Academic Feedback Module: An Integrated System for Quality Assurance and Student Evaluation at Libyan International University

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***Abstract*—Student feedback is a fundamental component of academic quality assurance; however, many higher education institutions continue to rely on fragmented feedback platforms that are not integrated with official enrollment systems. This separation undermines data credibility, increases administrative workload, and delays academic decision-making. This paper presents the design and validation of an integrated Academic Feedback Module (AFM) developed as a proof-of-concept at Libyan International University. The proposed system enables real-time feedback collection and validation by synchronizing student evaluations with verified enrollment data through a secure JSON-based Single Sign-On (SSO) mechanism. Rather than relying on stand-alone survey tools, the AFM enforces institutional feedback policies at the moment of submission, ensuring that only eligible students can evaluate registered courses. In parallel, the system provides centralized analytical views and structured reporting to support quality assurance monitoring and timely academic intervention. The AFM prototype was implemented using a modular architecture based on Laravel, MySQL, and Redis, and modeled using the C4 architectural framework. Functional and security testing confirmed reliable authentication, data integrity, and policy enforcement without direct database coupling to the Student Information System. The results demonstrate that real-time, enrollment-linked feedback improves data reliability, operational efficiency, and institutional responsiveness, offering a scalable model for digital transformation in higher education.**

***Index Terms*—academic quality assurance, student feedback, system integration, real-time validation, higher education**

I. Introduction

Student feedback is a fundamental component of academic quality assurance and plays a critical role in enhancing the credibility, transparency, and effectiveness of higher education institutions. Accurate and timely feedback enables universities to evaluate teaching quality, assess course content, examine examination fairness, and improve the overall student learning experience. Before academic concerns can be addressed or corrective actions implemented, their existence must be established through reliable and verifiable data. Structured feedback collected directly from students remains one of the most effective mechanisms for capturing such data, as it reflects students' lived academic experiences and provides direct insight into instructional delivery and assessment practices.

Despite its importance, student feedback in many higher education institutions is still managed through fragmented and loosely governed systems. Feedback platforms are often deployed as stand-alone tools that operate independently from institutional registration and academic record systems. This separation limits the reliability of collected data and weakens the role of feedback as an input to academic decision-making. When feedback systems are not institutionally integrated, universities face difficulties in verifying student eligibility, enforcing participation policies, and responding to academic issues in a timely manner. As a result, feedback risks becoming a procedural requirement rather than a trusted governance instrument.

At the Libyan International University (LIMU), structured student feedback is collected through two primary channels: end-of-semester teaching evaluations and examination-focused surveys assessing difficulty, clarity, and fairness. These evaluations are currently administered using a third-party survey platform that is not integrated with the university's internal student registration system. While this platform supports questionnaire design and response collection, the lack of integration introduces significant operational and data governance challenges. Without direct linkage to official enrollment records, the university cannot automatically confirm that feedback submissions correspond to students' registered courses.

This institutional disconnect generates a fragmented feedback environment in which data credibility is compromised. Students may unintentionally submit evaluations for courses in which they are not formally enrolled, leading to inaccurate or misleading results. To compensate for this limitation, the Quality Assurance department relies on manual reconciliation processes, typically involving exported spreadsheets and cross-checking against registration records. These manual procedures are time-consuming, resource-intensive, and prone to human error. Moreover, the delays introduced by post-processing reduce the university's ability to respond promptly to emerging

academic concerns.

The impact of these challenges extends beyond operational inefficiency. When feedback data is delayed, incomplete, or difficult to verify, its value as a decision-support input is significantly reduced. Academic interventions aimed at improving teaching practices, course structure, or examination fairness may be postponed or overlooked altogether. Over time, this undermines trust in the feedback process among students, weakens confidence in data-driven decisions among faculty members, and limits the institution's capacity to maintain a responsive and student-centered academic environment.

Multiple stakeholders within LIMU express a clear need for more reliable and actionable feedback mechanisms. Students expect their evaluations to influence academic practices in meaningful ways, while faculty members seek accurate feedback that supports reflective teaching and continuous improvement. University administrators and quality assurance officials require high-quality data to support evidence-based decision-making and compliance with institutional policies. These expectations highlight the need for feedback systems that are not only technically functional, but also institutionally aligned and governed as part of the academic process.

