PakkaPresent: A Web-Based Smart Attendance and Parent Alert System for College

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***Abstract*—Attendance is an important indicator of a student's academic participation, yet in many colleges it is still recorded and consolidated manually in Excel sheets, which is slow, repetitive and difficult to monitor. This paper presents PakkaPresent, a web-based Smart Attendance and Parent Alert System that centralizes attendance management with support for multiple institutions. Each college has its own separate workspace and Institution Admin (Principal), while all records are linked to that institution (for example, MITCORER Barshi). Teachers mark students as present or absent for their assigned lectures and submit the record; after submission, the system identifies the absent students and sends an e-mail notification to their parents. Within each institution, the system follows the college hierarchy of Admin (Principal), Head of Department (HOD), Class Coordinator (CC), Teacher and Student, organizes records by department, academic year, class and division, allows new colleges to join through a one-time invitation onboarding flow, and imports teacher and student data from Excel sheets. The top header dynamically displays the active institution name and role portal, and browser session data is kept separate for each institution. Students can view their daily, monthly and overall attendance, students whose attendance falls below the required 75% threshold can be identified for monitoring, and attendance reports can be downloaded by college authorities. Parents have no login account and receive e-mail notifications only. The application is built with React, TypeScript and Tailwind CSS on the frontend, Node.js and Express on the backend, and Supabase (PostgreSQL) for authentication and data storage.**

***Index Terms*—Attendance management, multi-institution platform, Parent notification, Role-based access, Excel import, React, Node.js, Supabase.**

I. INTRODUCTION

Attendance is one of the most important indicators of a student's academic participation. In many colleges, attendance records were maintained manually in Excel sheets. Teachers recorded attendance for each lecture, and the records then had to be updated, monitored and consolidated into reports. This required additional time and effort, especially when a college has several departments, academic years, classes and divisions.

The manual practice has further limitations. Managing the attendance of a large number of students and classes needs extra effort; identifying the absent students and informing their parents by telephone or message is time-consuming; students whose attendance is below the required 75% threshold can be found only by repeatedly checking the sheets; and preparing overall attendance reports involves repetitive work. In addition, an earlier version of the digital prototype was designed for only one college with a single global Admin and no separate institution table, so multiple colleges could not use the platform with separate records and login sessions.

To address these problems, this paper presents PakkaPresent – Smart Attendance and Parent Alert System, a multi-institution web application that digitizes and isolates the attendance process.

The main contributions of the work are as follows:

- A centralized multi-institution web platform where each college has its own separate workspace and Institution Admin (Principal), along with role-specific accounts for HOD, Class Coordinator, Teacher and Student;
- A controlled institution onboarding workflow using an access request and one-time invitation, together with a dynamic top header showing the active institution name and role portal and separate browser session storage;
- Marking and submission of attendance by teachers, followed by automatic e-mail notification of the parents of absent students after submission;

- Organization of records by institution, department, academic year, class and division, Excel-based import of teacher and student data, identification of students below 75% attendance, and downloadable attendance reports.

The paper is organized as follows. Section II gives the background and related work. Section III describes the proposed system, its multi-institution role hierarchy and its academic structure. Section IV presents the architecture, data model, technology stack and project directory structure. Section V explains the workflows for attendance submission, parent notification, institution onboarding, attendance monitoring, data import and reporting. Section VI describes the implementation outputs and testing. Section VII discusses advantages, limitations and future scope, and Section VIII concludes the paper.

II. RELATED WORK AND BACKGROUND

A. Spreadsheet-Based Attendance Practice and Single-College Limitations

In the existing arrangement of the college, each attendance sheet had to be updated by hand after every lecture, and separate sheets had to be consolidated to obtain overall information. The accuracy of the figures therefore depends on careful updating of every sheet, and each teacher's records must be collected and merged before overall attendance can be reviewed. Furthermore, the initial digital prototype had only one global Admin across the entire database, lacked an authoritative institutions table, and displayed a static header name. This paper focuses on replacing the manual Excel practice and upgrading the system into a multi-institution platform.

B. Attendance and Academic Performance

Regular attendance is closely related to academic performance [4]. If low attendance is noticed only at the end of a term, the student, the parents and the college have little time to take corrective action, which motivates early and accurate attendance information and prompt communication with parents.

