



OUR LADY OF LOURDES COLLEGE
COLLEGE OF COMPUTER STUDIES

**CHECKmate: A Learning Management System with AI-Enabled Assessment Tool
using Large Language Model (LLM)**

**A Capstone Project Presented to the
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In Partial Fulfillment of the Requirements for the Degree
BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

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CHAPTER 1

THE PROJECT AND ITS BACKGROUND

This chapter provides an introduction to the research, covering the project's context, purpose, and description. It also outlines the study's objectives, significance, scope and limitations.

Artificial Intelligence (AI) is improving Learning Management Systems (LMS) by making education more efficient and accessible. Traditional LMS platforms can be expensive and slow, making learning harder for students and increasing teachers' workload. AI-powered LMS solves these issues by automating grading, providing instant feedback, and personalizing learning experiences, which helps students learn faster and reduces the burden on educators (Alotaibi, 2024). Additionally, AI-driven LMS platforms enhance student engagement by adapting to individual learning styles and offering real-time performance analysis. These systems also support collaborative learning, enabling students to interact more effectively in digital environments, which further enhances knowledge retention and academic success (Alhamadi, 2024).

CHECKmate is an AI-powered learning management system currently in development to improve education. It aims to automate grading, detect plagiarism, and provide instant feedback, helping students receive results faster while reducing



teachers' workload. The system is being designed as a web-based platform for easy access on desktops.

Project Context

CHECKmate is developed specifically for Our Lady of Lourdes College, aiming to enhance the institution's digital learning framework. The system will integrate LLM (Large Language Model)-based assessment tools, ensuring faster and more accurate grading while providing personalized feedback. LLMs are advanced AI models trained to understand and process human language, enabling automated evaluation of student submissions with high accuracy and contextual understanding.

The project focuses on creating an AI-powered LMS that is intuitive, efficient, and cost-effective, addressing the following key areas:

- AI-Powered Assignment Evaluation – Automated grading based on predefined rubrics.
- Cloud-Based Hosting – Secure and scalable storage for course materials and assignments.
- Real-Time Notifications Communication – Facilitating seamless interaction between students and instructors.



- Plagiarism Detection – Ensuring academic integrity using AI-driven content analysis. By implementing CHECKmate, Our Lady of Lourdes College can improve the quality of education, reduce administrative burdens on faculty, and enhance student engagement through a data-driven, AI-enabled learning environment.

Purpose and Description

The rapid advancement of educational technology has made learning management systems (LMS) increasingly common. However, many existing LMS platforms struggle with grading efficiency, accessibility, and cost-effectiveness. Traditional assessment methods are time-consuming and require significant instructor effort, often delaying student feedback. Smaller institutions and independent educators face limited access due to the high subscription costs of many third-party LMS solutions.

A significant number of LMS platforms also lack AI-powered features to enhance grading and assessment. Current systems rely on manual evaluation methods, which are often subjective, inconsistent, and excessively time-consuming. This inefficiency negatively impacts both students and instructors, reducing engagement and productivity in academic environments.



This study aims to design an AI-integrated LMS that enhances efficiency and accessibility by leveraging AI technology to optimize the assessment process, ultimately improving learning outcomes

Objectives of the Study

General Objectives

This study aims to develop CHECKmate, an AI-powered web application designed as a desktop-based Learning Management System (LMS). The system will automate grading using AI-driven tools and APIs, streamline assessment processes, provide faster feedback for students, and optimize accessibility for desktop users.

Specific Objectives

1. Develop a user-friendly AI-powered LMS to enhance teaching and learning with the following features:
 - a. Automatic Grading - AI checks and scores assignments instantly.
 - b. Easy Dashboard - Simple layout for quick access to features.
 - c. Online Homework Submission - Students upload assignments online.
 - d. Progress Tracker – Shows student learning progress.
 - e. Class Chat - – Lets students and teachers talk easily.



- f. Basic Reports – Generates simple reports on student performance.
2. Implement LLM-based tools for automated grading and feedback.
3. Ensure cost-effective cloud storage for course materials and assignments.
4. Optimize accessibility for a web application designed for desktop use.
5. Integrate a notification system for seamless faculty-student communication.

Significance of the Study

This study explores the effects of artificial intelligence (AI) on various parts of education, including teachers, students, schools, and researchers. It demonstrates ways in which AI tools improve the quality and experience of learning.