In response to these challenges, this paper investigates how real-time feedback analysis combined with institutional system integration can enhance the effectiveness, accuracy, and responsiveness of academic quality assurance processes in higher education. Using LIMU as a case study, the study addresses both operational and research gaps arising from fragmented feedback systems and disconnected enrollment data. The paper presents an integrated academic feedback approach that positions student evaluation as a governed institutional process rather than an isolated survey activity, demonstrating how real-time validation and system integration can improve feedback credibility, reduce administrative burden, and support timely academic intervention.

II. Related Work

A. Real-Time Feedback Systems

Prior research on real-time feedback systems in higher education reflects increasing interest in using digital technologies to enhance academic quality assurance and instructional decision-making. Many studies focused on accelerating feedback availability, improving interpretability, and increasing student engagement through analytics-driven platforms, with the aim of enabling faster academic intervention compared to traditional end-of-term evaluations.

A major research direction involves the application of artificial intelligence and sentiment analysis to student feedback. Natural language processing and machine learning techniques have been used to analyze textual responses and infer student satisfaction, emotional tone, and learning difficulties [1]. While these approaches demonstrated value in extracting richer insights from qualitative data, they were typically evaluated in experimental or course-level contexts and operated independently of institutional enrollment and governance systems.

Other studies emphasized automated text mining and topic modeling to summarize large volumes of student comments. Tools such as Palaute and SUFAT illustrated how clustering, emotion lexicons, and suggestion extraction can support scalable feedback analysis without manual review [2], [3]. However, these systems generally relied on manual data uploads and lacked mechanisms for verifying student eligibility or enforcing participation policies, limiting their applicability to institution-wide quality assurance.

Structured digital evaluation platforms were also examined. Web-enabled systems such as WESET demonstrated that institutionally mandated participation could lead to high adoption rates and measurable teaching improvement [4]. Nevertheless, such systems were typically restricted to fixed evaluation periods and did not support real-time analysis or continuous administrative response during the academic term.

Broader academic analytics platforms addressed decision support at departmental or institutional levels. Systems such as Degree Compass and StudAnalyst highlighted the value of data-driven planning and performance monitoring [5], [6]. However, feedback data remained peripheral and weakly connected to institutional quality assurance and governance processes.

More formalized quality-oriented models, such as the Academic Quality Assurance Metamodel Information System (AQAMIS), proposed structured workflows and anonymization rules for academic evaluation [7]. Although AQAMIS demonstrated how feedback could inform quality assurance actions, it was implemented as a stand-alone system without real-time synchronization with enrollment records, leaving eligibility validation and policy enforcement unresolved.

Overall, existing research made significant progress in feedback analytics, visualization, and usability. However, feedback was largely treated as an analytical artifact rather than as a governed institutional process.

B. System Integration in Higher Education

In parallel, a substantial body of literature examined system integration within higher education institutions, focusing on interoperability among Student Information Systems (SIS), Learning Management Systems (LMS), and Enterprise Resource Planning (ERP) platforms. These studies emphasized improved operational efficiency, data consistency, and strategic decision-making through system unification.

Several studies investigated SIS–LMS integration using usability and acceptance models, reporting improved administrative coordination and reduced data redundancy [8]. Despite these benefits, such integrations primarily addressed academic records and content delivery, without extending validation logic to student feedback workflows.

Web-based synchronization systems demonstrated the operational value of real-time dashboards and role-based access control. Lecturer workload monitoring and academic credit synchronization platforms illustrated how real-time visualization and alerts could support institutional oversight [9]. Although not feedback-oriented, these systems highlighted how

governance mechanisms could be embedded within integrated academic environments.

Microservices-based architectures represented another integration trend. Modular LMS platforms built on RESTful APIs and token-based authentication demonstrated scalability, interoperability, and improved security [10]. While technically aligned with modern digital transformation goals, feedback processes were rarely treated as first-class components within these architectures.