C. Engineering Approach and Technologies

The development of PakkaPresent follows the software development life cycle described in standard software engineering texts [1], [2], and the system design is expressed with UML-style diagrams [3]. The application is implemented with React [5], TypeScript [6], Tailwind CSS, Node.js, Express and Supabase (PostgreSQL) [7], which are widely used and well-documented technologies for modern web applications.

III. PROPOSED SYSTEM

A. Overview

PakkaPresent provides a centralized multi-institution platform where each college operates in its own isolated workspace (for example, MITCORER Barshi). Teachers mark attendance for their lectures and submit the records. After submission, the system identifies the students marked absent and sends an e-mail notification to their parents. New colleges can join the platform by submitting an access request, receiving approval and a one-time invitation, and creating their Institution Admin account. Attendance is never marked automatically; it is always marked and submitted by the teacher.

B. User Roles and Hierarchy

Within each institution, PakkaPresent follows a five-level hierarchy that matches the administrative structure of the college, along with a planned Super Admin role for overall platform management (Fig. 1 and Table I). Each user has an individual login account verified for their active institution, and database security rules ensure that no user can access another college's records. Parents are not users of the system: they have no login account or dashboard and only receive e-mail notifications.

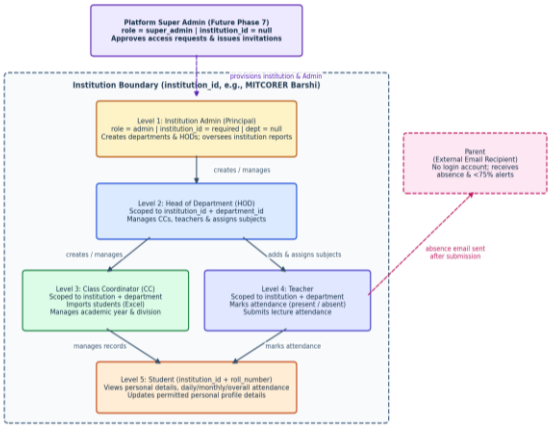

Fig. 1. Multi-institution system hierarchy of PakkaPresent. Each college has its own Institution Admin and five user levels inside the institution boundary, while the Parent is an external e-mail recipient.

TABLE I. User roles and responsibilities in PakkaPresent

Role	Main responsibilities
Institution Admin (Principal)	Highest administrative authority within one institution (has institution_id, no department_id); creates departments, manages HODs, oversees the college's attendance information and accesses overall attendance reports.
HOD	Manages the academic and staff-related information of the assigned department within the institution; creates or manages Class Coordinators; adds teachers and assigns subjects to them.
Class Coordinator (CC)	Manages the assigned classes and student information within the department; imports student records through Excel; organizes students by academic year and division.
Teacher	Logs in to an individual account; marks attendance for the assigned subject and lecture; submits attendance, which triggers the absent-student e-mail workflow.
Student	Logs in to an individual account; views personal details and daily, monthly and overall attendance; updates permitted personal information.
Parent	No login account; receives e-mail notifications about the child's absence and, according to the configured notification functionality, about attendance below 75%.
Platform Super Admin (Future)	Separate platform-level role (super_admin) planned to review institution access requests, manage invitations and oversee registered institutions.

C. Academic Structure and Dynamic Header

Each college department has four academic years: First Year, Second Year, Third Year and Fourth Year. From the Third Year onward, students are divided into two divisions, Division 1 (or A) and Division 2 (or B). PakkaPresent organizes student and attendance records according to the institution, department, academic year, class and division wherever applicable (Fig. 2). When a user logs in, the top-left header dynamically displays the product name and active institution name on the first line (for example, PakkaPresent • MITCORER Barshi) and the role portal with the department or student roll number on the second line.

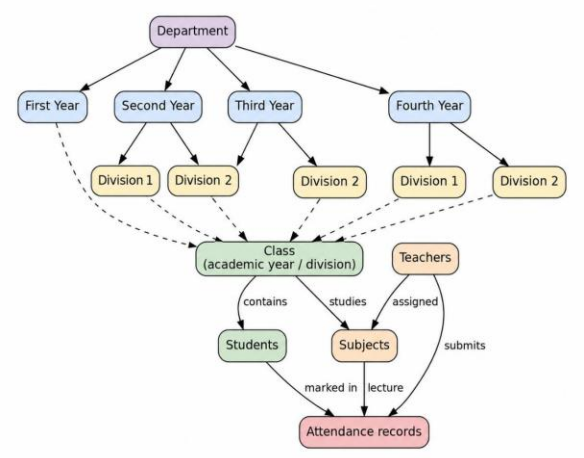

Fig. 2. Academic structure: department, academic years, divisions, subjects, teachers, students and attendance records.

