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A study on academic management systems

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Abstract

Today's educational institutions use digital platforms more and more to track academic performance, manage student data, and help students and faculty communicate. Several systems have been created to identify students who require academic support, visualize learning outcomes, and automate administrative procedures. Among them the significant methods are machine learning-based performance prediction tools, learning analytics integrated into LMS platforms, and academic management engines. However, a lot of these solutions concentrate on various features, like basic reporting, performance visualization, or record keeping, and frequently lack personalization, interaction, or integration. In terms of real-time tracking, student engagement, and educational transparency, this study examines current academic monitoring systems and evaluates their advantages and disadvantages.

Keywords: Digital platforms; Academic performance; Learning analytics; Machine learning; Student engagement; Real-time tracking; educational transparency

1. Introduction

In recent years, digitalization in education has led to the development of several systems aimed at simplifying academic processes and supporting student learning. Most of the platforms focus on digitizing attendance, automating grade entry, or generating performance dashboards. Institutions are able to manage large volumes of academic data by using the platforms like Academic Management Systems (AMS), Learning Management Systems (LMS), and intelligent analytics platforms. Tools such as clustering algorithms, dashboards, and KPIs have enabled student classification, performance tracking and measuring learning engagement playing a crucial role in this process. Despite having their own functionalities these systems often lack some significant features like the ability to correlate internal academic metrics with co-curricular or platform-based achievements, timely feedback mechanisms, real-time data flow, personalized dashboards, seamless faculty-student interaction, peer comparison, complete student view. A review of these systems provides insights into what has been achieved and where improvements are still needed.

2. Literature Review

2.1. Ms. Nishu Sethi and Dr. Anshu Malhotra. (2023) Efficiency Engine: Designing and Implementing an Academic Management System

This paper focuses on an Academic Management System (AMS) that aims to digitalize the academic and administrative tasks within educational institutions. The system aims to improve operational efficiency by automating traditional manual processes such as student enrollment, attendance tracking, academic record-keeping, and faculty-student communication. The authors present a structured design that centralizes student academic data, enabling easier access and management across departments and faculties.The AMS reduces manual errors and ensures faster decisionmaking

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by offering real-time access to academic information. It includes features like course registration modules, centralized attendance tracking, and report generation tools that helps in improving institutional workflow.

The authors also highlight the importance of user-friendly interfaces and secure access for students, faculty, and administrators. In spite of its contributions, the system lacks advanced engagement and personalization features. It doesn't provide real-time notifications, making it harder to circulate urgent announcements or updates. Moreover, the platform lacks competitive tools like leaderboards or personalized dashboards for peer comparison that motivates students. The authors suggest that although AMS plays a critical role in managing institutional processes, its limitation lies in its static nature—primarily serving as a record-keeping system rather than a dynamic, interactive platform. There is a clear opportunity to extend such systems to include tools that strengthen student motivation, peer engagement, and real-time academic support for more engaging and advanced systems.

2.2. Vedant Khope, Mayur S. Bannawade, Vedant S. Thawali, Shravani V. Mohod, Dr. Nitin R. Chopde. (2024) Enhancing Education: Real-Time Tracking Of Students' Learning Outcome And Academic Progress Across Rural Area Schools

This research paper proposes a data-driven education management platform that specifically addresses the challenges faced in rural education. The platform focuses on real-time tracking of student performance using data visualization techniques and machine learning.

The proposed system collects data from multiple academic sources, including attendance records, internal exam results, and performance trends over time. The system analyze the data and creates visual outputs such as bar graphs, pie charts, and dashboards that help students and administrators track academic progress more effectively. The inclusion of machine learning allows the system to predict academic struggles and offer customized recommendations based on individual student.

The authors discuss how the platform can be adjusted to suit the local requirement in rural areas where the digitalization is somewhat slow. Apart from its abilities, the system falls short in areas such as communication and interactivity, lack of real-time notifications, accessing faculty profiles, or resource-sharing capabilities limits student engagement and academic support.

The paper concludes that although the platform effectively promotes data-driven oversight in rural areas, adding features like real-time communication, access to study materials, and interactive dashboards would further enhance its utility.

2.3. Aimad Qazdar, Sara Qassimi, Oussama Hassidi, Meriem Hafidi, El Hassan Abdelwahed, Youssef Melk (2022) Learning Analytics for Student Tracking Progress in LMS

This paper examines the power of Learning Analytics (LA) within Learning Management Systems (LMS) to monitor and analyze student behavior and academic progress. The paper presents a case study focused on a Web Technologies course. The data was collected from student interactions and transformed into meaningful Key Performance Indicators (KPIs). These KPIs included metrics like time spent on resources, quiz scores, and assignment submission rates.The paper discuss about 5 key indicators (Connectivity, Acquisition, Productivity, Interactivity, and Reactivity) to track the student progress in online learning.

