



LMS-DRIVEN SKILL ACQUISITION THROUGH ATM SIMULATION IN TECHNICAL EDUCATION

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Abstract- This study examines the efficacy of Learning Management Systems (LMS) in higher education by incorporating an ATM simulation application created with Visual Studio and C#. The research examines the impact of experiential learning tools, including simulated banking environments, on student engagement, conceptual comprehension, and the cultivation of interdisciplinary skills. By replicating core ATM functionalities, including PIN authentication, balance inquiry, withdrawals, deposits, and transaction tracking, the simulation provides a hands-on platform for learners to apply theoretical knowledge in a controlled, interactive setting. Students use a secure login screen that acts like a real ATM. The system teaches users about authentication, error handling, and user experience design by enforcing PIN length, retry limits, and lockout mechanisms. The results show that the ATM-based LMS helps students learn more deeply, encourages research-based questions, and gets them ready for real-world problems in digital banking and financial technology. The simulation's flexibility and data-rich setting make it a scalable model for improving the delivery of curriculum and academic results in higher education.

Keywords: Learning Management System, ATM, Visual Studio etc.

I. INTRODUCTION

A Learning Management System (LMS) is a platform utilized by an organization to organize, implement, monitor, and assess educational activities. They are primarily used to manage and oversee educational activities, monitor advancement, evaluate performance, and guarantee adherence to training objectives and requirements. They are frequently utilized in corporate training and academic institutions to enhance effective learning and growth. An LMS often enables an instructor to produce and disseminate information, track student engagement, and evaluate student performance. It may also offer students interactive functionalities, including threaded discussions, video conferencing, and discussion boards [1].

These systems are frequently utilized by businesses, government entities, and both traditional and online educational institutions. They can enhance conventional teaching methodologies while concurrently conserving time and financial resources for enterprises. An efficient system enables instructors and administrators to effectively handle components such as user registration and access, content, calendars, communication, quizzes, certificates, and notifications. The U.S. government's Advanced Distributed Learning Initiative established a set of specifications known as the Sharable Content Object Reference Model (SCORM) to promote the standardization of Learning Management Systems (LMS). Educational institutions utilize various Learning Management Systems (LMS), such as Anthology's Blackboard Learn, Instructure's Canvas LMS, and Moodle. Examples of enterprise-level Learning Management Systems (LMS) include Cornerstone LMS, Docebo Learn LMS, LearnUpon, and TalentLMS [2].

As technical education changes, digital platforms have become very important for closing the gap between learning theory and developing practical skills. Learning Management Systems (LMS) have become powerful tools that provide structured, scalable, and interactive spaces for students from all fields of study. LMS platforms help schools and businesses provide competency-based training that meets industry standards, especially in vocational and technical fields. The efficacy of Learning Management Systems (LMS) in cultivating practical proficiency is a significant subject of investigation, particularly in the context of transactional systems such as Automated Teller Machines (ATMs), which necessitate both procedural precision and interface fluency.

ATM simulation offers an effective teaching method for learning technical skills. As a transactional system, it includes things like authentication, cash dispensing, error handling, and navigating the user interface that happen in the real world. By putting these kinds of simulations into LMS modules, students can practice cognitive and procedural skills in realistic situations without the risks that

come with using live systems. This method not only improves experiential learning, but it also allows for adaptive feedback, performance tracking, and repeated practice, all of which are important parts of good digital teaching [3].

The merging of LMS and ATM simulation is also a sign of bigger changes in educational technology, where learning through simulation is becoming more popular because it can replicate complicated systems in controlled settings. Using LMS features like gamification, analytics dashboards, and personalized learning paths, teachers can make ATM simulation experiences fit the needs of different types of students. This integration supports differentiated instruction, encourages self-paced learning, and promotes operational readiness, which is especially useful in banking, finance, and IT-oriented courses [4].

This paper seeks to assess the pedagogical effects of LMS-driven ATM simulation on skill acquisition in technical education students. It explores how simulation modules embedded in LMS platforms influence learner engagement, cognitive retention, and practical proficiency. The study employs a mixed-methods approach, integrating performance analytics, learner feedback, and instructional design analysis, to provide actionable insights for curriculum developers, institutional planners, and edtech innovators dedicated to improving vocational training through digital methods.