ERP-focused studies reported improvements in teaching quality, student satisfaction, and administrative responsiveness following large-scale adoption [11]. However, feedback collection was often handled through external tools, and real-time synchronization between feedback data and enrollment records was not addressed.

More technically oriented research explored real-time data synchronization using event-driven architectures, message brokers, and low-latency databases [12], [13]. Although not education-specific, these synchronization strategies were directly applicable to real-time enrollment validation and policy enforcement. Service-oriented integration with external accreditation bodies further demonstrated secure institutional data exchange [14], but focused primarily on reporting rather than internal academic governance.

Collectively, integration research established strong technical foundations for interoperability and scalability, yet consistently positioned feedback systems as peripheral rather than core institutional components.

C. Identified Research Gap

Synthesizing both research streams reveals a clear gap. Existing feedback systems emphasize analytics, visualization, and engagement but lack institutional integration and real-time governance. Conversely, system integration frameworks successfully unify academic and administrative data while excluding dynamic feedback validation and policy enforcement.

No reviewed study combines real-time student feedback with direct validation against official enrollment records at the point of submission. Moreover, automated enforcement of feedback participation policies within an integrated institutional environment remains largely unexplored. As a result, student feedback continues to operate outside core governance mechanisms.

Addressing this gap requires treating feedback as an institutionally integrated, policy-governed academic process rather than as a stand-alone survey activity. This unmet requirement forms the foundation for the system and methodology proposed in this paper.

III. Research Methodology

A. Research Design

This study adopts a case study design, using the Libyan International University (LIMU) as a bounded institutional environment where academic feedback challenges are observable and measurable. A mixed-methods approach was applied to capture both (i) qualitative operational constraints and stakeholder perspectives and (ii) quantitative indicators extracted from workflow artifacts and system exports. The research is applied and developmental: it investigates the institutional problem while producing and validating a proof-of-concept Academic Feedback Module (AFM) aligned with actual quality assurance practices.

B. Data Collection Methods

Multiple data collection methods were used to support methodological triangulation and ensure that AFM requirements reflect real institutional constraints.

1) Semi-Structured Interviews: Semi-structured interviews were conducted with (i) the Quality Assurance (QA) staff member responsible for evaluation processing within the School of Engineering and Technology and (ii) the developer responsible for the Student Information System (SIS). These interviews identified bottlenecks in the current workflow, including reliance on manual spreadsheet reconciliation and the absence of systematic enrollment validation during feedback submission. The developer interview clarified the SIS data model and confirmed feasibility of integration through controlled exchange mechanisms.

2) Workflow Observation: The end-to-end evaluation process was observed and mapped to identify manual dependencies, reconciliation steps, and delay points. The observation confirmed that exported survey data requires manual cross-checking against enrollment records, which introduces latency and increases error risk. These findings directly informed AFM requirements for eligibility validation, completion tracking, and QA reporting.

3) System Data Review: A targeted review of SIS data structures (student identity and course enrollment representations) was performed in collaboration with the SIS developer to identify the minimum fields required for validation and reporting. This review informed the AFM–SIS integration logic, particularly the Single Sign-On (SSO) handoff and course eligibility rules at submission time.

4) Document and Form Analysis: Existing feedback forms and exported templates used by the QA office were analyzed to standardize question structure and response representation. This analysis informed the AFM form schema and response storage approach to ensure compatibility with current evaluation instruments.

5) Recording and Validation: Findings were recorded as structured notes, workflow maps, and test artifacts (e.g., sample payloads and field mappings). Cross-verification was applied by comparing interview descriptions with observed workflow steps and system artifacts prior to finalizing functional and non-functional requirements.

C. System Development Methodology

The system was developed as a proof-of-concept using architectural modeling and iterative refinement. The C4 model (Context, Container, Component, and Code) was selected to present a multi-level view of system boundaries, deployable units, internal responsibilities, and implementation-level

structure. This approach is well-suited for integration-centric systems where security boundaries and inter-system contracts must be explicit.

