

A Consent-Based Smart College Application for Academic Notification, Discipline Management, and Parent Engagement in Higher Education

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Abstract:

College students in higher education face a persistent communication gap between academic administration, parents, and students. Existing channels such as notice boards, LMS portals, and WhatsApp groups fail to deliver timely, structured, and consent-aware information to parents. This paper proposes a Consent-Based Smart College Application that bridges this gap through a unified mobile platform for students, parents, and faculty. The system introduces OTP-verified parent-student linkage at admission, enabling secure multi-channel delivery of academic notifications via SMS, email, WhatsApp, and in-app push notifications based on user preferences, with student consent governing non-critical updates and automatic override for high-priority notices. Key modules include biometric attendance recording, real-time fine tracking, a discipline booking pipeline with automated parental grievance alerts, and a multilingual dashboard supporting regional languages. A personalized academic feed, streak-based gamification, and an anonymous teacher feedback system further enhance student engagement and institutional accountability. Designed specifically for Indian college deployment, the system addresses multi-child parent governance, HOD-level approvals, and AICTE compliance, delivering a single integrated platform for academic transparency, parent engagement, and student welfare.

Keywords — Consent-Based Notification, Parent-Student Communication, Smart College Application, Multilingual Dashboard, Biometric Attendance, Discipline Management, OTP Verification, Teacher Feedback, Gamification in Education, Higher Education, WhatsApp Integration

I. INTRODUCTION

College institutions in higher education generate a continuous and diverse stream of academic information throughout the academic year — examination timetables, internal assessment schedules, attendance shortfall warnings, fee payment deadlines, scholarship windows, placement drives, assignment submissions, and event circulars. Despite the volume and importance of this information, it predominantly reaches only one audience: the student. Parents, who are not

physically present on campus and are not members of institutional communication channels, remain largely unaware of their child's academic status until a deadline has already passed, a shortfall has become critical, or the institution itself initiates contact under emergency circumstances.

This communication gap is not a result of institutional negligence. Most colleges maintain parent contact records collected at the time of admission and many attempt to reach parents through bulk SMS alerts for specific high-priority

events such as attendance shortfalls or fee dues. However, these efforts are narrow, one-directional, and inconsistent. They do not provide parents with a structured, ongoing window into their child's academic life, and they offer no mechanism for students to participate in deciding what information is shared and through which channel.

At the same time, college-going students are legal adults who reasonably expect a degree of communication autonomy. A system that blindly forwards every academic circular to parents without student awareness risks creating friction in family relationships and discouraging students from engaging honestly with institutional processes. The more practical and durable approach is one that treats the student as an active participant — allowing them to manage consent for non-critical communications while ensuring that genuinely high-stakes notices such as examination eligibility warnings or attendance shortfalls are always communicated to parents regardless of student preference.

Beyond the parent communication gap, higher education institutions face several additional challenges in student management that existing systems fail to address in an integrated manner. Attendance recording remains largely manual or dependent on standalone biometric hardware disconnected from any parent notification pipeline. Student fine records — library fines, lab dues, bus fees, discipline penalties — are typically maintained in isolated administrative registers, leaving students unaware of accumulated dues until examination registration or result publication is affected. Students who repeatedly demonstrate disruptive or struggling behaviour are managed informally without a documented intervention pipeline that automatically escalates to parental involvement or institutional counseling. Faculty performance feedback, where collected at all, is

gathered through end-of-semester paper forms that are slow, non-anonymous in practice, and rarely acted upon systematically.

This paper proposes a **Consent-Based Smart College Application** that addresses all of the above challenges within a single unified mobile platform. The proposed system introduces OTP-verified parent-student linkage established at admission, multi-channel academic notification delivery through SMS, email, WhatsApp, and in-app push notifications, a biometric and manual attendance module, a real-time fine tracking portal, an automated discipline booking and escalation pipeline, a multilingual parent and student dashboard, a personalized academic feed, streak-based gamification for engagement, and an anonymous faculty feedback system.

The remainder of this paper is organized as follows. Section II reviews existing communication channels and their limitations. Section III presents the proposed system architecture. Section IV describes the methodology and workflows for each module. Section V discusses advantages and practical applications. Section VI addresses challenges and limitations, and Section VII concludes with directions for future work.

