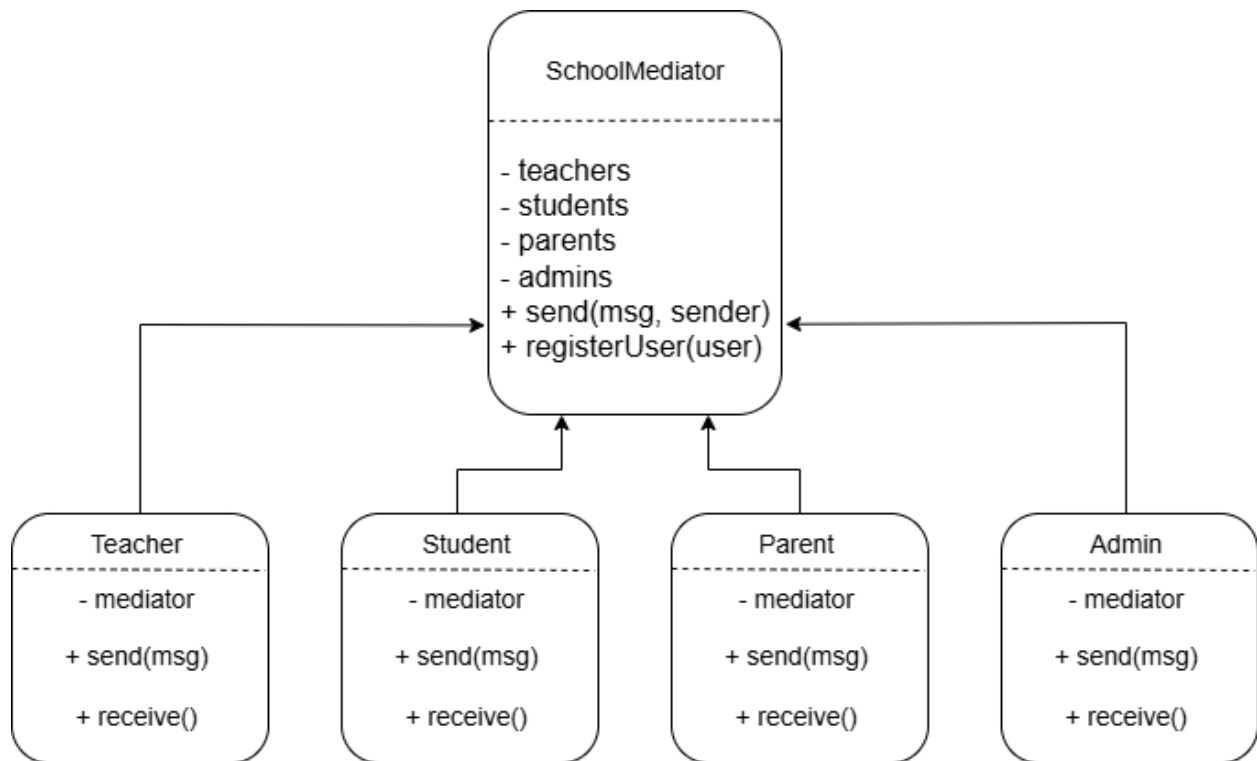
Strategy



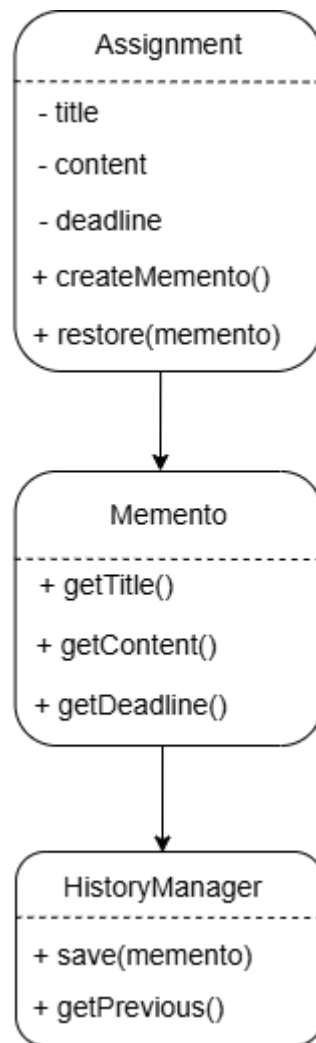
Command



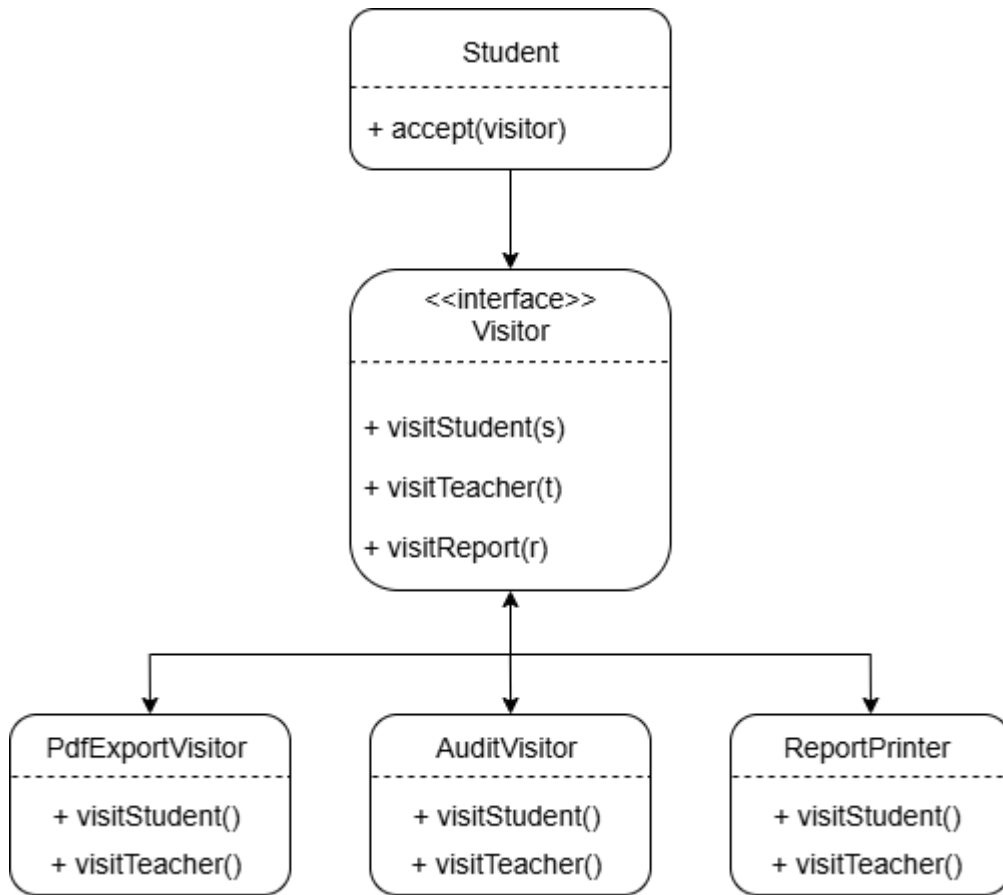
Mediator



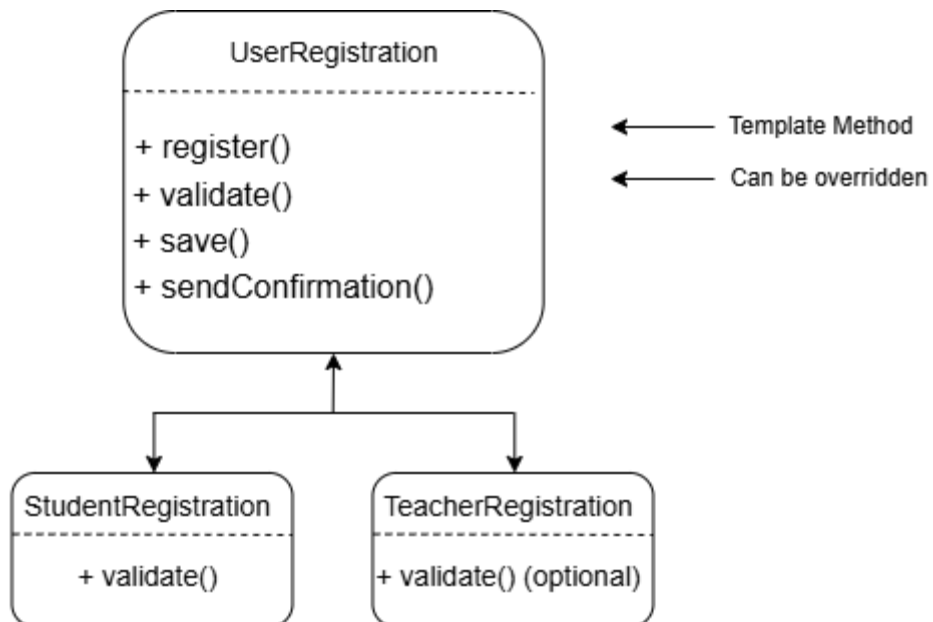
State



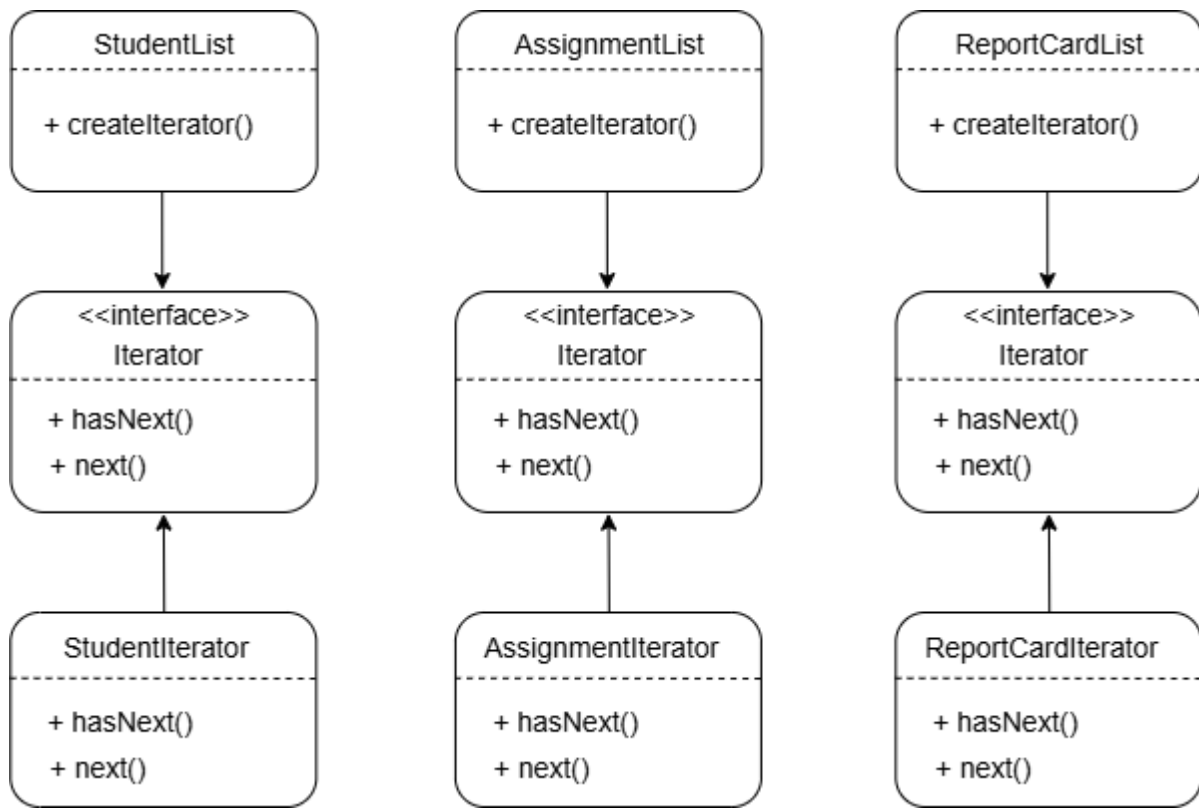
Chain of Responsibility



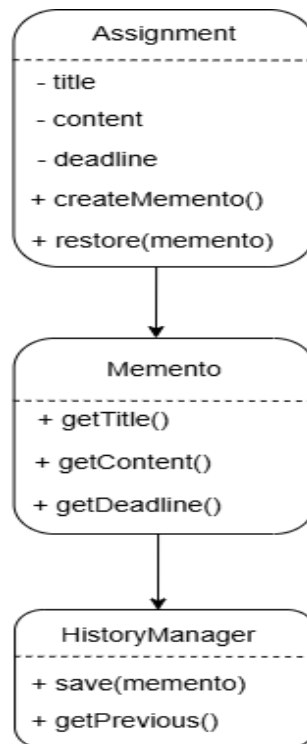
Template Method