D. Functional Modules

- Role-based login and authorization verified for the user's active institution, for Admin, HOD, Class Coordinator, Teacher and Student.
- Multi-institution separation and onboarding through public access requests, approval, and one-time invitation onboarding.
- Dynamic header and session isolation showing the active institution display name, role portal and department or roll number, with separate browser cache per institution.
- Department and staff management: creation of departments, HODs, Class Coordinators and teachers, and assignment of subjects.
- Class and student management by academic year and division, including SheetJS Excel import of teacher and student records.

- Attendance and parent notification: marking of students as present or absent, submission of attendance by teachers, and automatic parent e-mail alerts.
- Student dashboard and reports with daily, monthly and overall attendance, 75% threshold monitoring, and downloadable PDF reports.

IV. SYSTEM DESIGN AND ARCHITECTURE

A. Architecture

PakkaPresent is a web application with a client–server–database architecture (Fig. 3). Users of the five roles access the React, TypeScript and Tailwind CSS frontend deployed on Cloudflare Pages over HTTPS. The frontend verifies the user's active institution, keeps local session cache separated by institution, and displays the dynamic header identity.

It communicates with Supabase (PostgreSQL and Authentication with Row-Level Security) and the Node.js and Express backend deployed on Render for account management, institution onboarding and triggering parent e-mail notifications.