For Educators. The AI-powered grading system will significantly reduce teachers' workloads by automating assessment tasks. This will allow educators to dedicate more time to interactive learning and student engagement rather than spending hours on manual grading.

For Students. CHECKmate will provide timely and objective feedback, helping ensure students receive consistent and fair evaluations. Faster



assessment results will allow students to identify their strengths and areas for improvement, enhancing their overall learning experience.

For Educational Institutions. By offering a cost-effective alternative to existing LMS solutions, institutions can modernize their digital learning environment without incurring high operational costs. The platform's AI-driven automation will also contribute to a more structured and efficient academic process.

For Developers and Researchers. This study will contribute to the advancement of AI-driven educational technology by demonstrating how LLMs can be effectively integrated into an LMS. It serves as a foundation for future innovations in AI-assisted learning platforms, encouraging further research and development in this field. CHECKmate's significance extends beyond its immediate users, demonstrating how AI can transform traditional LMS platforms into more engaging and efficient educational tools.

Scope and Limitations

Scope

This study focuses on the development and implementation of CHECKmate, an AI powered web application designed as a desktop-based Learning Management System that integrates Large Language Models



(LLMs) for automated assignment grading. The system will provide the following key functionalities:

1. Automated Grading System – AI-based grading tools that analyze student assignments based on predefined rubrics set by instructors.
2. Cloud-Based Storage – A cloud-based file management system for storing course materials, assignments, and other educational resources.
3. Notification and Announcement System – A built-in feature that enables instructors to send real-time updates and announcements to students.
4. User-Friendly Interface—A simple and intuitive UI/UX to enhance usability.

Limitations

Despite its capabilities, CHECKmate has the following limitations:

1. Limited Assessment Types – The AI grading system will mainly support text-based assignments like essays and reports. It will not initially handle subjects that require solving math problems or drawing diagrams.
2. Teacher Review Needed – While AI helps speed up grading, teachers will still need to check the results to ensure fairness and accuracy.



3. Internet Required – Since the system runs online, users must have a stable internet connection to access it.
4. Basic Features First – The project will focus on the most important LMS features first, with improvements planned based on user feedback and future updates.

This study aims to build a strong starting point for an AI-powered LMS while recognizing areas that may need further improvement over time.



CHAPTER 2

REVIEW OF RELATED LITERATURE AND STUDIES

This chapter presents a review of related literature and studies that support the development of the CHECKMate web application. The discussion covers both foreign and local literature, focusing on artificial intelligence (AI), Learning Management Systems (LMS), and Large Language Models (LLM). Additionally, this section synthesizes the findings and identifies gaps that this study aims to address.

Learning Management System (LMS)

Reich (2022)

Educational technologies have traditionally employed instruction approaches, where learning is teacher directed, and students passively receive information. Platforms such as Coursera and edX exemplify this approach through their Massive Open Online Course. While these platforms have widened access to education, they often struggle with engagement and retention among diverse learners due to their one size-fits-all nature (Reich 2022).

Heiser et al. (2025)

In their study, Heiser et al. (2025) conducted a systematic review to identify inclusive design considerations for videoconferencing in higher education, aiming to



support digital well-being and equitable learning. Analyzing data from 36 empirical studies, the authors identified six key considerations: accessibility, active learning strategies, multimodal communication, readiness, social presence, and sociocultural sensitivity. These considerations provide a practical framework for course designers to create inclusive and effective video conferencing learning environments.

The study emphasizes that digital wellness is a shared responsibility among institutional stakeholders, including faculty, learners, and administrative professionals. The authors recommend that institutional policies prioritize learner choice and equitable access, empowering stakeholders to make informed decisions about digital habits. Addressing accessibility barriers through intentional learning design is crucial to ensure meaningful participation for all students. Overall, the research highlights the importance of inclusive design in promoting digital well-being in videoconferencing-based education.

Alhamadi (2024)

Alhamadi (2024) studied how AI-powered Learning Management Systems (LMS) improve teaching and learning in higher education. The research showed that AI can help teachers by automating tasks, giving personalized feedback, and predicting student performance. Using different research methods, the study explored the benefits and challenges of AI in education. This is related to CHECKmate: A Learning



Management System with AI-Enabled Assessment Tool using Large Language Model (LLM) because both focus on using AI to assess students and provide learning support. The study helps confirm that AI-driven tools can make learning more effective and efficient, supporting the goal of CHECKmate.