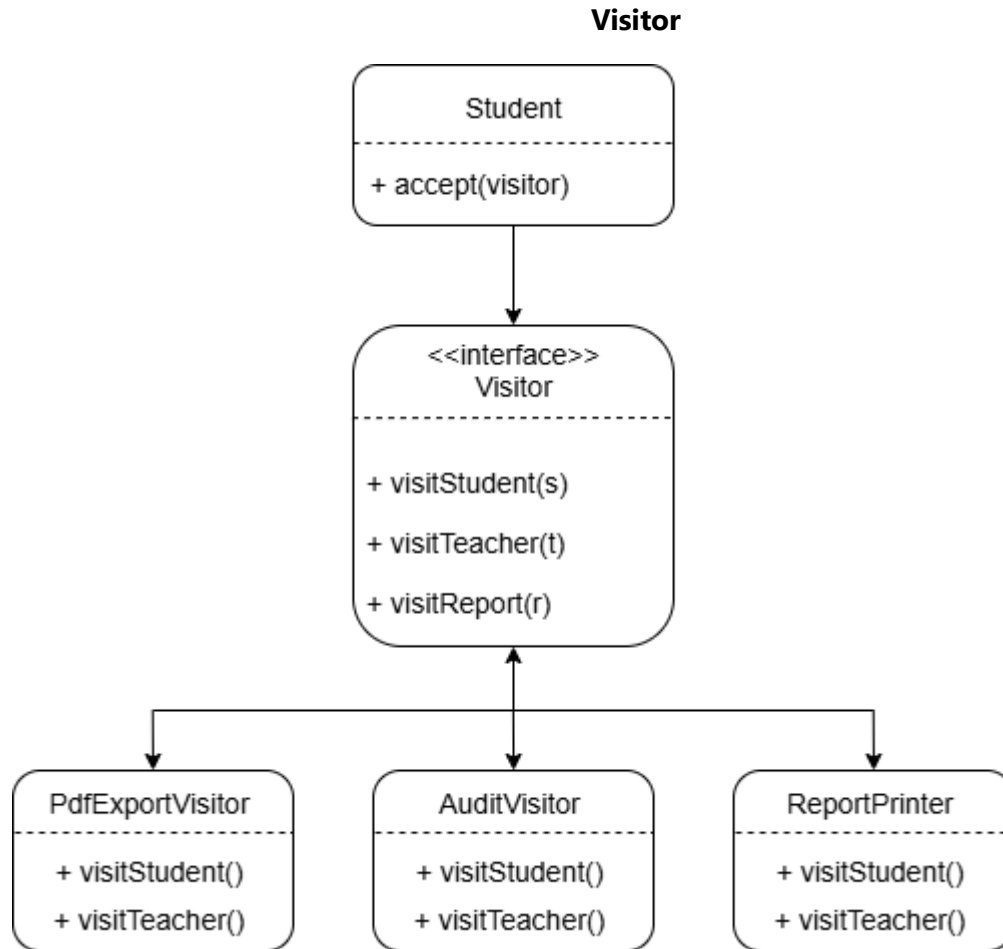


Iterator



Memento

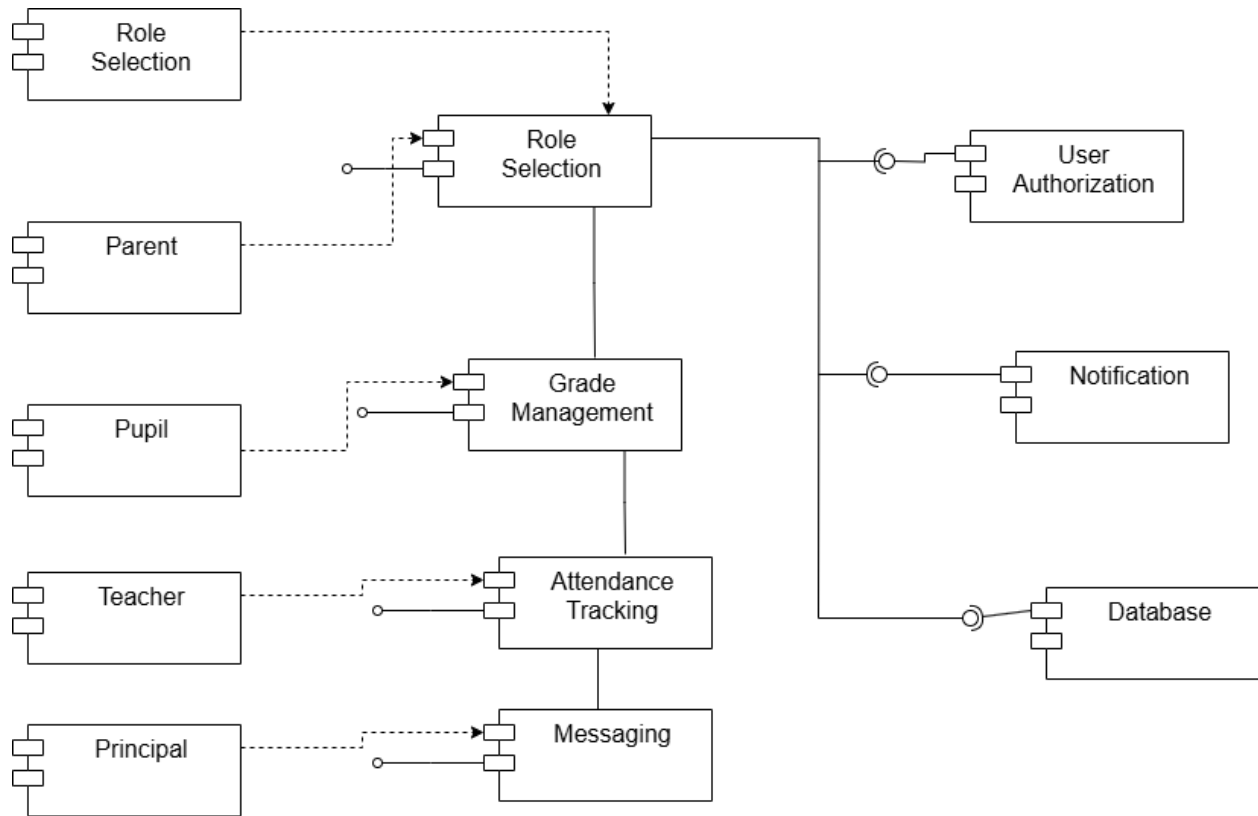




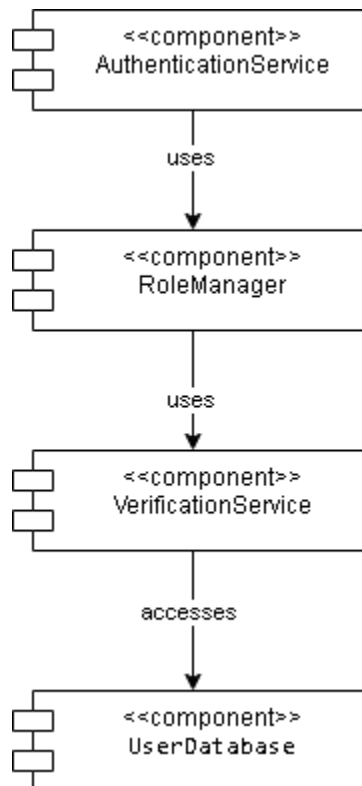
12. Architecture and Physical Design Diagrams

12.1 Component Diagrams

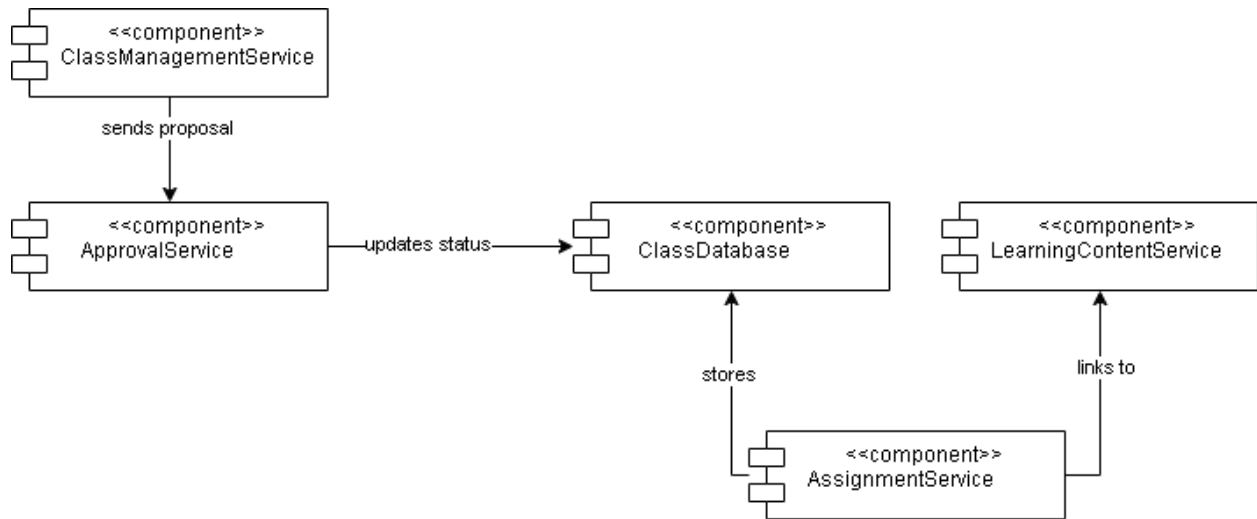
Component Diagrams model the high-level organization and dependencies among software components or modules. They illustrate how the system is divided into functional parts and how these components interact. For the middle school management system, these diagrams show subsystems like User Management, Class Management, Assignment Handling, and Messaging modules, clarifying their relationships and dependencies.



