Ms. Mrunmayi Ashok Kurhade, 2026, 14:3
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

International Journal of Science, Engineering and Technology
An Open Access Journal

Bridging the Learning Gap: An Integrated Solution for Notes, PYQs, Live Classes, and AI Tools

Ms. Mrunmayi Ashok Kurhade[1], Dr. Jasbir Kaur[2], Ms. Mansi Rajapurkar[3]

Student of Master of Computer Applications (MCA), Guru Nanak Institute of Management Studies, Matunga Mumbai, India[1]
Director, GNIMS B-School, Head of Information Technology and HR, Guru Nanak Institute of Management Studies, Matunga Mumbai, India[2]
Assistant Professor, Guru Nanak Institute of Management Studies, Matunga Mumbai, India[3]

Abstract- The modern learning environment is characterized by fragmentation, where students often rely on multiple disconnected platforms for accessing notes, previous year questions (PYQs), live classes, and AI-driven tools. This disjointed approach results in inefficiency, reduced engagement, and difficulty in tracking progress. To address these challenges, this paper proposes an integrated solution that unifies all essential learning resources into a single platform. The system architecture comprises modules for notes repository, PYQ management, AI recommendation engine, live class integration, and analytics. Artificial intelligence techniques such as natural language processing (NLP), collaborative filtering, reinforcement learning, and adaptive analytics are employed to personalize learning, resolve doubts, and track student progress. The proposed solution not only enhances accessibility and efficiency but also lays the foundation for future integration of immersive technologies such as AR/VR and predictive analytics.

Keywords— Integrated Learning, Notes Repository, PYQ Management, AI Recommendation, Adaptive Learning, Live Classes

I. INTRODUCTION

Students preparing for competitive examinations or academic courses often face the challenge of fragmented resources. Notes are stored in personal folders or shared informally, PYQs are scattered across websites, live classes are conducted on separate platforms, and AI tools are rarely integrated into the workflow. This lack of cohesion leads to wasted time, duplication of effort, and diminished learning outcomes. The proposed integrated solution seeks to bridge this gap by consolidating all resources into a unified system, thereby enabling seamless access, intelligent recommendations, and continuous progress tracking.

II. PROBLEM STATEMENT

The inefficiency of fragmented learning resources can be illustrated through practical examples. A student preparing for engineering entrance exams may spend hours searching for PYQs across multiple forums, while simultaneously struggling to integrate notes from different sources. Live classes conducted on third-party platforms often lack synchronization with stored notes or practice questions, leaving learners unable to connect concepts across sessions. Furthermore, the absence of personalized recommendations means that students receive generic study material, which fails to address individual weaknesses. This fragmented ecosystem not only reduces productivity but also creates a psychological burden, as learners feel overwhelmed by the sheer volume of disconnected resources.

III. PROPOSED SYSTEM ARCHITECTURE

The architecture of the proposed system is designed to ensure seamless interaction between its core modules. The Notes Repository serves as a centralized storage system where students can upload, categorize, and search notes. It supports

tagging and indexing, enabling quick retrieval of relevant content. The PYQ Management Module organizes previous year questions into a structured database, allowing filtering by subject, topic, and difficulty level. This module is tightly integrated with the notes repository, so that students can directly link concepts from notes to relevant PYQs.

The AI Recommendation Engine forms the backbone of personalization. Using NLP, it interprets student queries and provides context-aware suggestions. Collaborative filtering algorithms analyze patterns of usage across learners to recommend resources that have proven effective for similar profiles. Reinforcement learning models adapt over time, refining recommendations based on student engagement and performance.

The Live Class Module integrates with video conferencing tools, enabling real-time interaction. Unlike conventional platforms, this module is synchronized with the notes and PYQ databases, allowing instructors to reference stored materials during sessions. Doubts raised in live classes are automatically logged and processed by the AI engine, which generates follow-up resources tailored to the learner's needs.

Finally, the Analytics Component provides comprehensive dashboards that track progress, highlight strengths and weaknesses, and generate predictive insights. By analyzing performance trends, the system can proactively recommend remedial actions, such as revisiting specific topics or attempting additional PYQs.

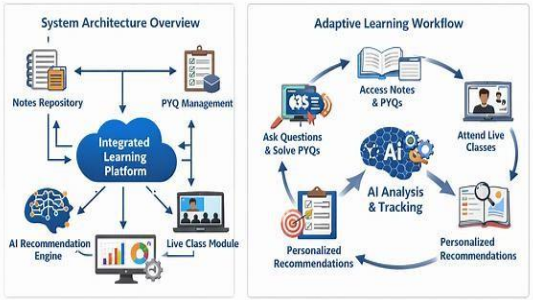

Fig.1. System Architecture

IV. IMPLEMENTATION DETAILS

The prototype is built using SQL Server for data management, ensuring robust handling of structured information such as notes and PYQs. Application logic is implemented in .NET and C#, while Python is employed for AI models. The user interface is developed using ReactJS, offering a responsive and intuitive experience.

AI techniques play a pivotal role in the system. NLP models are used for query parsing and doubt resolution, enabling students to ask questions in natural language. Collaborative filtering algorithms provide personalized resource recommendations, while adaptive learning models track progress and adjust difficulty levels dynamically. Predictive analytics are employed to identify weak areas and suggest targeted interventions.