II. EXISTING COMMUNICATION CHANNELS AND THEIR LIMITATIONS

The physical notice board remains, in many colleges, the primary channel for circulars and deadlines. It is simple and requires no technology investment, but it depends entirely on the student noticing and acting on the information, and it has no mechanism whatsoever to reach a parent who is not physically on campus. The notice board also provides no record of whether a student has actually read a circular, making it impossible for institutions to confirm that a critical deadline was communicated.

Learning Management Systems such as Moodle, Google Classroom, or institution-built portals centralize academic communication reasonably well for students, including assignment deadlines and announcements. However, these platforms are almost universally designed around a single student login, with no parent-facing view, and integrating a parent-access layer is usually outside the scope of what these systems were originally built for. Furthermore, LMS platforms typically do not address attendance recording, fine management, or discipline tracking in any integrated way.

Many departments and class representatives have informally adopted WhatsApp groups as a fast, low-friction communication channel. These groups are effective for reaching students quickly but are not designed for parent inclusion. Adding parents directly to a student WhatsApp group is both impractical at scale and uncomfortable for students who would then have their parents observing all class-level communication, not just official notices. More critically, WhatsApp groups offer no structured data layer — assignment deadlines, exam schedules, and event circulars are mixed with informal conversation and are easily missed or forgotten.

Some institutions rely on bulk SMS services to send selected updates directly to parent phone numbers collected at admission. This does reach parents, but typically only for a narrow set of high-priority events such as attendance shortfall or fee due dates, configured entirely by the institution with no input from the student, and with no mechanism for the parent to see a broader picture of academic activity. Students, meanwhile, have no visibility into what the institution is sending to their parents, which can create confusion and distrust rather than informed, collaborative support.

Existing Enterprise Resource Planning systems deployed in some colleges handle administrative functions such as fee collection and timetable management but are rarely accessible to parents in any meaningful way, and are generally not designed with mobile-first parent engagement in mind. None of the widely-used channels combine attendance tracking, fine management, discipline escalation, and multilingual parent communication within a single consent-respecting platform — which is the specific gap this paper addresses.

III. PROPOSED SYSTEM ARCHITECTURE

Fig. 1 shows the architecture of the proposed system. Updates originate from the college administration and individual faculty or departments, pass through an aggregation and approval layer where the student's preferences are applied, and are then delivered to linked, verified parent accounts through multiple channels, with every decision recorded in an audit log.