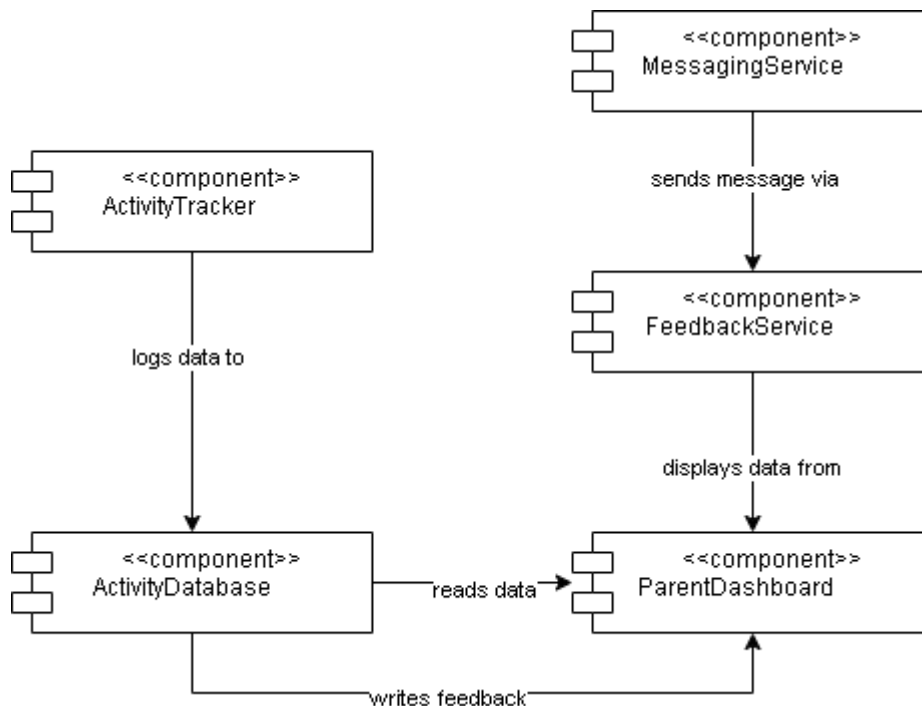
Authentication



Classroom

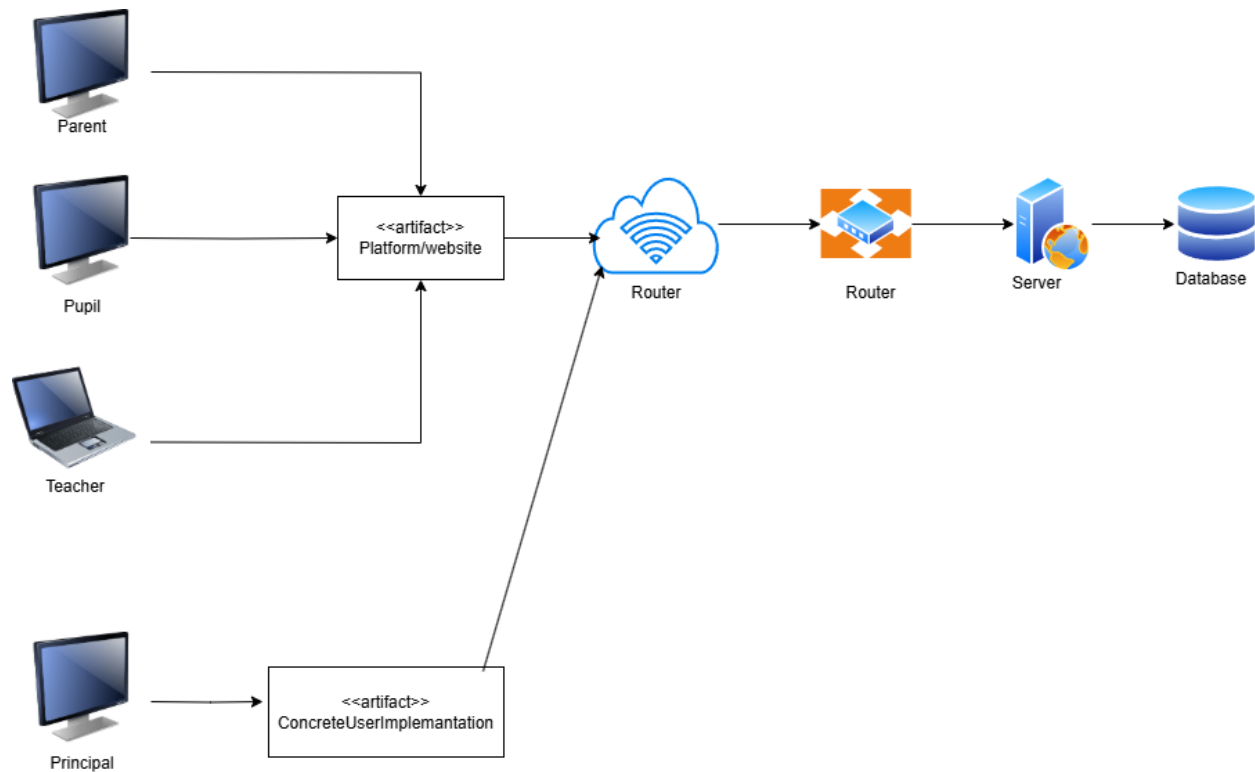


Messaging



12.2 Deployment Diagrams

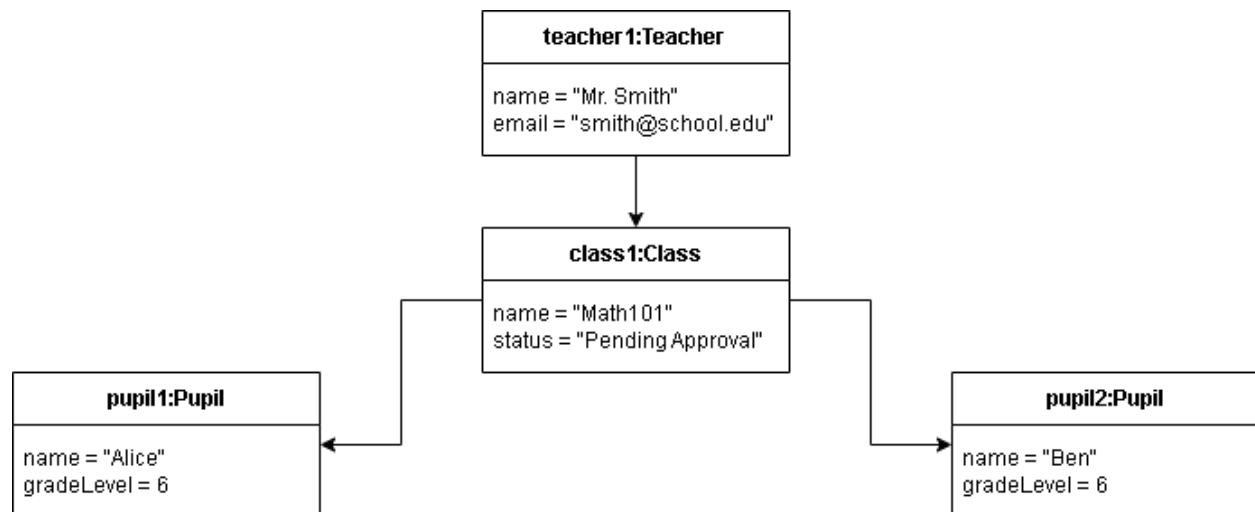
Deployment Diagrams depict the physical deployment of software artifacts on hardware nodes. They show how the system components are distributed across servers, client devices, databases, and networks. In this project, deployment diagrams illustrate how the application is hosted (e.g., web servers, database servers) and accessed by users (parents, pupils, teachers, principal) via different devices.



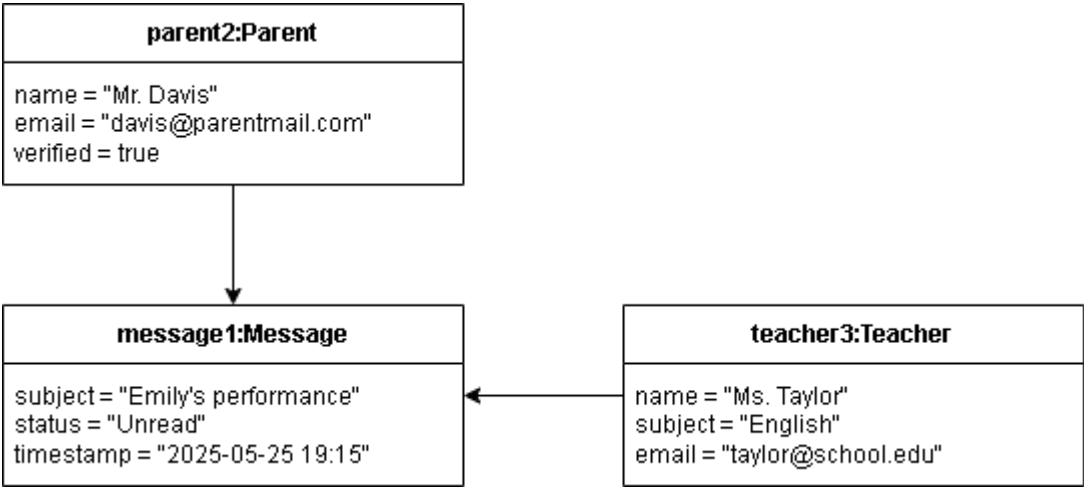
12.3 Object Diagrams

Object Diagrams represent instances of classes at a particular moment in time. They are useful to visualize the system's state with real data, showing objects, their attribute values, and links between them. These diagrams help understand the system behavior and data flow during specific scenarios such as a pupil's enrollment in a class or submission of an assignment.