Tenorio et al. (2023)

Tenorio et al. (2023) assess the effectiveness of the Learning Management System (LMS) used at the University of Science and Technology of Southern Philippines. The study evaluates user satisfaction and system efficiency, offering policy recommendations to enhance LMS implementation. Findings from this research can inform the development of CHECKmate, ensuring it meets the specific requirements and expectations of local institutions.

Imperial and Ong (2021)

Imperial and Ong (2021) conducted a study to identify the difficulty levels of reading materials in Filipino education. They analyzed various linguistic features to assess difficulty reading, aiming to ensure quality and effective learning. This research is relevant to CHECKmate as it provides insights into evaluating educational content, which can be integrated into AI-enabled assessment tools.



Artificial Intelligence (AI)

Zhang & Huang,(2024)

In their 2024 study, Zhang and Huang explored how chatbots powered by large language models (LLMs) can aid in learning new vocabulary in a second language. They divided 52 foreign language students into two groups: one group used an AI chatbot to assist their learning, while the other group did not. Over eight weeks, both groups studied the same set of target words. After the study period, tests showed that the group using the chatbot had a better grasp of both recognizing and using new words compared to the group without chat bot assistance.

The researchers also found that the chatbot group retained their ability to use new words longer and picked up additional vocabulary incidentally. This suggests that AI chatbots can be effective tools in enhancing vocabulary learning in a second language. The study highlights the importance for educators to understand and incorporate such technologies into their teaching methods to improve language learning outcomes.

Sajja et al.(2023)

Sajja et al. (2023) introduced the Artificial Intelligence-Enabled Intelligent Assistant (AIIA), a framework designed to enhance personalized and adaptive learning in higher



education. Using AI and Natural Language Processing (NLP), AIIA interacts with students, answers inquiries, generates quizzes, and offers personalized learning pathways while reducing cognitive load. The study details its system architecture, intelligent services, and integration with Learning Management Systems (LMS), highlighting AI's role in improving assessments and tailored learning experiences. This research supports our project by providing insights into AI-driven assessment tools and personalized learning within an LMS (Sajja et al., 2023).

El-Deeb et al.(2024)

Artificial intelligence (AI) has significantly changed the traditional understanding of intelligence, bridging the gap between human and machine capabilities. However, AI is advancing faster than regulations can keep up, raising concerns about ethical use and control. Open-source AI accelerates development, making it difficult to impose restrictions without hindering progress. Various policies, including the European Union AI Act (EU AI), White House AI, and the G7's Hiroshima Artificial Intelligence Process (HAP), aim to regulate AI while maintaining innovation. The EU's AI Act, recognized as the world's first comprehensive AI law, focuses on five key principles: safety, transparency, traceability, non-discrimination, and environmental sustainability. To ensure responsible AI, regulators must adopt dynamic and globally harmonized policies (El-Deeb et al., 2024).



Reyes-Chua (2023)

Reyes-Chua (2023) examines the integration of AI in Philippine higher education, focusing on its effects on teaching and administrative processes. The study highlights both the benefits and challenges of AI adoption, providing insights into how AI can enhance educational practices in the local context. This aligns with CHECKmate's goal of implementing AI-driven tools tailored to the needs of Filipino educators and administrators.

Okebukola (2024)

The integration of artificial intelligence (AI) in higher education is profoundly influencing academic integrity, institutional practices, and quality assurance. Okebukola (2024) examines AI's dual role, highlighting its potential to both facilitate academic misconduct and enhance ethical practices within educational settings. The adoption of AI technologies has streamlined teaching, learning, and research processes, leading to increased efficiency and innovation. However, this integration also raises ethical concerns, particularly regarding data privacy, algorithmic bias, and the evolving responsibilities of educators (Okebukola, 2024).

Saidu (2024)

Saidu (2024) addresses the specific challenge of plagiarism in the context of AI tools like ChatGPT. Despite awareness of plagiarism's implications, students may resort



to AI generated content due to factors such as time constraints and the pursuit of higher grades. Saidu emphasizes the importance of fostering a culture of academic integrity to mitigate the potential misuse of AI in academic writing (Saidu, 2024).

Murana (2025)

Murana (2025) explores the application of AI in curriculum design, focusing on its ability to identify and address skill gaps in existing educational programs. By analyzing large datasets, AI can inform curriculum development, ensuring alignment with current industry demands. This approach not only enhances the relevance of educational offerings but also prepares students for the evolving job market (Murana,2025).