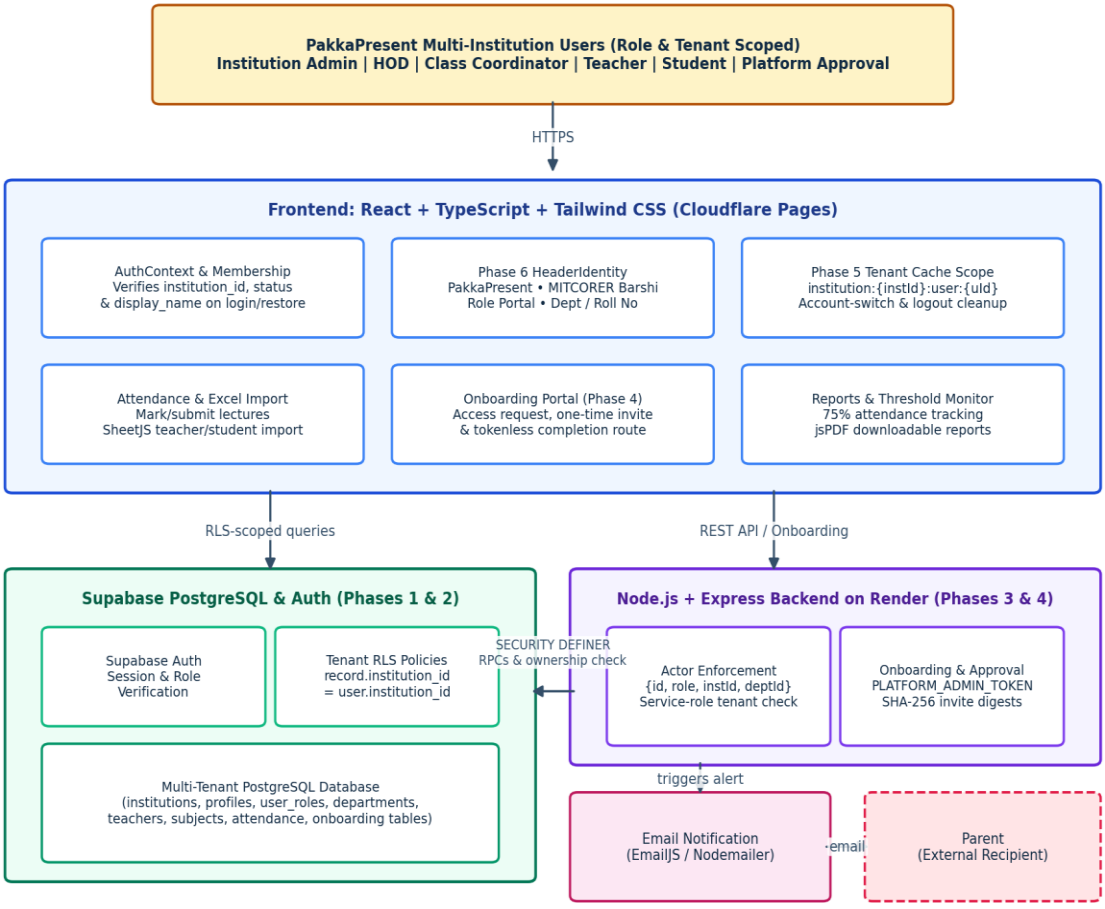

Fig. 3. Multi-institution system architecture of PakkaPresent across Cloudflare Pages (React/TypeScript), Render (Node.js/Express) and Supabase (PostgreSQL/Auth/RLS).

B. Data Model and Project Structure

The multi-institution data model contains a central institutions table (storing official name, display name, institution code, DTE code and status) and onboarding tables (onboarding_requests and invitations), together with tables for departments, user_roles, profiles, teachers, subjects, notices, attendance and sms_logs. Every college-owned record is linked to its institution_id, and Row-Level Security (RLS) policies ensure that each institution can read and write only its own records. The repository is organized into backend/ and server.ts (Node.js/Express routes and

onboarding/authorization checks), frontend/src/ (components, AuthContext, sessionScope utilities and role pages), and tests/ (automated security and session regression scripts).

C. Technology Stack

Table II summarizes the core technologies used for the development and deployment of PakkaPresent.

TABLE II. Technologies used in PakkaPresent

Technology	Role in the system
React.js & TypeScript	Builds role dashboards, AuthContext checks and dynamic header.
Tailwind CSS & Vite	Styles responsive layouts and builds the frontend bundle.
Supabase & PostgreSQL	Manages login, relational tables and Row-Level Security (RLS).
Node.js & Express.js	Runs backend APIs, onboarding and target institution checks.
EmailJS & Nodemailer	Sends parent absence and low-attendance (<75%) e-mails.
SheetJS & jsPDF	Imports Excel records and generates downloadable PDF reports.

V. WORKFLOW AND METHODOLOGY

A. Attendance Submission, Onboarding and Parent Notification

When a new college joins PakkaPresent, it submits an access request and completes a one-time invitation onboarding step that creates the institution record and its Institution Admin account.

For daily lecture attendance, the process is carried out in the following steps:

1. The teacher logs in to the individual account, and the system verifies the active institution and displays it in the top header.
2. The teacher selects the relevant class, subject and lecture according to the assigned responsibilities.
3. The teacher marks students as present or absent.
4. The teacher submits the attendance record, which is saved in Supabase under the teacher's institution_id.
5. After submission, the system identifies the students marked absent.
6. For each absent student, the system retrieves the registered e-mail address of the parent.
7. The system sends an e-mail notification to the parent, for example: "Your child was absent for this lecture."
8. The attendance record is maintained in the system; students can log in to check their attendance and the college can access overall information and reports.

The notification is triggered only after attendance submission, and not when the teacher merely starts marking attendance (Figs. 4 and 5). If no student is absent, no absence e-mail is sent. When a user logs out or switches accounts, the browser session cache for the previous account is cleared automatically.

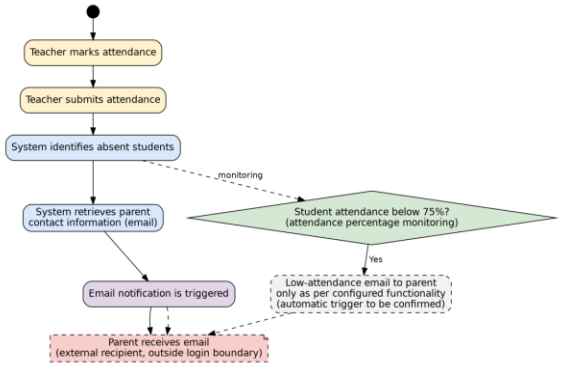

Fig. 4. Parent e-mail notification flow. The low-attendance branch is shown dashed because its automatic trigger depends on the configured functionality.