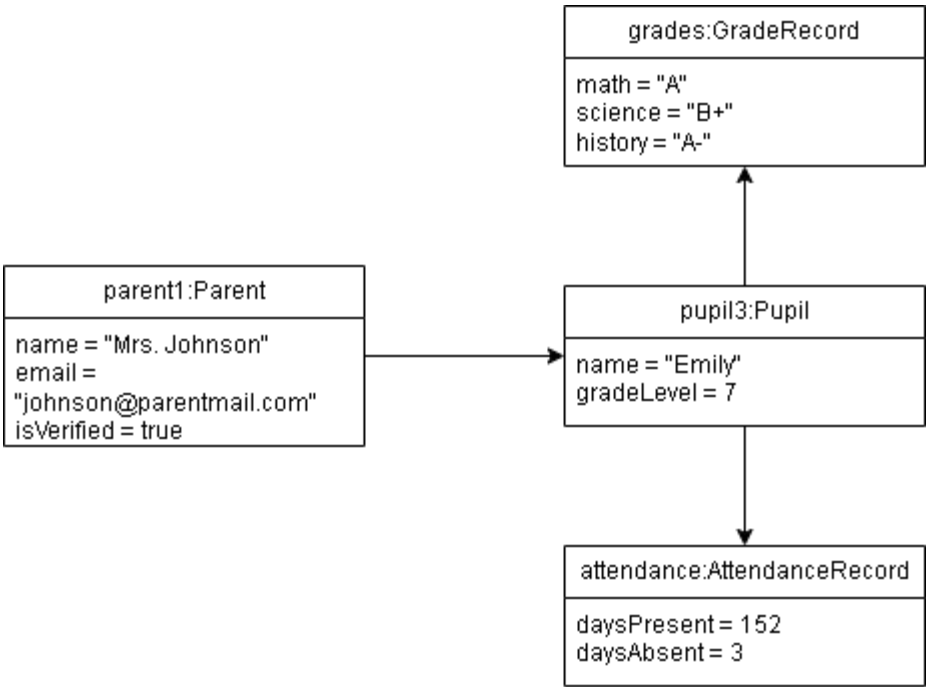
Class



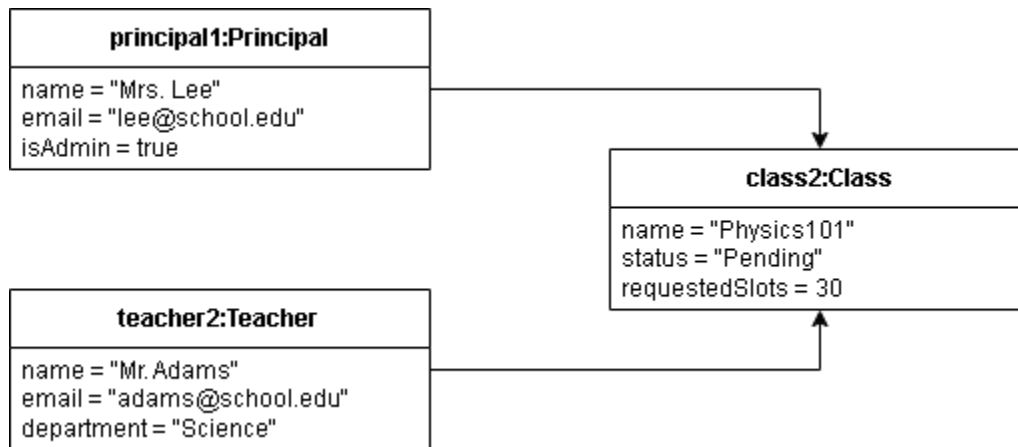
Messaging



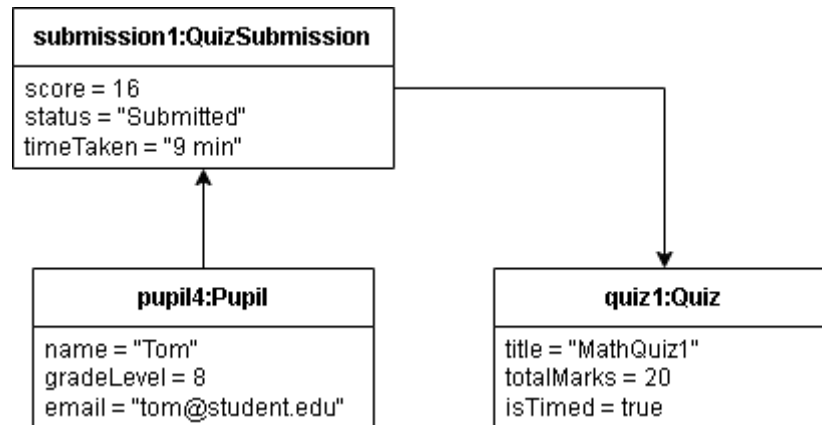
Parent



Principal class approval



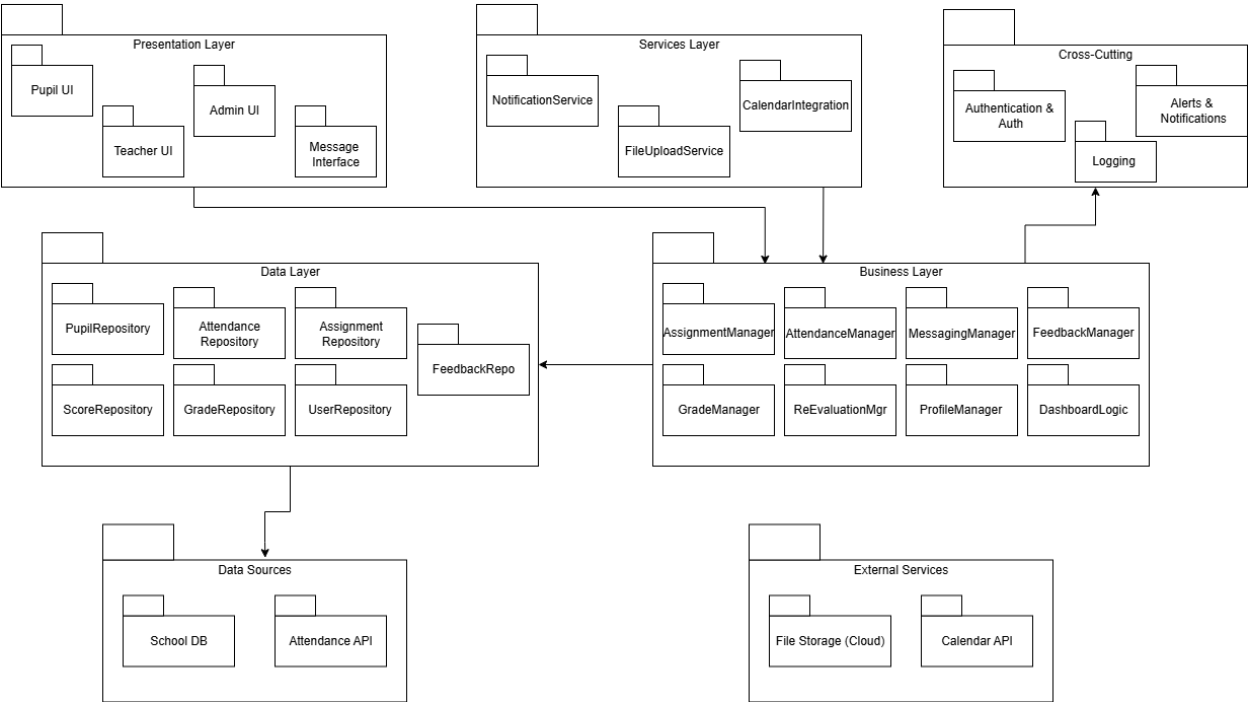
Quiz



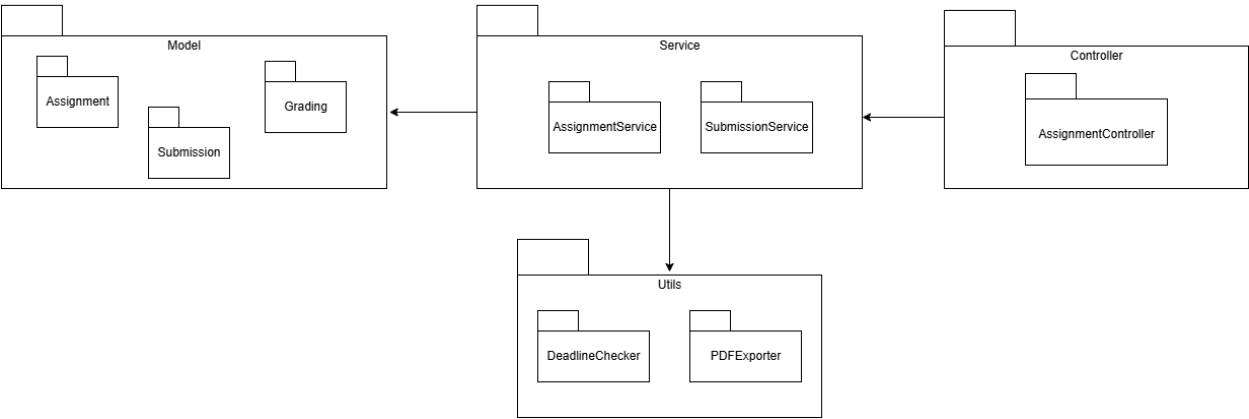
12.4 Package Diagrams

Package Diagrams organize the system model into packages (groups of related classes or components) to manage complexity. They depict the dependencies between these packages, providing a modular view of the system's structure. For this project, package diagrams group related classes or modules such as Authentication, User Profiles, Course Management, and Messaging.