II. RELATED WORK

Güntem et al. (2025) [5] looked at how well Learning Management Systems (LMS) and university websites in Northern Cyprus worked and how long they will last. The researchers looked at several platforms side by side to see how easy they were to use, how easy it was to find information, and how environmentally friendly the design was. The results showed that while many systems worked at their best, many others did not have sustainable web architecture or user-centered design. The study stressed how important it is to use ideas from digital sustainability to make online learning better.

Veseli et al. (2025) [6] looked at how people's perspectives on Organizational Change Readiness (OCR) affected the success of Learning Management System (LMS) projects at Higher Education Institutions (HEIs). The study took place at eleven universities in Kosovo and included a cross-sectional survey with 316 academic and administrative staff. The results showed that vision clarity, change appropriateness, top-management support, project champion effectiveness, and organizational flexibility were the most important factors in perceived preparation. These factors explained 75% of the variance in OCR. On the other hand, things including the history of organizational change, group self-efficacy, and internal conflicts had less of an effect. The study showed that linking LMS projects to school goals and encouraging a culture of change are important for making digital transformation in education last.

Ngulube et al. (2025) [7] looked at how learning analytics can be used to make the experience of using Learning Management Systems (LMS) in colleges and universities better. The authors looked at 41 papers from five academic databases and found a number of analytical methods and problems with putting them into practice. The results showed that learning analytics can help make systems more personalized and better, but they are not as effective because of problems like ethical difficulties, misinterpreting data, and not adapting to the context well enough. The study showed that strict, context-sensitive methods are needed to make LMS systems better for different types of learners.

Gavrus et al. (2025) [8] did a study that looked at the effects of e-learning platforms on making higher education more sustainable across different continents. The study included both quantitative methods and feedback from students at universities in Romania and the US. It showed that systems like Moodle and Blackboard had a big effect on how long students stayed in school, how efficiently they used resources, and how engaged they were with their teachers. The results showed how important platform-specific features like editable files, synchronous meetings, and ways to give feedback are for making education more sustainable and getting people more involved online.

Alotaibi et al. (2024) [9] looked at how combining Artificial Intelligence (AI) with Learning Management Systems (LMS) could affect higher education. It focused on how it could make personalized learning, adaptive assessments, and decision-making at the institution level better. The study combined the results of 60 peer-reviewed studies published between 2014 and 2023. It found that AI-LMS systems improved student engagement and learning outcomes, but it also pointed up problems including data privacy concerns, algorithmic bias, and teachers not being ready. Alotaibi stressed the importance of fair access and ethical execution in order to bring about lasting changes in education.

Olivares et al. (2024) [10] looked at how Learning Management Systems (LMS), especially Moodle, affect how geography is taught in primary schools. There were 80 fifth-grade kids in the study. The researchers looked at two types of feedback: simple correct-answer feedback (control group) and extended input based on learning analytics (experimental group). The results showed that both types of feedback improved learning outcomes, but students in the experimental group were happier and thought the activities were more useful. The study showed that daily analytics data helped teachers predict final academic outcomes. This shows how important LMS-integrated feedback systems are for making geography lessons better and supporting long-term educational frameworks.

Koshiry et al. (2024) [11] used both qualitative and quantitative methodologies to look at how well Moodle Cloud, a cloud-based Learning Management System (LMS), helped visually impaired graduate students improve their digital transformation skills. Twenty visually impaired graduate students took part in the study at Beni Suef University. They were split into two groups: an experimental group and a control group. The study showed that the experimental group, which used the cloud LMS, had much better digital skills than the control group, as measured by achievement tests and performance ratings. The results showed that there was no significant difference between using the LMS remotely and in person, which shows how flexible and easy it is to use. The results support the usage of cloud-based LMS platforms in inclusive education, as well as Egypt's Vision 2030 and other goals for digital transformation.

Masrukhin et al. (2024) [12] looked at how individualized learning programs used in higher education at Binus Bandung, Indonesia, through Learning Management Systems (LMS) affected students. The study used both qualitative and descriptive methods to look at how LMS-supported personalized learning affected students' independence, interest, and academic success. Interviews with students, professors, and staff showed that the LMS made it possible for learning paths to change based on the needs of Industry 4.0. The results showed that there was a shift in how curricula were designed. Students did better when they could learn at their own pace without having to be present, which encouraged independence and digital readiness.