1) Context-Level Architecture (C1): Fig. 1 presents the AFM within LIMU's ecosystem and shows its interaction with institutional roles and the SIS as the authoritative source of identity and enrollment.

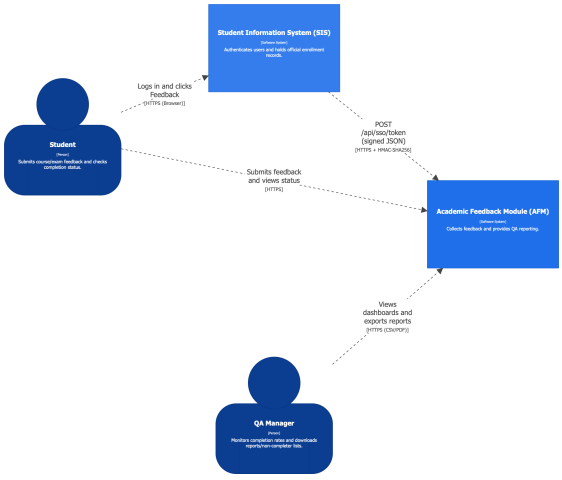


Fig. 1. System context-level diagram for AFM integration (C1).

2) Container-Level Architecture (C2): Fig. 2 decomposes the AFM into runtime containers within an AFM security boundary and highlights the HTTPS JSON-based SSO exchange as the only integration entry point.

3) Component-Level Architecture (C3): Fig. 3 details internal component responsibilities, distinguishing security-critical API components from session-based web workflows.

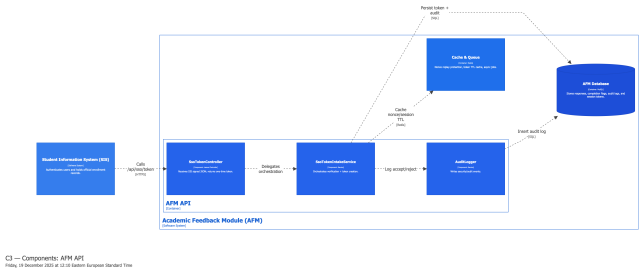
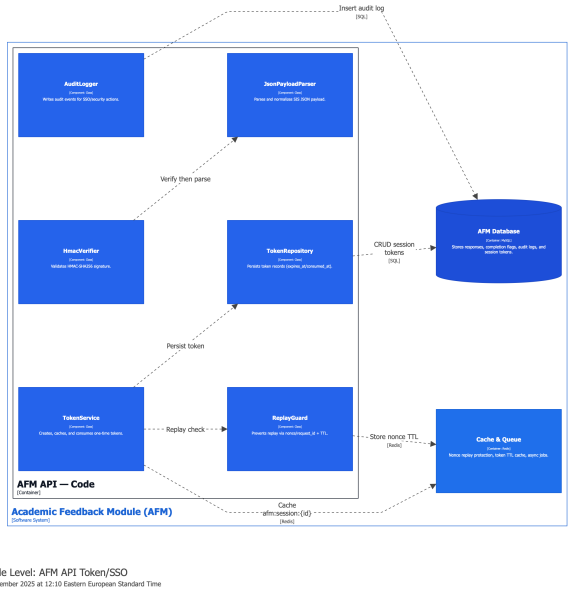


Fig. 3. AFM component-level diagram (C3).

4) Code-Level Structure (C4): Fig. 4 summarizes implementation-level collaboration among core services supporting SSO, token validation, persistence, and caching without direct coupling to the SIS database.



C4 — Code Level: AFM API Token/SSO
Friday, 19 December 2025 at 12:10 Eastern European Standard Time

Fig. 4. AFM API code-level structure for token/SRR/SSO workflow (C4).

D. Ethical and Institutional Considerations

Because AFM processes academic evaluation data, privacy, confidentiality, and institutional compliance were treated as design constraints.

1) Data Privacy and Confidentiality: Student identifiers were protected throughout design and testing using role-based authorization, short-lived authentication tokens, and encrypted transport (HTTPS) for inter-system communication.