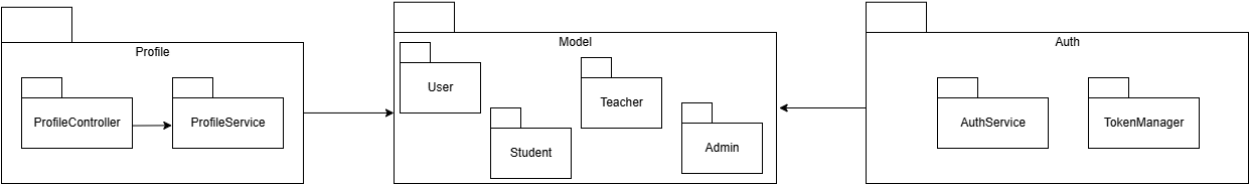
Layered School Management System



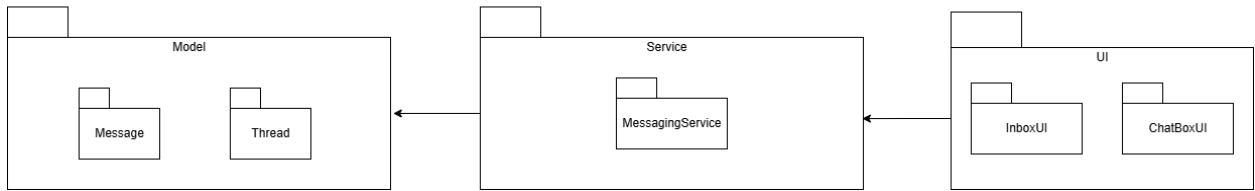
AssignmentManager



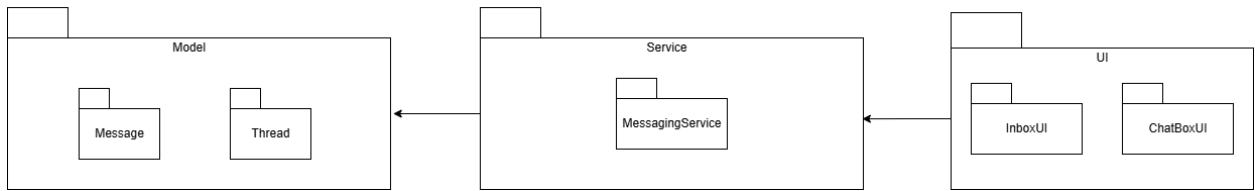
UserManagement



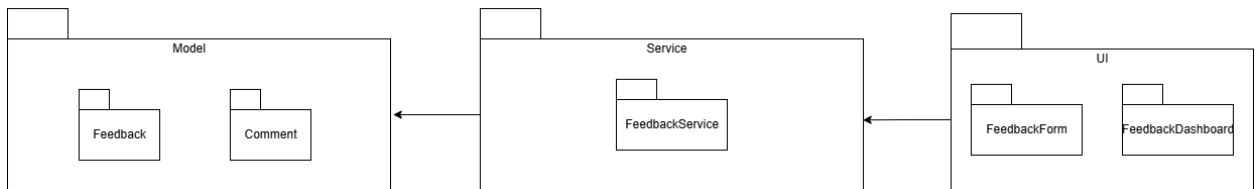
MessagingManager



MessagingManager



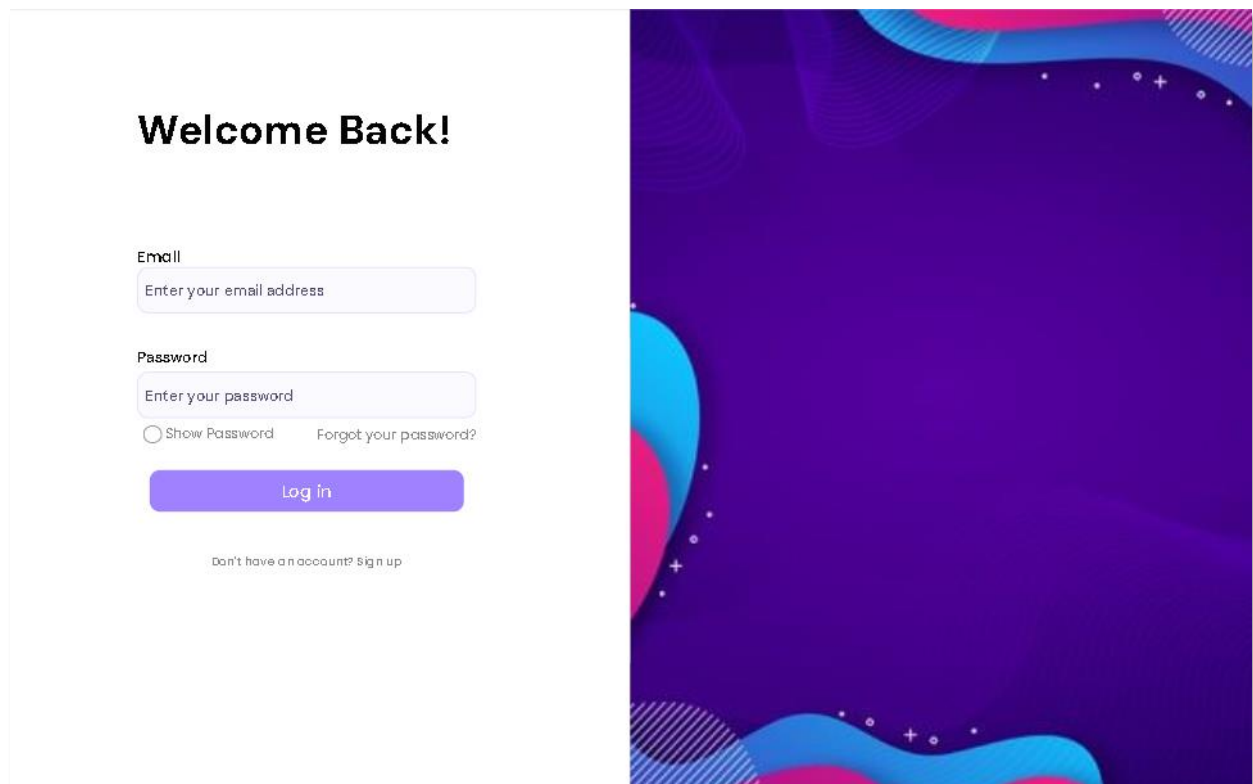
FeedbackManager



13: User Interface Designs

13.1 Login Page

The login page provides a simple and secure entry point for all users (parents, pupils, teachers, and principal). It includes input fields for username and password, with a clear call-to-action button for login. The design is clean and accessible, ensuring easy navigation and quick authentication. Error messages are displayed for invalid inputs to guide the user effectively.



Welcome Back!

Email

Password

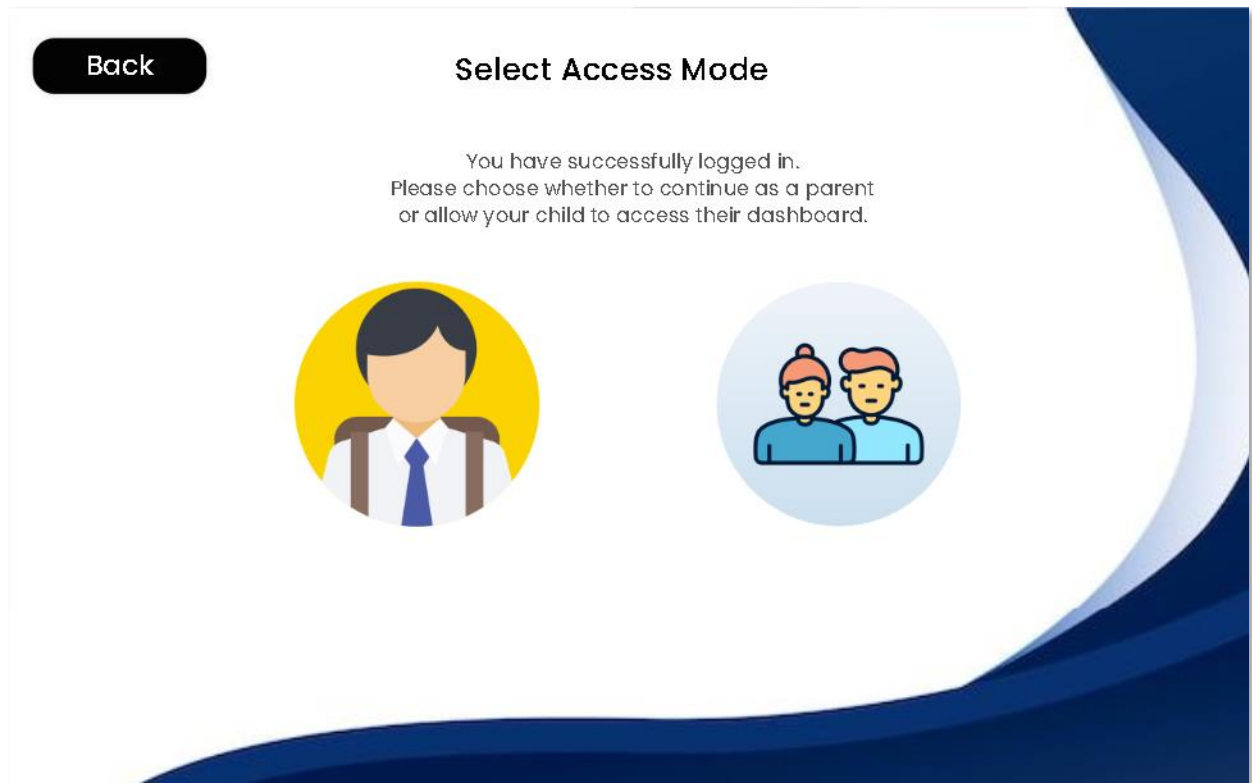
☐ Show Password [Forgot your password?](#)

[Log in](#)

[Don't have an account? Sign up](#)