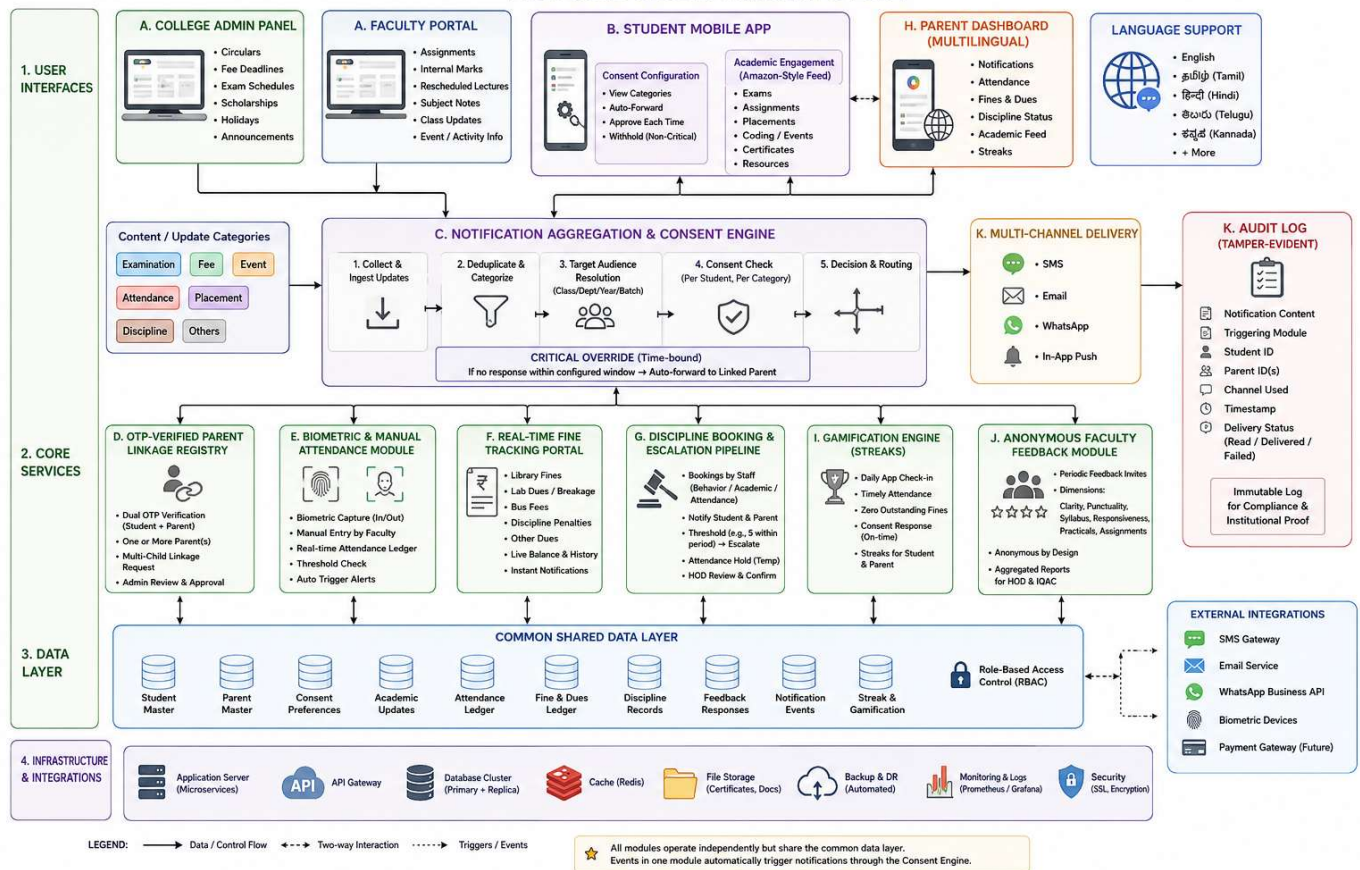
III. PROPOSED SYSTEM ARCHITECTURE

The proposed system is designed as a unified mobile-first platform comprising three primary user interfaces — a Student App, a Parent Dashboard, and a Faculty and Admin Portal — supported by a backend comprising modular services that handle consent management, notification routing, attendance processing, fine tracking, discipline escalation, and feedback analytics. The architecture is designed so that each module operates independently but shares a common data layer, meaning that an attendance shortfall recorded by the Attendance Module automatically triggers the Notification Module to route an alert to the linked parent account without requiring manual intervention from any administrative staff.

TABLE I
COMPARISON OF PROPOSED SYSTEM WITH EXISTING COMMUNICATION CHANNELS

Feature	Notice Board	LMS Portal	WhatsApp Group	Bulk SMS	Proposed System
Reaches parents directly	No	No	Indirect	Partial	Yes
Student consent before forwarding	N/A	No	No	No	Yes
Multi-channel delivery	No	No	No	SMS only	Yes
Attendance tracking	No	Limited	No	No	Yes
Fine record management	No	No	No	No	Yes
Discipline escalation pipeline	No	No	No	No	Yes
Multilingual dashboard	No	No	No	No	Yes
Delivery audit trail	No	Limited	No	No	Yes

PROPOSED SYSTEM ARCHITECTURE



A. College Admin Panel and Faculty / Department Portal

These are the entry points through which official academic information enters the system. The admin panel handles institution-wide circulars such as holiday notices, fee deadlines, examination schedules, and scholarship announcements, while the faculty portal handles class-specific updates such as assignment due dates, rescheduled lectures, internal marks, and subject-specific notes. Each update is tagged with a category at the point of creation — for example, examination, fee, event, attendance, placement, or discipline — and this category tag determines how the Consent Engine processes and routes the notification.