Nelson (2024)

Nelson (2024) explores how artificial intelligence (AI) is transforming higher education by reshaping teaching, learning, and research. In *Academic Identity in the Age of AI: Higher Education and Digital Transformation*, he highlights how AI improves efficiency in academic workflows while also raising ethical concerns such as data privacy, algorithmic bias, and the changing roles of educators. The book presents case studies showing how universities use AI to enhance learning experiences and streamline institutional processes. As AI continues to advance, Nelson emphasizes the need for institutions to balance technological innovation with ethical considerations to create a responsible and inclusive academic environment (Nelson, 2024).



Perkins (2023)

Perkins (2023) explores the challenges AI tools, particularly Large Language Models (LLMs) like ChatGPT, pose to academic integrity in formal assessments. He examines their evolving role in education, including writing instruction, human-AI collaboration, support for English as a Foreign Language (EFL) learners, and Automated Writing Evaluations (AWE). A major concern is that LLMs can generate original, coherent text that may bypass current plagiarism detection tools, raising integrity issues. However, Perkins argues that using AI tools is not inherently plagiarism; rather, transparency is key. He stresses that whether AI-assisted work constitutes misconduct depends on institutional policies. Therefore, he urges Higher Education Institutions (HEIs) to update their guidelines to clearly define acceptable AI use while upholding academic standards.

Cooper et al. (2024)

In their 2024 article, Cooper et al. (2024) examine how large language models (LLMs), a form of artificial intelligence (AI), can assist with coding tasks in ecology and evolution research. They highlight how LLMs can generate, explain, debug, optimize, and test code, helping researchers streamline their work while focusing on more complex aspects. The authors emphasize the importance of crafting precise prompts and carefully reviewing AI-generated outputs for accuracy. LLMs can make coding more



accessible, particularly for those with limited experience, but the quality of AI-generated code may vary, sometimes containing errors. The authors advocate for using LLMs as educational tools while maintaining traditional coding education to ensure critical thinking and evaluation skills. They also recommend transparency in research publications, advising that any AI use should be clearly disclosed in the methods section.

Lan & Chen,(2024)

Lan and Chen (2024) explore the integration of generative AI in education, highlighting its potential to work alongside human teachers. They propose a model where AI provides personalized content delivery and data-driven feedback, while educators contribute pedagogical expertise and emotional intelligence. This collaboration aims to improve learning efficiency and address diverse student needs. However, the study also acknowledges concerns such as overreliance on AI, which could impact students' engagement and critical thinking. The authors suggest that a balanced approach, where AI supports rather than replaces teachers, is crucial for effective learning outcomes.

Estrellado (2023)

Estrellado (2023) explores the integration of AI in the Philippine educational system, focusing on adaptive learning technologies that personalize educational



experiences. The study emphasizes the need for careful consideration of AI's potential and challenges within the local context. This aligns with CHECKmate's objective to implement AI-driven assessment tools tailored to Filipino learners

Dalan (2023)

Dalan (2023) provides a comprehensive review of AI integration in language education within the Philippines. The study examines various AI applications, such as language learning apps and automated assessments, discussing their potential and challenges in the local educational landscape. This research supports CHECKmate's aim to incorporate AI in language assessments, ensuring cultural and contextual relevance.

Flodén (2024)

Flodén (2024) explores the effectiveness of ChatGPT-3.5 in grading university-level exams, also examining its consistency, accuracy, and alignment with human grading. The study analyzed 463 Master's-level exam responses, each graded three times, totaling 1,389 individual gradings. Results showed that 70% of ChatGPT's scores were within 10% of human-assigned grades, with 31% falling within a 5% margin. While the AI tended to assign slightly higher scores on average, it avoided extreme high or low marks. However, it struggled with grading questions tied to specific course lectures but performed better on general topics. Educators were surprised by the level of agreement



between ChatGPT and human grading but raised ethical concerns about AI's transparency, potential biases, and the implications of relying on automated assessment. The study underscores the importance of continuous assessment and ethical considerations as AI grading becomes more common in higher education.

März et al. (2024)

In their 2024 article, März et al. explore the legal challenges of using artificial intelligence (AI) and large language models (LLMs) in academic assessments and student work. They emphasize the need for universities to establish clear policies on AI usage to prevent issues like plagiarism and cheating, which can be difficult to detect. The authors stress the importance of ethical guidelines, urging both students and educators to use AI responsibly (März et al., 2024).