Vergara et al. (2024) [13] examined how Learning Management Systems (LMS) use Artificial Intelligence (AI) by looking at 256 documents from Scopus and Web of Science from 2004 to 2023. Using the PRISMA framework, the authors were able to identify important trends, new themes, and possible future study paths. The results showed that LMS platforms with AI make it easier to learn in a flexible way, get personalized materials, and learn on your own in person, in a hybrid context, or online. The assessment made it clear how important it is for teachers to be familiar with AI and how important it is to have thorough design and evaluation methods in place to make sure it is used.

III. OBJECTIVES OF WORK

The goal of this study is to find out how Learning Management Systems (LMS) can help students learn practical skills in technical education settings when they are used with ATM simulation modules made with Visual Studio. The study seeks to develop a realistic ATM interface that simulates transactional functions such as PIN authentication, balance inquiry, and cash withdrawal, utilizing Visual Studio's features for constructing interactive, event-driven applications. This simulation is part of an LMS environment and is meant to help students connect what they learn in theory with what they do in practice. It lets them work with system logic, error handling, and user interface design in a safe space where they can get feedback. The study centers on quantifying enhancements in operational comprehension, cognitive retention, and learner engagement, thereby substantiating the efficacy of simulation-based LMS content in equipping students for real-world technical challenges.

IV. METHODOLOGY

Information and Communication Technologies (ICTs), encompassing radio, television, and contemporary digital technologies like computers and the Internet, are regarded as potentially formidable instruments for educational transformation and reform. The word ICT denotes technology utilized for the creation, storage, sharing, transmission, or exchange of information. Furthermore, LMS technology enables tailored learning experiences, catering to the distinct needs and preferences of individual students. This level of customization may improve academic achievement and overall student contentment. An LMS generally facilitates learner registration, the provision of educational activities, and learner evaluation in a digital setting. Comprehensive LMSs typically incorporate tools for competency management, skills-gap analysis, succession planning, certifications, and resource allocation (including venues, rooms, texts, and instructors). Learning Management Systems (LMSs) utilize several development platforms, ranging from Java EE frameworks to Microsoft .NET, and typically incorporate a sophisticated database backend.

Using an ATM (Automated Teller Machine) simulation as a Learning Management System (LMS) for colleges and universities is a new and useful way to teach technical, analytical, and management skills. An ATM-based LMS is different from traditional LMS platforms because it focuses on experiential learning through coding, simulation, and system design instead of just delivering content and testing it. It lets students, especially those in engineering, IT, and management programs, work with real banking systems, learn how transactions work, and look into how to build secure systems.

The ATM simulation can be used as a real-world lab setting in technical fields like computer science or electronics. Students can learn how to use serial ports, program events, encrypt data, and connect to databases. Learners become better at C# programming, UI/UX design, and debugging by changing and adding to the ATM codebase. This fits well with outcome-based education models, where students show what they know and can do through projects instead of tests.

A. Steps of ATM using visual studio

The application typically includes a graphical interface with a keypad, display panel, and buttons for various transactions.

1. PIN Authentication

This is where security starts. When a user types in their PIN on the keypad, the system checks it against stored credentials, which are usually kept in a local database or file. If the PIN is correct, you can get in. If not, the system may lock the account after several failed attempts.

2. Balance Inquiry

Users can check their account balance after they have been verified. This function gets the current balance from the database and shows it on the screen.

3. Cash Withdrawal

Users can take out money by typing in an amount. The system checks to see if the amount is valid (for example, if it is in multiples of ₹100) and if there is enough money in the account. If approved, the balance is changed, and a record of the transaction is made.

4. Cash Deposit

This feature lets people put money into their accounts. The amount you entered is added to the balance and kept.

5. Serial Port Communication

When it uses serial communication, you send data one bit at a time over a communication channel. The System.IO.Ports. The Serial Port class lets this program send and receive data through COM ports, like COM1 and COM2, which are often used to connect to other devices.

V. RESULTS AND DISCUSSION

This study integrates an ATM simulation application created with Visual Studio and C# to investigate the efficacy of Learning Management Systems (LMS) in higher education. The study investigates how simulated banking environments and other experiential learning tools improve student engagement, conceptual understanding, and the development of multidisciplinary skills. The simulation offers a practical platform for students to apply theoretical knowledge in a safe, interactive environment by simulating key ATM functions, such as PIN authentication, balance inquiry, withdrawals, deposits, and transaction tracking. An ATM simulation as an LMS turns passive learning into active exploration. It encourages students from different fields to work together on system design, analytics, and user testing. The platform can be changed to include gamified modules, performance dashboards, and feedback loops. This makes it a flexible and interesting tool for modern education. It gets students ready for real-world banking problems by letting them practice what they've learned in school in a real-world setting.