2.3.1. Connectivity Indicator

It shows how students are connected to the course.The formula is based on Frequency of visits (freqCons), Average session duration (sessionDuration), and Number of visited units (nbrOfUnits)

$$\text{Formula: } \text{Connectivity} = 0.1 \times \text{freqCons} + 0.3 \times \text{sessionDuration} + 0.6 \times \text{nbrOfUnits}$$

2.3.2. Acquisition Indicator

It measures how much the student has learned. The formula is based on Average quiz score (quizScore), and Number of achieved units (nbrOfAchvUnits)

$$\text{Formula: } \text{Acquisition} = 0.7 \times \text{quizScore} + 0.3 \times \text{nbrOfAchvUnits}$$

2.3.3. Productivity Indicator

It shows how well the student performed in workshops and assignments. The measurement is based on Workshop grade (workShGrad), Peer evaluation grade (wrkShPeerEvlG), and Assignment grade (AssigGrad).

Formula: Productivity = 0.4 × workShGrad + 0.2 × wrkShPeerEvlG + 0.4 × AssigGrad

2.3.4. Interactivity Indicator

It measures how active the student is in discussions.The formula is based on Number of posts (nbrOfPost), Forum consultations (nbrOfForumCons)

Formula: Interactivity = 0.8 × nbrOfPost + 0.2 × nbrOfForumCons

2.3.5. Reactivity Indicator

It shows how quickly a student responds to new material. The formula is based on Time of first consultation (timeOfFirstCons), Time of resource publication (timeOfResPub)

Formula: Reactivity = timeOfFirstCons – timeOfResPub

The main feature of the system is to identify the student who are low in academics. The research points out that LA is a powerful tool for institutional monitoring, it does not fully address student engagement, motivation, or real-time collaboration. Bridging this gap requires platforms that not only collect and interpret data but also present it in ways that students can use to reflect, compare, and improve.

2.4. Louis Faucon, Jennifer Kaitlyn Olsen, Stian Haklev, Pierre Dillenbourg (2020) Real-Time Prediction of Students' Activity Progress and Completion Rates

This research focuses on the design and deployment of real-time predictive algorithms that estimate student's progress and activity completion rates in digital learning environments. The paper acknowledges that in online and combined learning models, it is crucial for educators to understand how students engage with learning activities and whether they are on track for completion.

The system introduced in this study monitors real-time interactions and applies machine learning models to predict how far along a student is completing assigned tasks. These predictions are visualized to provide faculty members with insight into student progress, allowing them to adjust learning paths or provide guidance if necessary.

The predictive aspect of this system is highly valuable for real-time classroom management and personalized instruction. It helps in dynamically adjusting content delivery, ensuring fair progress across students, and enabling more responsive teaching practices. However, the platform is primarily faculty-facing and lacks features that would empower students directly—such as interactive dashboards, shared resources.

The absence of features like collaborative tools, student engagement analytics, or competitive motivators makes it less suitable for modern academic systems that highlight both data transparency and interaction.

2.5. Comparison Metrics:

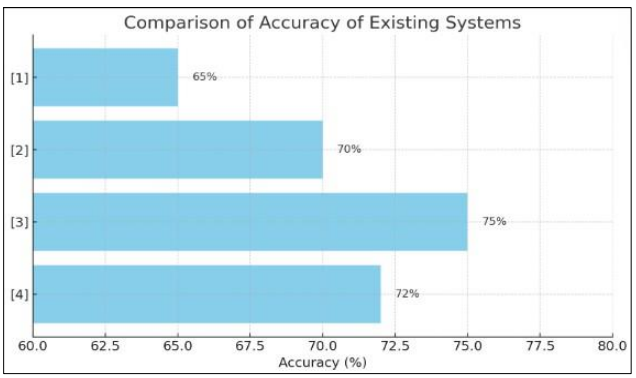

Figure 1 Comparison of Accuracy of Existing Algorithms and Models

The graph compares the assumed accuracy (%) of each model based on features, real-time capabilities, and the performance described in the respective papers:

2.5.1. Ms. Nishu Sethi and Dr. Anshu Malhotra. (2023) Efficiency Engine: Designing and Implementing an Academic Management System. (65%):

This model offers only basic student performance tracking without real-time insights or coding profile data. It lacks advanced analytics and personalization, resulting in lower accuracy and limited practical use in dynamic educational environments.