B. Attendance Percentage Monitoring

For a student, let T be the total number of lectures conducted and A the number of lectures in which the student was marked present. The attendance percentage is:

Attendance % = (A / T) × 100

A student whose attendance percentage is below the required threshold of 75% (Attendance % < 75) is identified for monitoring. Attendance-related notifications can bring low attendance to the attention of students and parents according to the configured functionality. PakkaPresent does not impose penalties or decide academic eligibility automatically; it only provides the information.

C. Excel Data Import and Reports

PakkaPresent includes a data import feature that allows authorized users to upload Excel sheets. Teacher information can be imported by an authorized user and student information by the Class Coordinator (Fig. 6). Each import follows the steps of selecting the file, validating it, processing the records, saving the valid data under the active institution and department, and displaying the result.

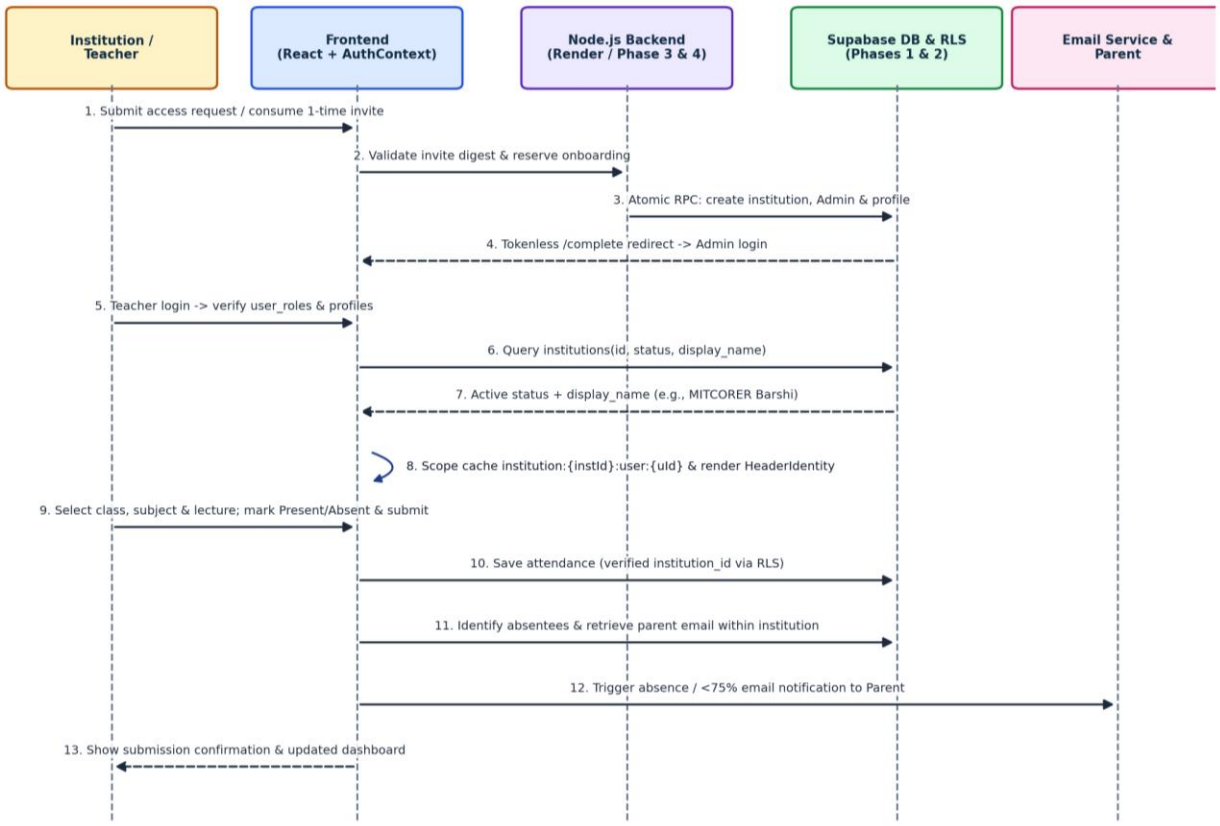

Fig. 5. Sequence of interactions for institution onboarding, login session check, and lecture attendance submission.