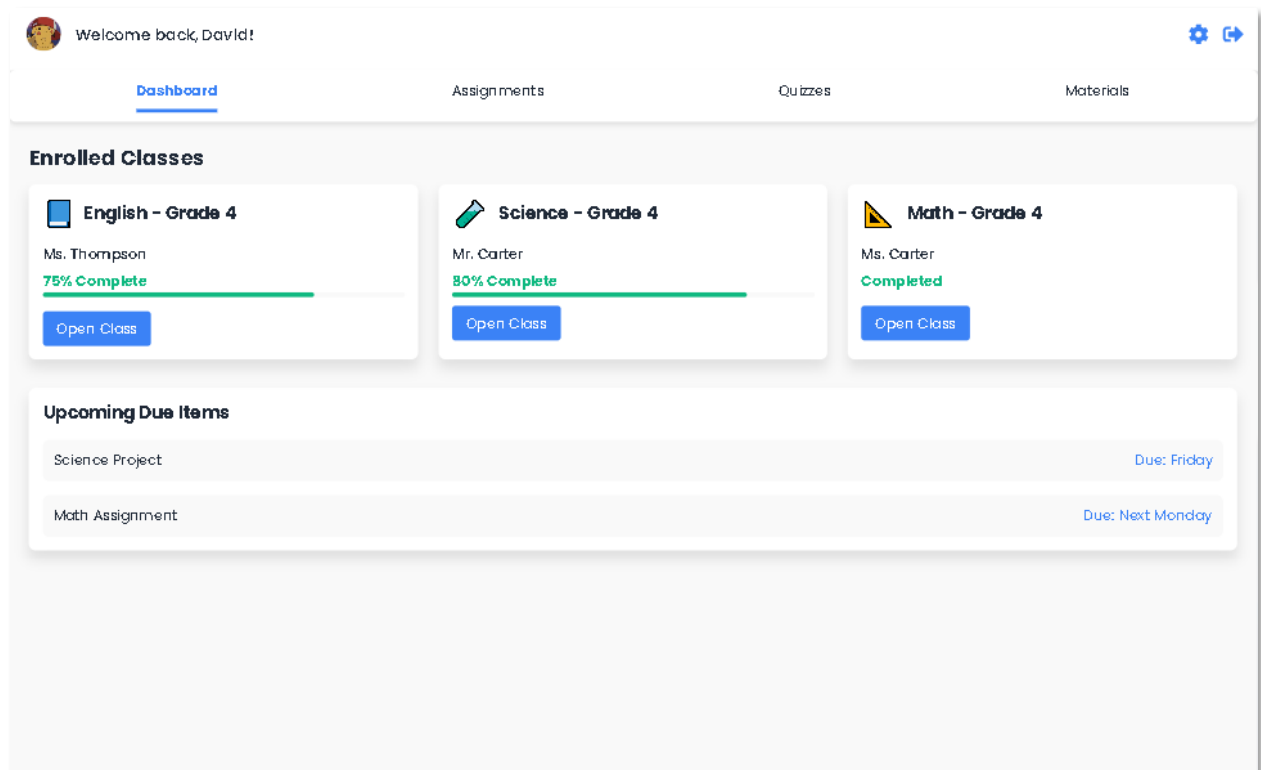
13.2 Role Selection Page (Parent or Child)

After the parent logs in, this page allows them to select whether to continue as a parent or switch to their child's (pupil's) dedicated portal. The interface presents two clear options with descriptive buttons. This page ensures the dual-access functionality where parents manage their accounts but pupils access their own educational materials.




13.3 Pupil Dashboard

The pupil dashboard features a user-friendly navigation bar with tabs for Assignments, Quizzes, and other relevant sections. At the top-left corner, a profile picture and pupil information are displayed for personalization. The main body lists all enrolled classes, showing upcoming assignments, quizzes, and announcements clearly. The color scheme is bright and engaging to motivate pupils, with intuitive layouts to simplify access to learning resources.



13.4 Pupil Topic Detail Page

When a pupil opens a specific topic inside a class, this page provides detailed content related to that topic. It includes displayed learning materials such as PDFs, videos, or images. Below the materials, optional sections for Assignments and Quizzes are provided if available, with clear submission buttons and due dates. Above the open theme, two other themes are shown in collapsed form with upload dates to provide context. The navigation bar switches to a back button for easy return to the main pupil dashboard, maintaining the profile picture position for consistency.

 Welcome back, David!⚙️ [Log out](#)


[← Back to Dashboard](#)**Math - Grade 4**
Uploaded on: March 10, 2025


Multiplication Basics
Uploaded on: February 25, 2025


Number Patterns
Uploaded on: March 3, 2025

Introduction to Fractions

Below is the main content provided by your teacher.

 Intro to Fractions.pdf — 1.2MB [Download](#)

 Fractions Explained.mp4 — 8 mins [Play](#)

 Fraction Practice.pptx [View](#) [Download](#)