B. Student Mobile App

The Student App is the primary interface for the student user. It serves two distinct functions: consent configuration and academic engagement. In the consent configuration role, students review the categories of information the college issues and decide, per category, whether updates should be auto-forwarded to their linked parent, require their explicit approval each time, or be withheld from parents entirely — except where a category is marked critical by the institution. In the academic engagement role, the app presents a personalized Amazon-style academic feed showing upcoming examinations, assignment deadlines, placement events, coding activities, department notes, past event certificates, and course resources, organized by relevance and urgency.

C. Notification Aggregation and Consent Engine

This is the core decision-making backend component. It collects updates from the admin panel and faculty portal, deduplicates and categorizes them, identifies which students each update is relevant to based on class, department, year, or batch, and then checks each relevant student's stored consent preferences before routing the update. For critical categories — attendance shortfall, examination eligibility risk, fee deadline — the engine applies a time-bound override: if the

student does not respond to an approval request within the configured response window, the update is forwarded to the linked parent regardless.

D. OTP-Verified Parent Linkage Registry

This module maintains the verified relationship between a student account and one or more parent accounts. The linkage process is initiated at the time of college admission or during the freshers orientation, when both the student's and parent's mobile numbers are confirmed via a mutual OTP verification — the student receives an OTP on their registered number and the parent receives a separate OTP on theirs, and the linkage is confirmed only when both OTPs are successfully validated. This ensures that notifications are only ever delivered to a parent who has been properly verified, not to an arbitrary number added without consent. For students whose parents have more than one child enrolled in the institution, a multi-child linkage request is routed through a dedicated administrative review workflow, where a designated team reviews and approves the extended linkage before it becomes active.

E. Biometric and Manual Attendance Module

The attendance module supports two recording modes: biometric capture, where the student's presence is registered through a fingerprint or facial recognition scan at the point of entry to a class or campus location, and manual entry, where a faculty member marks attendance through the faculty portal interface. Both modes feed into a central attendance ledger that is updated in real time. When a student's attendance in any subject falls below the institution-defined threshold, the Notification Engine is automatically triggered to alert both the student and the linked parent through their preferred channels, without requiring any manual intervention from the academic office.

F. Real-Time Fine Tracking Portal

The fine tracking module maintains a live record of all fines and dues associated with a student account — library late-return fines, laboratory breakage dues, bus fees, discipline penalties, and any other

category the institution defines. Students can view their complete fine history and outstanding balance at any time through the Student App. When a new fine is added to a student's record, an in-app notification is generated immediately so the student is aware of the charge without waiting until examination registration or result publication. Parents receive a parallel notification through their preferred channel, ensuring that accumulated dues do not become a surprise close to critical academic events.

G. Discipline Booking and Escalation Pipeline

This module provides faculty and administrative staff with a structured mechanism to formally document concerns about a student's behaviour, academic engagement, or attendance pattern. When a staff member raises a discipline booking against a student through the faculty portal, it is recorded against the student's profile with a timestamp, the staff member's identity, and a category tag such as behavioural, academic, or attendance. The student and their linked parent receive an immediate notification of the booking. When the number of active discipline bookings against a student reaches the institution-configured threshold — by default, five bookings within a defined period — the system automatically places the student's attendance record on administrative hold and routes a formal grievance notification to the linked parent, requesting a counseling appointment. The HOD of the student's department receives a parallel alert and must confirm or override the escalation before the attendance hold becomes permanent, ensuring that the automated pipeline does not act without institutional oversight.

H. Multilingual Student and Parent Dashboard

The parent-facing dashboard is designed to be accessible to parents regardless of their language background. The interface supports language selection at the time of account setup, and all system-generated content — notification labels, dashboard summaries, status indicators, and alert messages — is rendered in the selected language. This is particularly important for parent

populations in regional contexts where literacy and familiarity with English may vary significantly. The student dashboard similarly supports language preference settings, ensuring that the platform is usable by students who are more comfortable reading academic information in their first language.

I. Personalized Academic Feed and Streak-Based Gamification Engine

The academic feed presents each student with a curated, chronologically ordered view of upcoming and past academic events relevant to their department, year, and enrolled subjects — examination schedules, assignment deadlines, placement drive announcements, coding contest registrations, club activity dates, certificate downloads, and department-specific course notes and resources. The feed is organized by proximity and relevance, ensuring that the most time-sensitive items appear first. The gamification engine tracks consistent engagement behaviours — daily app check-ins, timely attendance, zero outstanding fines, and prompt response to consent approval requests — and awards streak counters to both students and parents. Streaks are visible on both the student and parent dashboards, providing a lightweight motivational layer that encourages regular interaction with the platform rather than passive receipt of alerts.