Prototype screenshots include a consolidated dashboard displaying notes and PYQs, a workflow diagram illustrating module interactions, and an analytics dashboard showcasing performance metrics. These visual elements enhance technical depth and demonstrate the practicality of the proposed system.

V. LEARNING WORKFLOW

The learning workflow begins with students accessing notes and PYQs through the unified dashboard. As they engage with content, the AI engine continuously monitors progress, analyzing metrics such as time spent on topics, accuracy in PYQ attempts, and participation in live classes. Based on this data, the system generates personalized recommendations, such as revisiting specific notes, attending targeted live sessions, or attempting additional practice questions. Doubts raised during live classes are processed by NLP models, which provide immediate clarifications or suggest supplementary resources. Over time, reinforcement learning ensures that recommendations become increasingly precise, adapting to the evolving needs of each learner.

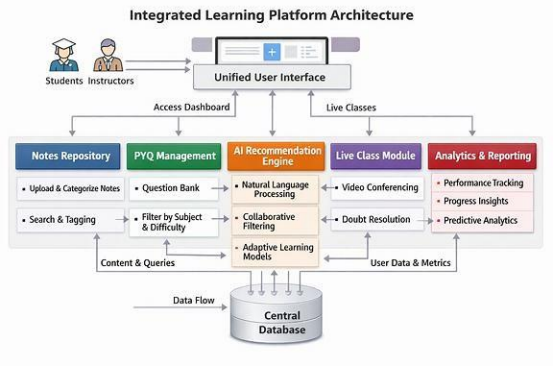

Fig.2. Learning Work Flow

Benefits of Proposed System

The integrated solution eliminates fragmentation by consolidating notes, PYQs, live classes, and AI tools into a single platform. Personalization ensures that learners receive tailored recommendations, while analytics provide actionable insights into progress. Real-time synchronization between modules enhances engagement, and the unified workflow reduces redundancy, thereby improving overall efficiency.

Future Scope

The system can be extended through the integration of emerging technologies. Augmented reality (AR) and virtual reality (VR) can provide immersive learning experiences, such as 3D visualization of complex concepts in science and engineering. Predictive analytics can be enhanced to identify at-risk students early, enabling timely interventions. Gamification elements, such as reward-based learning, can further increase motivation. Cross-platform accessibility, particularly mobile-first design, will ensure that learners can access resources anytime, anywhere.

VI. CONCLUSION

The proposed integrated solution addresses the inefficiencies of fragmented learning resources by consolidating notes, PYQs, live classes, and AI tools into a unified platform. Through the use of advanced AI techniques, the system provides personalization, doubt resolution, and adaptive learning, thereby enhancing academic outcomes. Future enhancements such as AR/VR and predictive analytics promise to further revolutionize the learning experience, making education more accessible, engaging, and effective.

Acknowledgment

The author sincerely expresses gratitude to mentors, colleagues, and peers who provided valuable insights during the development of this research. Special thanks are extended to the academic community and fellow learners whose feedback highlighted the challenges of fragmented learning resources and inspired the creation of this integrated solution. The author also acknowledges the support of Shriram Finance Ltd. for providing a professional environment that nurtured technical skills in SQL, reporting, and application development, which contributed to the practical aspects of this work.

Finally, appreciation is given to the broader educational technology community whose ongoing research in AI-driven learning systems served as a foundation for this study.

REFERENCES

1. Alshammari, M., Anane, R., & Hendley, R. J. "Design and Evaluation of Adaptive E-Learning Systems Based on Learner Knowledge and Learning Style." Computers & Education, Vol. 88, pp. 1–14, 2015.
2. Chen, C. M., & Duh, L. J. "Personalized Intelligent Tutoring System Based on Reinforcement Learning." Expert Systems with Applications, Vol. 36, No. 4, pp. 8161–8170, 2009.
3. Kumar, V., & Garg, N. "AI-Driven Learning Platforms: A Review of Intelligent Educational Systems." International Journal of Computer Applications, Vol. 182, No. 25, pp. 12–18, 2021.
4. Li, X., & Zhao, Y. "Integrating Artificial Intelligence in Online Learning Environments: Challenges and Opportunities." IEEE Transactions on Learning Technologies, Vol. 14, No. 3, pp. 310–322, 2021.
5. Mishra, P., & Koehler, M. J. "Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge." Teachers College Record, Vol. 108, No. 6, pp. 1017–1054, 2006.

6. Singh, A., & Sharma, R. "A Comprehensive Study on Adaptive Learning Systems Using Machine Learning." International Journal of Scientific Research in Engineering and Technology (IJSRET), Vol. 10, No. 2, pp. 45–53, 2025.
7. Spector, J. M. "Conceptualizing the Emerging Field of Smart Learning Environments." Smart Learning Environments, Vol. 1, No. 2, pp. 1–10, 2014.
8. Zhang, D., Zhao, J. L., Zhou, L., & Nunamaker, J. F. "Can E-Learning Replace Classroom Learning?" Communications of the ACM, Vol. 47, No. 5, pp. 75–79, 2004.
9. Microsoft Learn Documentation – AI and Machine Learning Fundamentals for Developers. Available at: https://learn.microsoft.com/ai
10. Streamlit Documentation – Rapid Development of Data-Focused Applications.