2) Institutional Compliance: The prototype validation was conducted in an isolated environment and did not modify the live SIS or official academic records, ensuring zero operational impact while validating feasibility and governance alignment.

3) Informed Collaboration: Continuous collaboration with the QA office and SIS developer ensured that AFM assumptions, field mappings, and workflow decisions aligned with institutional practice and quality assurance governance requirements.

IV. Results and Discussion

A. Functional Results

The Academic Feedback Module (AFM) prototype was executed and evaluated in a controlled proof-of-concept environment using a simulated Student Information System (SIS) that generated HMAC-signed JSON payloads representing authenticated identity and verified enrollments. Functional testing confirmed that the end-to-end workflow—authentication handoff, session establishment, enrollment-scoped access, feedback submission, and quality assurance reporting—operated correctly under the defined scenarios.

Validation success was observed when valid payloads were submitted within the configured validity window. In these cases, the AFM verified payload integrity, established a short-lived session, and scoped student access strictly to the courses

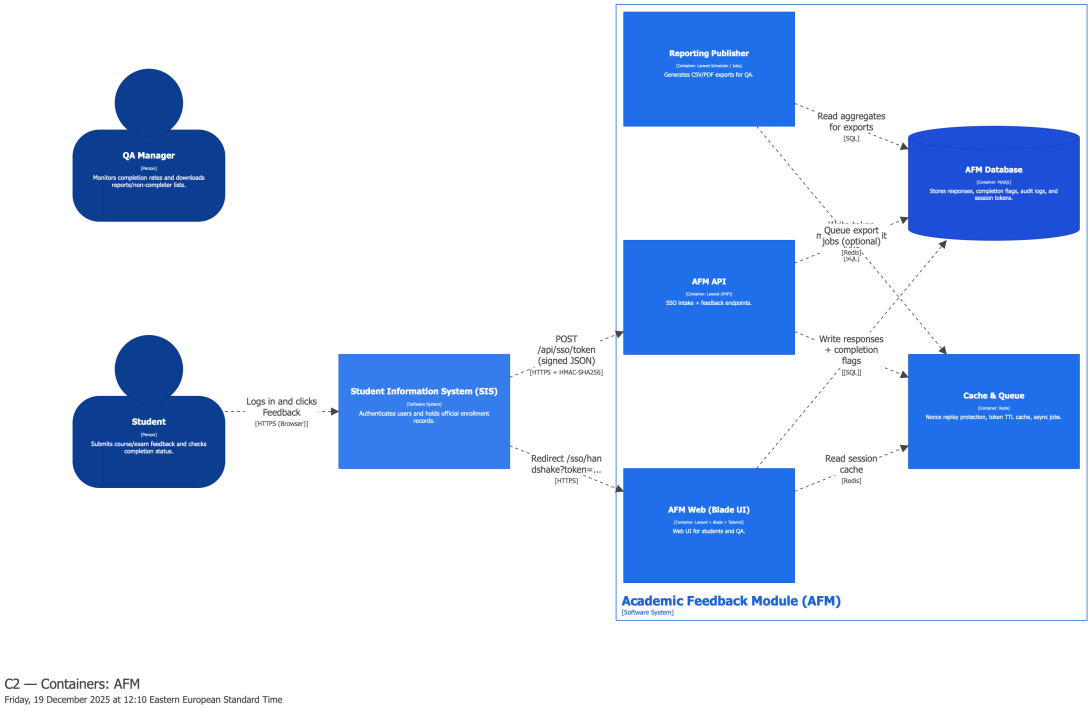


Fig. 2. AFM container-level diagram (C2).

contained in the verified enrollment snapshot. Students were able to view only eligible course evaluations and submit feedback within an authenticated context. No cross-course visibility or unauthorized access paths were observed during these executions.

Workflow correctness was further validated at the business-process level. The AFM enforced a single feedback submission per student per course per term, blocking repeat submissions without creating duplicate records. Upon successful feedback submission, a completion status record was generated and persisted, and completion was reflected consistently across subsequent student views and quality assurance reporting. Feedback records and completion records remained accurately linked to verified identifiers from the SIS snapshot (student, course registration, and term), and no mismatches or orphaned records were observed. Quality Assurance users were able to access participation monitoring views, identify non-participating students, and export structured reports, with all relevant access and reporting actions recorded in audit logs.