The article also examines relevant laws and regulations, including copyright laws, data protection policies, and upcoming AI regulations in the European Union. While AI can assist in generating exam questions, the authors highlight that human oversight is essential to ensure accuracy. Additionally, they emphasize that exams cannot be graded solely by AI without human review to comply with legal standards. To address these concerns, the authors recommend that universities provide AI training for educators and implement clear guidelines to ensure responsible AI integration in education (März et al., 2024).



Gao et al. (2024)

In their 2024 article, Gao et al. conducted a systematic review of automated systems designed to assess text-based responses in higher education. Recognizing the challenges instructors face in grading open-ended questions, especially in large classes, the authors analyzed 93 studies out of an initial 838 to understand the development and application of these systems. They categorized the systems based on input, output, and processing frameworks, and examined the educational objectives and motivations behind their implementation. The review highlights the potential of artificial intelligence (AI) and natural language processing (NLP) technologies, particularly large language models (LLMs), to streamline the evaluation process and provide timely feedback to students.

Jiang & Sha (2025)

Jiang and Sha (2025) explore the reliability of Large Language Models (LLMs) in generating and evaluating educational feedback, aiming to verify their consistency and accuracy as evaluators. The research highlights how LLMs can assist educators by automating assessment tasks, providing detailed feedback, and ensuring a standardized evaluation process. However, it also emphasizes the need for careful implementation to ensure alignment with human evaluators. This study is relevant to our capstone project as it supports the integration of LLMs in assessment tools within a



Learning Management System. By leveraging the insights from this research, our project will ensure that AI-driven evaluations are not only efficient but also consistent and reliable in assessing student performance (Jiang & Sha, 2025).

Perkins, Furze, and Roe (2024)

Perkins, Furze, and Roe (2024) introduced the Artificial Intelligence Assessment Scale (AIAS), a framework for integrating generative AI into educational assessments while maintaining academic integrity. Their study emphasizes the importance of ethical AI use in learning environments and provides strategies for educators to apply AI-based assessment tools effectively. This is relevant to CHECKmate: A Learning Management System with AI-Enabled Assessment Tool using Large Language Model (LLM) as it ensures responsible AI-driven evaluation methods that maintain fairness and reliability in student assessments.

Wilkins (2024)

Wilkins (2024) examines how to make Large Language Models (LLMs) more energy-efficient in data centers. The study investigates how different hardware, like NVIDIA GPUs, Apple Silicon, Intel CPUs, and AMD CPUs, affects energy use and performance. It highlights the trade-offs between model complexity, token counts, and system speed (Wilkins, 2024).



To improve efficiency, Wilkins (2024) develops strategies for managing workloads. An offline routing system is designed to reduce energy use while keeping high accuracy, and an online routing system adjusts in real-time to optimize resource use. Simulations show that these methods help balance energy consumption and performance (Wilkins, 2024).

This research provides insights into making AI systems more sustainable. It shows that optimizing energy use in AI can reduce environmental impact while maintaining efficiency. The study also makes its datasets and benchmarks available for further research (Wilkins, 2024).

Marche, S., et al. (2022).

Artificial Intelligence (AI) is something educators should already know about, and many may wonder how it will impact their jobs in the future (Marche, 2022). Schools and universities have started using Educational Data Mining, which uses AI to process large amounts of data to better understand students and their learning environments. AI tools like Amazon Alexa, Google Assistant, and Apple Siri can understand different accents and non-standard language (Moussalli & Cardoso, 2020). These tools are used in creative projects, such as helping students build personalized voice recognition systems as tour guides (Frazier et al., 2020). However, a new form of AI, Large Language Models (LLMs), has become a powerful tool in language teaching. LLMs are trained on



billions of texts, which help them predict the next word and generate relevant and accurate text. LLMs can interpret requests and produce human-like responses, such as student essays, leading many to predict major changes in education (Roose, 2023; Gillani, 2023).

Bent (2023)

In his 2023 article, “Large Language Models: AI’s Legal Revolution,” Adam Allen Bent explores the transformative impact of Large Language Models (LLMs) on the legal profession. Bent provides a historical overview of artificial intelligence advancements, leading up to the development of contemporary LLMs, and examines their potential applications in legal contexts. He discusses the capabilities of current LLM products and emphasizes the growing inevitability of AI integration into legal practice. Bent advocates for the legal industry’s proactive adoption and regulation of these technologies to ensure ethical legal services.