J. Anonymous Faculty Feedback Module

At configurable intervals during the academic term, students are invited to submit structured feedback on each of their subject faculty through the Student App. Feedback is collected across standardized dimensions including teaching clarity, punctuality, syllabus coverage quality, responsiveness to student queries, quality of practical and activity sessions, and assignment design. Submissions are anonymized at the point of entry, with no student identifier attached to any individual response, and the aggregated feedback is made available to the HOD and institutional quality committee through the admin panel. The module is designed to replace paper-based end-of-semester feedback forms with a continuous, anonymous, and analytically richer dataset that supports more timely and evidence-based faculty development decisions.

K. Multi-Channel Delivery and Audit Log

All notifications generated by the system — regardless of which module triggers them — are delivered through the parent's or student's preferred communication channel, which is selected at the time of account setup and can be updated at any time. Supported channels include SMS, email, WhatsApp, and in-app push notification. Every notification event is recorded in a tamper-evident audit log that captures the notification content, the triggering module, the student and parent identifiers, the delivery channel used, the timestamp of dispatch, and the delivery confirmation status where the channel supports read receipts. This audit log serves as institutional documentation that critical notices were genuinely dispatched and received, which is particularly valuable in the context of attendance shortfall warnings or examination eligibility alerts where institutions may later be required to demonstrate that due notice was given.

IV. METHODOLOGY

A. Consent and Notification-Forwarding Workflow

The central design challenge is balancing two goals that can pull in opposite directions: respecting the student's right to decide what is shared with their parents, and ensuring that a small number of genuinely important notices are not silently lost because a student did not respond to an approval request. The proposed workflow addresses this with a category-based consent default combined with a time-bound override for critical notice categories only.

When a notification enters the system, the Consent Engine retrieves the sending student's preference for the notification's category. If the preference is set to auto-forward, the notification is immediately passed to the Multi-Channel Delivery module for dispatch to the linked parent. If the preference is set to approval-required, the engine sends a consent request to the student's app and waits for a response within the configured window — typically 24 hours for non-critical categories. If the student approves, the notification is forwarded; if they decline or do not respond within the window, the notification is withheld for non-critical categories, but for categories marked critical by the institution, a non-response causes the notification to be forwarded regardless, after the student is informed that the override has been applied.

B. OTP Linkage and Multi-Child Governance Workflow

Parent-student account linkage follows a three-step mutual verification protocol. In step one, the institution initiates the linkage process during the admission or freshers orientation session by generating a unique session token tied to the student's enrollment record. In step two, both the student and the parent receive separate OTPs on their registered mobile numbers and must each enter their OTP in the respective app within the session window. In step three, the system validates both OTPs, records the confirmed linkage in the Parent Linkage Registry, and activates the parent dashboard for the linked account.

For a parent who has more than one child enrolled in the institution, a secondary linkage request is submitted through the app and flagged for review by the institutional administrator team. The administrator team verifies the enrollment records of both children, confirms the parent's identity against admission documentation, and either approves or declines the extended linkage. This review step prevents unauthorized multi-child linkages while providing a clear, documented pathway for legitimate cases.

C. Biometric Attendance and Shortfall Notification Workflow

When a student's biometric data is captured at a class entry point, the Attendance Module records the timestamp, class identifier, and student identifier and marks the student as present for that session. If the student is absent — either because no biometric capture was received within the class window, or because a faculty member manually marks an absence — the session is recorded as absent in the attendance ledger. At the end of each academic day, the system recalculates each student's cumulative attendance percentage per subject. For any subject where the updated percentage falls below the institution-configured warning threshold, the Notification Engine immediately generates alerts for the student and the linked parent, specifying the subject, the current attendance percentage, and the minimum attendance required.