College authorities can also generate and download attendance reports in PDF or spreadsheet format without manually compiling multiple Excel sheets

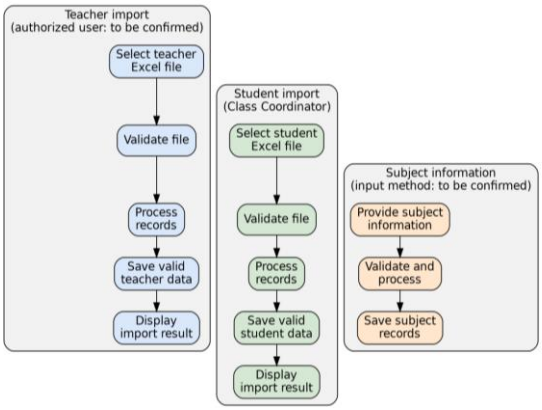

Fig. 6. Excel data import workflow for teachers, students and subject information.

VI. IMPLEMENTATION AND TESTING

A. Implementation Outputs

After login or institution onboarding, each user reaches the interface of the assigned role, with the top header showing the active institution name, role portal and department or roll number. The Institution Admin creates departments and HODs; the HOD manages Class Coordinators, teachers and subjects; and the Class Coordinator imports students via Excel. The teacher selects the class, subject and lecture, marks the students and submits the attendance, triggering parent e-mail alerts for absentees. The student dashboard shows personal details and daily, monthly and overall attendance, while authorities can download reports.

B. Testing

Unit, integration and acceptance testing were carried out to verify functional and multi-institution requirements. Table III lists representative test cases.

TABLE III. Representative test cases

Test case	Level	Expected / verified output
Valid / invalid login & institution check	Unit	Redirect to role dashboard for active institution / block inactive or invalid login (Pass)
One Admin per institution & onboarding	Integration	New institution and Institution Admin created via one-time invitation (Pass)

Multi-institution data isolation (RLS)	Integration	Users of one institution cannot view or edit another institution's data (Pass)
Dynamic header & logout cache cleanup	Unit	Header displays institution name & role portal; session cache cleared on logout (Pass)
Excel import of students and teachers	Unit	Valid records saved under the active institution; import result displayed (Pass)
Percentage calculation & <75% check	Unit	A = 12, T = 16 gives 75%; A = 10, T = 16 (62.5%) identified below 75% (Pass)
Attendance submission & parent e-mail	Integration	Attendance record stored and absence e-mail sent to parent after submission (Pass)
Submission with all students present	Acceptance	Attendance stored and no absence e-mail sent (Pass)
Student dashboard and PDF reports	Acceptance	Daily, monthly and overall attendance visible; report downloaded (Pass)

VII. ADVANTAGES, LIMITATIONS AND FUTURE SCOPE

A. Advantages

- Reduces manual attendance management and repetitive administrative work, and saves the time of teachers and staff.
- Supports multiple institutions with separate data, one Institution Admin per college, one-time invitation onboarding and isolated browser sessions.
- Maintains centralized attendance records, displays the active institution and role portal in the header, and makes reports easy to download.
- Improves communication with parents through automatic e-mail alerts and helps monitor the 75% attendance requirement.
- Simplifies teacher and student data entry through Excel import and supports department-wise and class-wise organization.

B. Limitations

- Attendance is marked manually by teachers in the web portal; it is not marked automatically by biometric hardware.
- Parents are notified only by e-mail and have no login or dashboard, and notification depends on a valid parent e-mail address.
- The system does not automatically impose penalties or make decisions on academic eligibility.

C. Future Scope

The following improvements are proposed for future work: a dedicated Platform Super Admin dashboard (Phase 7) to review institution access requests, manage invitations and monitor all colleges; parent notifications through additional channels such as SMS or WhatsApp along with a delivery retry log; a mobile application for teachers and students; and analytics dashboards for departments and classes.

VIII. CONCLUSION

PakkaPresent digitizes and simplifies attendance management in colleges. It replaces manual Excel-based attendance maintenance with a centralized, multi-institution web application in which each college has its own separate workspace and Institution Admin, teachers mark and submit attendance, the system identifies absent students and sends e-mail notifications to their parents after submission, students check their own attendance, and college authorities access overall information and downloadable reports. The hierarchy of Institution Admin, HOD, Class Coordinator, Teacher and Student, the organization by department, academic year, class and division, the institution onboarding flow, the dynamic header and the Excel import feature make the system well suited for college use, while attendance percentage monitoring helps identify students below the 75% requirement.

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