B. Institutional Impact

Although the evaluation was conducted in a proof-of-concept context, the observed outcomes indicate institutional value aligned with the operational challenges documented at LIMU. The most immediate impact is quality assurance efficiency. By enforcing enrollment validation at access time and generating completion status automatically, the AFM removes the core dependency on manual reconciliation between external survey exports and enrollment records. This reduces repetitive spreadsheet processing and minimizes opportunities for human error during participation tracking.

TABLE I
FUNCTIONAL EVALUATION SUMMARY

Result Area	Observed Outcome	Evidence Type
Validation success	Valid payloads created scoped sessions	Runtime behavior and logs
Security enforcement	Tampered/expired/replayed payloads rejected	Logs and blocked sessions
Workflow correctness	Single submission and completion tracking enforced	Database state and UI behavior

The prototype also improves data reliability. Feedback eligibility is enforced through verified enrollment snapshots, preventing evaluations from being submitted for non-registered courses and ensuring that recorded feedback remains institutionally valid. This strengthens the credibility of evaluation outputs and increases confidence among quality assurance stakeholders in using feedback as a basis for academic review.

Finally, the system improves decision speed by shortening the feedback-to-visibility cycle. When participation tracking and reporting are generated from validated records rather than post-processed exports, quality assurance teams can identify low participation or course-level concerns earlier and respond more quickly. In institutional terms, this shifts feedback from a delayed administrative task toward an operational monitoring capability that supports timely intervention.

V. Conclusion and Future Work

This paper presents an integrated approach to academic feedback governance that addresses persistent limitations in higher education quality assurance. By focusing on real-time validation and institutional system integration, the research demonstrates how student feedback can be transformed from a fragmented, post-processed activity into a governed academic process aligned with official enrollment data. Using Libyan International University (LIMU) as a case study, the study confirms that feedback credibility, operational efficiency, and institutional responsiveness improve when validation is enforced at the point of access rather than during post-processing.

From an academic perspective, the research contributes a unified model that bridges two domains often treated separately in the literature: real-time feedback systems and higher education system integration. Rather than emphasizing analytics in isolation or infrastructure integration alone, the proposed approach positions feedback as a regulated institutional process supported by secure authentication, enrollment verification, and policy enforcement. This contribution extends existing discussions on educational analytics by reframing feedback as an element of academic governance rather than a stand-alone survey mechanism.

At the institutional level, the findings demonstrate clear practical relevance. The proof-of-concept implementation confirms that manual reconciliation and delayed verification can be replaced by automated validation and completion tracking without introducing tight coupling to core academic systems. This enables quality assurance teams to rely on timely and reliable data, reduces administrative workload, and supports faster, evidence-based academic decision-making. To support transparency, reproducibility, and future extension, the complete Academic Feedback Module (AFM) prototype—including the simulated Student Information System used for controlled validation—is publicly available at: https://github.com/nahnagib/AFM-prototpe.

While the research validates both technical feasibility and institutional value, it is conducted within a proof-of-concept scope and a single organizational context. Future work includes deployment within a live Student Information System to evaluate scalability, performance under concurrent usage, and long-term operational impact. A key extension involves integration with the academic results management system, enabling automated enforcement of institutional policies such as restricting result visibility or academic progression for students who have not completed mandatory evaluation processes. This integration would transform feedback participation from a voluntary activity into a formally governed academic requirement, aligned with university regulations.

Additional future extensions include faculty-facing dashboards, longitudinal feedback analysis across academic terms, and advanced analytical techniques built on the validated, enrollment-linked data foundation.

In conclusion, the study demonstrates that real-time, enrollment-linked academic feedback is both achievable and beneficial for higher education institutions. Treating feedback systems as core components of institutional governance—rather than auxiliary survey tools—enables more transparent, accountable, and data-driven quality assurance practices that support continuous academic improvement.

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