2.5.2. Vedant Khope, Mayur S. Bannawade, Vedant S. Thawali, Shravani V. Mohod, Dr. Nitin R. Chopde. (2024) Enhancing Education: Real-Time Tracking Of Students' Learning Outcome And Academic Progress Across Rural Area Schools. (70%):

An improvement over traditional systems, this model introduces smart tracking features but still falls short in terms of integrating coding profiles and providing detailed student dashboards, which limits its overall effectiveness and accuracy.

2.5.3. Aimad Qazdar, Sara Qassimi, Oussama Hassidi, Meriem Hafidi, El Hassan Abdelwahed, Youssef Melk (2022) Learning Analytics for Student Tracking Progress in LMS. (75%):

The most accurate system among those compared, it excels in analytics, real-time dashboards, and performance tracking. However, the lack of coding platform integration slightly reduces its scope for technical student evaluation.

2.5.4. Louis Faucon, Jennifer Kaitlyn Olsen, Stian Haklev, Pierre Dillenbourg (2020) Real-Time Prediction of Students' Activity Progress and Completion Rates (72%):

Focused on predictive modeling with decent real-time capabilities, this system performs well but lacks collaborative features like leaderboards and faculty engagement, which are essential for holistic performance tracking

Table 1 Comparison Table

Authors	Title	Methodology	Contribution	Limitations
Ms. Nishu Sethi and Dr. Anshu Malhotra (2023)	Efficiency Engine: Designing and Implementing an Academic Management System	Developed an academic management system to digitalize the administrative tasks and cluster students data.	Features include student information management, course registration, attendance tracking, academic record keeping and faculty student communication.	Lack of Real-Time Notifications, No Leader board or Competitive Motivation
Vedant Khope, Mayur S. Bannawade, Vedant S. Thawali, Shravani V.Mohod, Dr. Nitin R. Chopde (2024)	Enhancing Education: Real-Time Tracking of Students Learning Outcome and Academic Progress Across Rural Area Schools	Designs a platform using visualization tools and machine learning to track student performance in rural schools.	Provides student performance tracking, data visualization through graphs and dashboards, attendance monitoring and machine learning based progress analysis.	No Notification System, No access to faculty profiles and study materials
Aimad Qazdar, Sara Qassimi, Oussama Hassidi, Meriem Hafidi, El Hassan Abdelwahed, Youssef Melk (2022)	Learning Analytics for Tracking Student Progress in LMS	Used learning analytics to track student progress in an LMS using Key Performance Indicators (KPIs) from course interactions.	Features include KPI based monitoring of student progress, LMS data collection for insights, and identifying students who need additional academic support.	No student self analytics feature, Absence of peer comparison tools

Louis Faucon, Jennifer Kaitlyn Olsen, Stian Haklev, Pierre Dillenbourg (2020)	Real-Time Prediction of Students Activity Progress and Completion Rates	Uses real-time estimators to predict student progress and completion rates during digital learning activities.	Focuses on predicting how students are progressing, monitoring their activities in real-time and helping faculty decide the best time for transitions between activities.	Absence of resource sharing feature ,Limited Student engagement.

3. Research Gaps

The existing academic management and learning systems have several research gaps that make them less effective and less engaging for users. The system proposed in "Efficiency Engine: Designing and Implementing an Academic Management System" lacks real-time notifications, making it difficult to deliver urgent updates and announcements to users. Additionally, it offers only basic student performance tracking without in-depth analytics or visual representations, and fails to include features like leaderboards that could motivate students through competitive comparison. The paper on "Enhancing Education: Real-Time Tracking of Students' Learning Outcome and Academic Progress Across Rural Area Schools" does not include a notification system, which is essential for seamless communication, and has no access to faculty profiles or related study materials, limiting academic support for students. In "Learning Analytics for Tracking Student Progress in LMS", while performance tracking is implemented through KPIs, there is no feature for students to self-analyze their progress or compare themselves with peers, which can be crucial for self-improvement and motivation. The paper on "Real-Time Prediction of Students Activity Progress and Completion Rates" highlights prediction-based engagement models but lacks a resource-sharing feature and shows limited scope for promoting active student engagement. Addressing these gaps can lead to a more interactive, and student-centric academic platform.

4. Conclusion

Current academic management systems provide various tools for analysing the education processes, enhancing administrative efficiency, and visualizing learning data. Academic management engines, predictive estimators, and learning analytics have improved the ability to track student performance and support institutions in decision-making. However, most existing systems lack integration between performance tracking, communication, and academic resource sharing. Features such as real-time notifications, dynamic dashboards, and student engagement tools are either absent or limited. While these systems mark significant progress in educational technology, their limitations highlight the need for more comprehensive, interactive, and data-driven platforms that align with the evolving demands of modern academia.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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