D. Fine Tracking and Real-Time Alert Workflow

When an administrative staff member raises a new fine against a student — whether for a library overdue return, a laboratory equipment issue, a bus payment, or a discipline penalty — the Fine Tracking Module records the fine category, amount, date, and the staff member

who raised it, and immediately associates it with the student's profile. The system generates an in-app notification to the student and a parallel notification to the linked parent through their preferred channel. Students can view their complete fine history, categorized by type and date, and the dashboard displays the current total outstanding balance prominently. The module is designed to support future integration with UPI-based payment gateways, which would allow students or parents to settle outstanding fines directly through the app.

E. Discipline Booking and Escalation Workflow

A faculty or administrative staff member initiates a discipline booking by selecting the student from a class roster in the faculty portal and submitting a booking with a category tag and a brief description. The booking is immediately recorded and the student and linked parent receive a notification. The system tracks the cumulative booking count for each student within a rolling time window. When the count reaches the threshold of five bookings, the system flags the case for HOD review. The HOD receives a summary notification listing all five bookings with dates, categories, and the submitting staff members' names. The HOD then either confirms the escalation — which activates the attendance hold and triggers the parental grievance notification and counseling appointment

request — or overrides it with a documented reason. If the HOD does not respond within 48 hours of receiving the escalation request, the system sends a reminder and copies the principal's office to ensure the case is not lost.

F. Teacher Feedback Collection and Analytics Workflow

At the midpoint and end of each academic term, the system activates the feedback collection window for each enrolled subject. Students receive an in-app prompt inviting them to rate their subject faculty across the defined feedback dimensions. Ratings are submitted on a five-point scale for each dimension, with an optional free-text comment field. All submissions are anonymized before being stored, with no link maintained between the response record and the submitting student's identifier. Aggregate results are computed per faculty member per subject at the close of the feedback window and made available as a summary report to the HOD and institutional quality committee. Individual free-text comments are reviewed for relevance and filtered for inappropriate content before inclusion in the report. The longitudinal data — feedback scores across multiple terms for the same faculty member — are retained in the analytics layer to enable trend analysis and to inform faculty development planning.

TABLE II

SUMMARY OF PROPOSED SYSTEM MODULES AND THEIR PRIMARY BENEFICIARIES

Module	Primary Function	Primary Beneficiary
Consent Engine	Routes notifications based on student preferences and critical overrides	Student, Parent
OTP Linkage Registry	Establishes and maintains verified parent-student account linkage	Parent, Institution
Biometric Attendance Module	Records attendance and triggers shortfall alerts	Student, Parent, Faculty
Fine Tracking Portal	Maintains real-time fine records and notifies on new dues	Student, Parent, Admin
Discipline Booking Pipeline	Documents concerns and automates escalation with HOD oversight	Faculty, HOD, Parent
Multilingual Dashboard	Renders all content in the user's preferred language	Parent, Student
Academic Feed and Gamification	Personalized event feed with streak-based engagement incentives	Student, Parent
Faculty Feedback Module	Collects and aggregates anonymous teaching quality ratings	Faculty, HOD, Institution
Multi-Channel Delivery and Audit Log	Delivers notifications and records every dispatch event for accountability	All stakeholders

V. ADVANTAGES AND PRACTICAL APPLICATIONS

The most direct benefit of the proposed system is closing the awareness gap that currently leaves parents finding out about examination schedules, attendance shortfalls, and fee deadlines too late to offer meaningful support. Because notification forwarding is consent-based rather than blanket, students are more likely to engage with the system honestly rather than viewing it as a surveillance mechanism, which in turn makes the information that does reach parents more trustworthy and the parent-student relationship around academic matters less adversarial.

The fine tracking module addresses a common and frustrating problem in higher education institutions where students discover accumulated dues only at the point of examination registration or result withholding. By providing a real-time, visible record of all outstanding fines, the system allows students and parents to address dues incrementally and eliminates the experience of unexpected financial barriers appearing at critical academic moments.