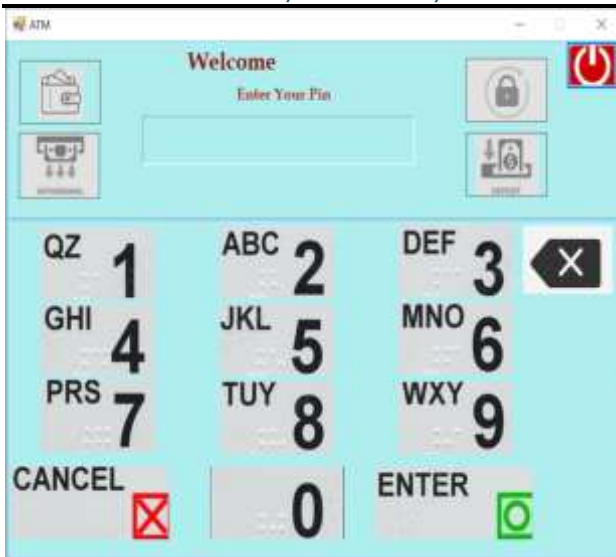


Fig 1: ATM Interface Page

The design of the front page looks like a real ATM interface so that users can easily find their way around. It usually has a welcome message, a numeric keypad (made with button controls), a masked text box for entering a PIN, and a "Submit" button to check credentials.

The first steps in an ATM simulation's security are card scanning and PIN authentication. These are meant to mimic how people access their bank accounts in real life. The system finds the account linked to a card when a user inserts or scans it. It usually does this by using a unique identifier, like a card number or serial input. After that, the user is asked to enter a Personal Identification Number (PIN), which is checked against stored credentials to make sure they have permission to access the system.

Balance Operation



Fig 2: Balance Check Operation

Once the user enters their PIN correctly, the system opens the transaction dashboard. When you click the Balance button, the app gets the default balance of ₹3000 and shows it in a label box, which is usually very clear. At the same time, the other buttons (Withdrawal, Deposit, and PIN Change) are visually dimmed or turned off so that they can't be used at the same time. This makes sure that the user has a focused and safe experience.

Withdrawal Operation

In this ATM simulation with Visual Studio C#, a Message Box that asks the user to enter the amount they want to withdraw acts as a prompt. Since `MessageBox.Show()` is usually used to show messages and not to accept input, it

needs to use an Input Box-style form or a custom modal dialog instead. A ₹1000 withdrawal is started and goes through without a hitch. The system sends a message saying "Withdrawal Successful for ₹1000" to confirm the transaction. After this, the account balance is recalculated and set to ₹2000, which is what it would have been like if the original balance had been ₹3000. This new balance is shown on the interface, through a label box, so that the deduction is clear.



Fig 3: Successful Withdrawal

When it enters a withdrawal amount greater than ₹2000 into the ATM simulation, the system checks the current account balance to make sure it is correct. Because the available balance is ₹2000, any request that goes over this amount is marked as invalid.

VI. CONCLUSION

The ATM simulation is a great way to teach higher education students, especially those studying computer science, management, or financial technology, how to use a Learning Management System (LMS). Students learn about event-driven programming, user interface design, and backend logic by doing things like changing their PIN, checking their balance, and logging transactions. This hands-on method connects theory with practice and strengthens learning through trial and error and solving problems repeatedly. It also helps students think critically because they must plan for edge cases, make sure data is safe, and set up secure workflows. Operations like changing PIN, checking balance, and tracking transactions teach students how to handle data validation, error handling, and session control, which are all important skills for making software and systems that work reliably. This dual-purpose model ultimately helps students build strong systems and understand how they affect society and how they work, which prepares them for real-world problems in digital banking and consumer analytics. In the end, the ATM operation is more than just a coding exercise; it's a way to learn how technology affects user experience, operational efficiency, and strategic decision-making in modern banking.

VII. FUTURE SCOPE

- Students studying management and behavioral sciences can use it to learn about how people use technology, how they think about service quality, and how demographics affect digital adoption.
- With analytics dashboards built in, teachers can keep track of learning outcomes, engagement metrics, and even create customer satisfaction indices (CSI) for research studies.

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