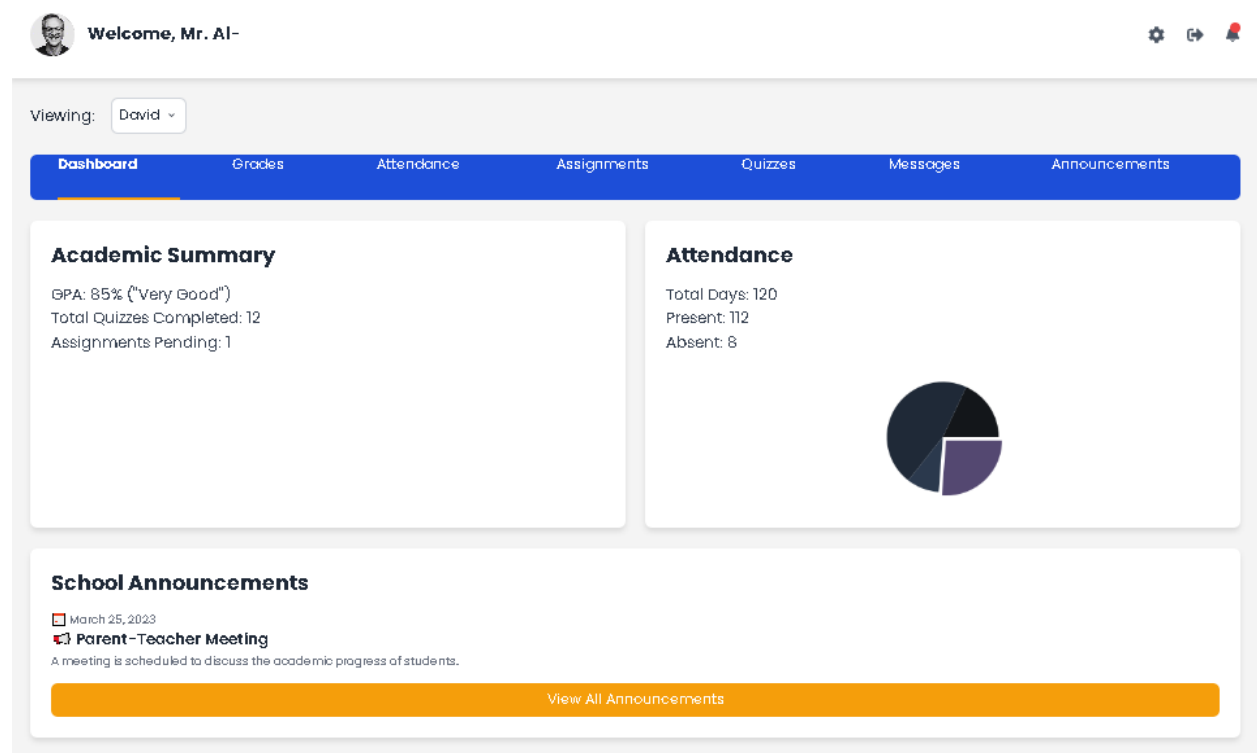
Assignment

Complete this by March 15, 2025

Fraction Worksheet [View Assignment](#) Not Submitted

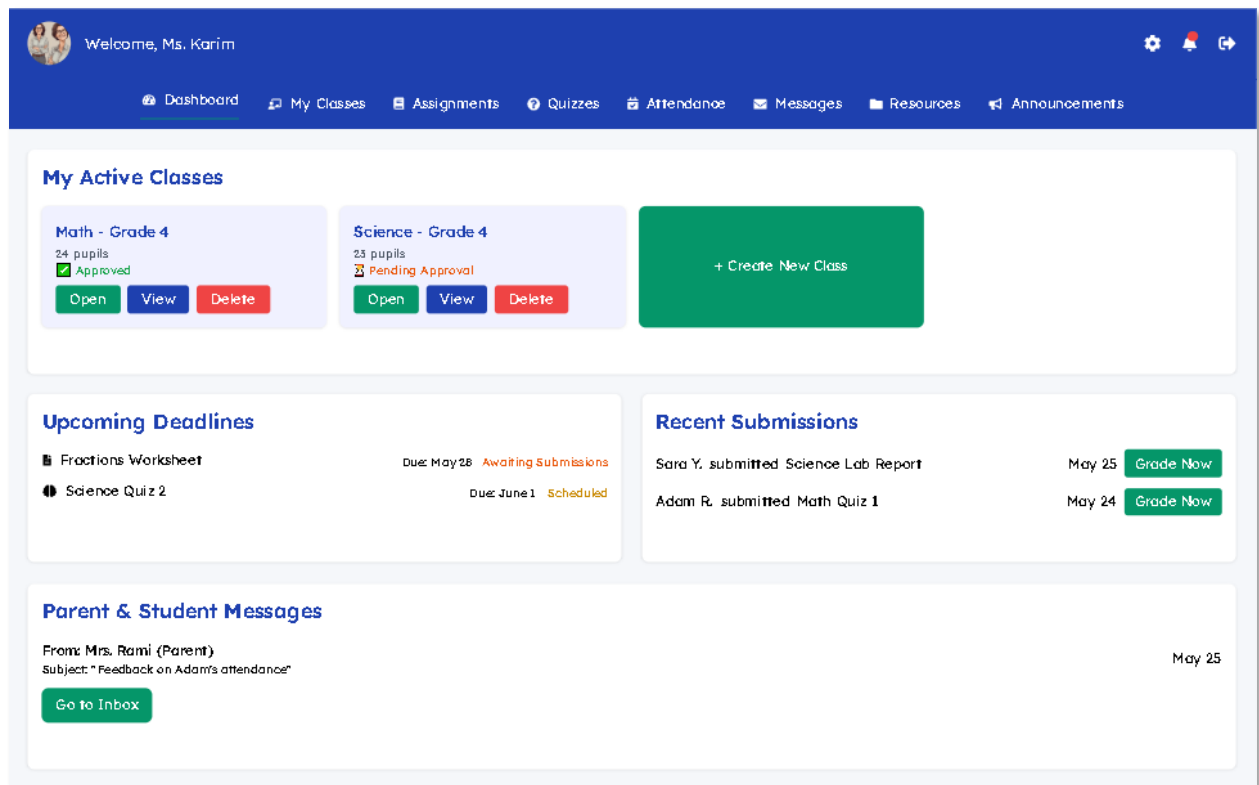
13.5 Parent Dashboard

The parent dashboard is designed to be more formal and information-rich. It includes a navigation bar featuring a child selector dropdown to switch between multiple children, along with tabs for Grades, Attendance, Announcements, Messages, and more. The interface prioritizes clear data presentation such as detailed reports of the pupil's progress, attendance logs, teacher feedback, and school announcements. The design uses a clean, professional color scheme to convey trustworthiness and easy readability.



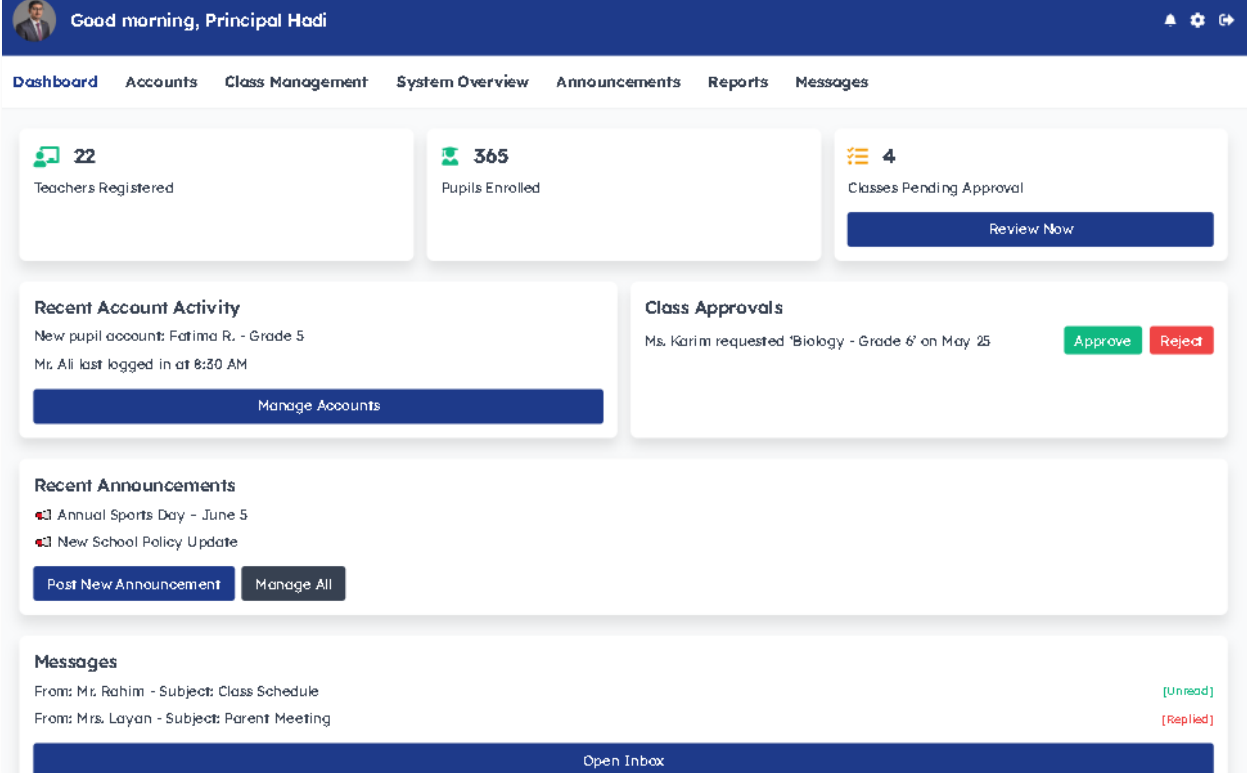
13.6 Teacher Dashboard

The teacher dashboard supports the complex roles teachers play. It includes navigation to manage classes, assignments, quizzes, attendance, and messaging. Teachers can view class lists, upload learning materials, and track pupil submissions. The layout focuses on efficiency and clarity, with actionable buttons and quick access to important functions. The design uses muted but professional colors, emphasizing usability during extended use.




13.7 Principal Dashboard


The principal dashboard provides an overview of the entire school's operation. It includes access to user account management (teachers, pupils, parents), class approval requests, teacher performance monitoring, and announcement posting. The navigation bar contains direct links to these major functions, laid out for rapid management and decision-making. The interface is clean, minimal, and authoritative, reinforcing the principal's role as the system administrator and overseer.





The screenshot displays the Principal Dashboard interface. At the top, a dark blue header bar contains a profile picture of Principal Hadi, the greeting "Good morning, Principal Hadi", and notification, settings, and help icons. Below the header is a navigation bar with links to Dashboard, Accounts, Class Management, System Overview, Announcements, Reports, and Messages. The main content area features three summary cards: "Teachers Registered" (22), "Pupils Enrolled" (365), and "Classes Pending Approval" (4) with a "Review Now" button. Below these are two sections: "Recent Account Activity" showing new pupil and teacher logins with a "Manage Accounts" button, and "Class Approvals" showing a request for 'Biology - Grade 6' with "Approve" and "Reject" buttons. Further down is the "Recent Announcements" section with two items and buttons for "Post New Announcement" and "Manage All". The "Messages" section at the bottom lists two messages with "Unread" and "Replied" status indicators and an "Open Inbox" button.

 Good morning, Principal Hadi

[Dashboard](#) [Accounts](#) [Class Management](#) [System Overview](#) [Announcements](#) [Reports](#) [Messages](#)

 22
Teachers Registered

 365
Pupils Enrolled

 4
Classes Pending Approval
[Review Now](#)

Recent Account Activity

New pupil account: Fatima R. - Grade 5
Mr. Ali last logged in at 8:30 AM

[Manage Accounts](#)

Class Approvals

Ms. Karim requested 'Biology - Grade 6' on May 25

[Approve](#) [Reject](#)

Recent Announcements

- Annual Sports Day - June 5
- New School Policy Update

[Post New Announcement](#) [Manage All](#)

Messages

From: Mr. Rahim - Subject: Class Schedule [Unread]
From: Mrs. Layan - Subject: Parent Meeting [Replied]

[Open Inbox](#)

14. Conclusion

This Elementary School Management System project successfully integrates key functionalities required to support the diverse needs of pupils, parents, teachers, and school administrators. Through comprehensive requirements gathering, detailed design models, and thoughtful user interface planning, the system addresses essential educational workflows such as attendance tracking, grading, communication, and resource management.

The layered design approach, including UML diagrams, design patterns, and component architectures, ensures the system is scalable, maintainable, and secure. The user-centric interfaces reflect the specific roles and needs of each stakeholder, promoting ease of use and accessibility.

Overall, this project demonstrates a practical application of software engineering principles in an educational context, providing a foundation for further enhancement and deployment in a real-world school environment. Future work could focus on extending features such as real-time notifications, mobile app integration, and analytics for deeper insights into pupil performance.