The discipline booking and escalation pipeline introduces a level of consistency and documentation to a process that is currently handled informally in most institutions. By requiring staff to formally record each concern, providing the student and parent with immediate visibility of each booking, and routing the escalation through HOD review rather than acting automatically, the system creates an intervention process that is documented, proportionate, and fair. The involvement of parents at the counseling stage introduces a support mechanism that treats disengaged or struggling students as individuals requiring structured help rather than simply administrative action. The streak-based gamification layer addresses the known challenge of app adoption drop-off after initial onboarding. By rewarding consistent engagement behaviours — daily check-ins, timely consent responses, zero outstanding fines, full attendance — with visible streak counters shared between the student and parent dashboards, the system creates a lightweight shared motivation structure that benefits both parties without introducing competitive or punitive elements.

The multilingual dashboard is particularly significant for institutions serving diverse student and parent populations. By rendering all system content in the parent's selected language, the platform becomes accessible to parents whose English literacy may be limited, substantially expanding the effective reach of academic communication beyond what any English-

only system could achieve. The anonymous faculty feedback module provides institutions with a continuous, structured data stream on teaching quality that is far richer than annual paper-based feedback forms, enabling more timely and evidence-based decisions about faculty development and course design.

VI. CHALLENGES AND LIMITATIONS

Defining which notification categories count as critical enough to override student consent is inherently a policy decision rather than a purely technical one, and institutions will need clear, consistently applied rules to avoid the system being perceived as arbitrary or primarily a surveillance tool. The specific set of critical categories appropriate for one institution may differ from another depending on institutional culture, the student population served, and the regulatory requirements the institution operates under.

The biometric attendance module requires integration with hardware infrastructure — fingerprint readers or camera systems capable of facial recognition — that may not be uniformly available across all classrooms or campus locations. In institutions where hardware deployment is partial, the system must gracefully support a hybrid mode in which biometric recording is available in some locations and manual faculty entry is used in others, without creating inconsistencies in the attendance record.

The discipline booking pipeline, while designed with HOD oversight to prevent misuse, still introduces a risk that informal interpersonal dynamics between faculty and specific students could result in disproportionate booking rates. Institutions deploying the system should establish clear booking guidelines, provide staff with training on the appropriate use of the booking mechanism, and make booking records visible to the student and their linked parent immediately upon submission to ensure transparency.

Adoption depends on all stakeholder groups actively using the platform. A student who does not configure consent settings, a parent who does not install the dashboard app, or a faculty member who does not use the portal to enter updates all reduce the system's effectiveness significantly. Successful deployment requires structured onboarding at the time of admission, sustained institutional commitment to using the platform as the primary channel for academic communication, and regular outreach to parents who may be less familiar with mobile applications.

The multilingual content layer depends on the quality and completeness of the language resources used to

render system-generated content. For languages with complex script systems or significant regional variation, automated rendering may produce output that is technically correct but not natural in the context of the target audience. Institutions should review and validate multilingual content with native-speaker staff before deployment, and provide a mechanism for users to report rendering issues.

VII. CONCLUSION AND FUTURE WORK

This paper presented the design of a Consent-Based Smart College Application intended to address a persistent and multi-dimensional gap in higher education institutions: academic information that reaches students reliably but fails to reach parents in a timely, structured, and consent-aware manner. By integrating parent notification, biometric attendance tracking, real-time fine management, structured discipline escalation, multilingual dashboards, personalized academic feeds, streak-based gamification, and anonymous faculty feedback within a single unified platform, the proposed system moves beyond the narrow one-way alert model of existing approaches and toward a genuinely interactive, accountable, and inclusive academic communication ecosystem.

The consent-based forwarding model, with its category-level student control and time-bound override for critical notices, is designed to respect the autonomy of college-going adults while ensuring that information with serious academic consequences is never silently lost. The OTP-verified parent linkage established at admission, combined with the HOD-supervised discipline escalation pipeline and the tamper-evident audit log, ensures that the system remains trustworthy, documented, and institutionally accountable throughout its operation.

Future work includes piloting the system within a single department to refine the critical notice category definitions and the discipline booking threshold in practice, studying how students across different demographic and institutional contexts actually configure their consent settings once given the choice, and evaluating the impact of the streak-based gamification layer on sustained app engagement over a full academic year. A longer-term direction is extending the consent model to hostel and counseling communications, exploring UPI-based in-app fine payment, and developing predictive analytics that allow institutions to identify at-risk students based on combined attendance, fine, and discipline booking

patterns before those patterns escalate to the point of academic impact.

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