The article also examines how LLMs can be applied in various legal domains, including academia, private practice, and the U.S. court system. Bent highlights how LLMs can enhance legal research, drafting, and decision-making, potentially improving efficiency and accuracy. However, he also raises concerns about overreliance on AI and stresses the importance of maintaining human judgment in legal matters. The article



concludes with a call to reconsider judicial interpretations, particularly regarding the defense of reproductive autonomy, within a polarized legal environment.

Gunawardena et al.(2023)

In their 2023 study, Gunawardena et al. looked at using deep learning models to automate the analysis of online knowledge construction, which is usually done through the Interaction Analysis Model (IAM). They compared two types of neural networks: a feed-forward network using Doc2Vec and a transformer-based model using BERT. The study aimed to see how accurately these models could predict IAM phases compared to human coders. The results showed that the Doc2Vec model had an accuracy of 21.55%, fine-tuning a pre-trained large language model (LLM) reached 43%, and prompt-engineering an LLM achieved 52.79%. The authors suggest that improving training data or refining prompts could make the models perform better.

This research, based on social constructivism and the IAM framework, provides insights into how AI can support online collaborative learning. The findings could help develop AI tools that give timely feedback to students and course designers, potentially making online education more effective.

Zhang, Yu, Li, and Hou (2023)



Zhang, Yu, Li, and Hou (2023) explored how large language models (LLMs) process knowledge using an educational diagnostic assessment approach. Their findings provide insights into how AI understands and evaluates student responses, which is useful for designing intelligent assessment tools. This study supports the development of CHECKmate by offering a scientific basis for AI-driven student evaluation and personalized learning strategies.

Jeon and Lee (2023)

Jeon and Lee (2023) examined the role of AI, particularly ChatGPT, in complementing human teachers in education. Their research discusses the benefits and challenges of AI-assisted learning and how LLMs can work alongside educators to enhance student engagement. This aligns with CHECKmate's goal of providing AI-powered learning assistance, ensuring that AI supports, rather than replaces, traditional teaching methods.

Cruz, J. M., & Cheng, C. (2022)

This paper focuses on enhancing language resources for the low-resource Filipino language by constructing the TL Unified dataset, a large-scale pretraining corpus that surpasses existing datasets in scale and topic variety. Additionally, the researchers pretrain new Transformer language models following the RoBERTa



technique to improve upon existing models trained with smaller corpora. The study's advancements in language modeling are crucial for developing AI-enabled assessment tools that accurately process and evaluate content in the Filipino language. Incorporating these improved language models into our project will enhance the system's ability to understand and assess student input effectively.

Assessment Tool

Kooli & Yusuf,(2024)

This study examines the role of ChatGPT and other LLMs in automating the grading process. It discusses the advantages of AI-driven assessment tools, such as increased efficiency, unbiased evaluations, and scalability in educational settings. The authors also address challenges such as ethical concerns, data privacy, and the need for humans overlooking AI-powered grading systems. This study is crucial to our capstone project as it directly supports the development of an AI-enabled assessment tool in our LMS. It provides valuable insights into the benefits and challenges of AI-driven grading, ensuring that our system incorporates best practices for fair and accurate assessments.



Liao, Zhang, Wang, & Luo (2024)

Liao, Zhang, Wang, and Luo (2024) studied how to design and build an AI powered visual report tool for formative assessments that helps improve student learning and self-regulation. Their research, published in the British Journal of Educational Technology, introduced a tool that uses natural language processing, cognitive diagnostics, and simple charts to analyze and show students' exam data. The study found that AI-based assessment tools can greatly help students understand their learning progress and support self-directed learning. This study is important for our CHECKmate project because it shows how effective AI can be in educational assessments. By using similar AI methods, CHECKmate aims to offer automated grading, personalized feedback, and data-driven insights to improve both teaching and learning.

Large Language Model(LLM)

Peláez-Sánchez (2024)

In their 2024 article, Peláez-Sánchez et al. examine how large language models (LLMs), a type of generative artificial intelligence (AI), are influencing higher education within the framework of Education 4.0. The authors conducted a systematic review of 83 relevant studies, selected from an initial pool of 841 papers, to assess the integration of LLMs in modern teaching methods. Their analysis indicates that LLMs have the



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potential to enhance learning by promoting autonomy, collaboration, and interactivity among students. However, they emphasize the importance of human oversight to ensure the accuracy and quality of AI-generated content.

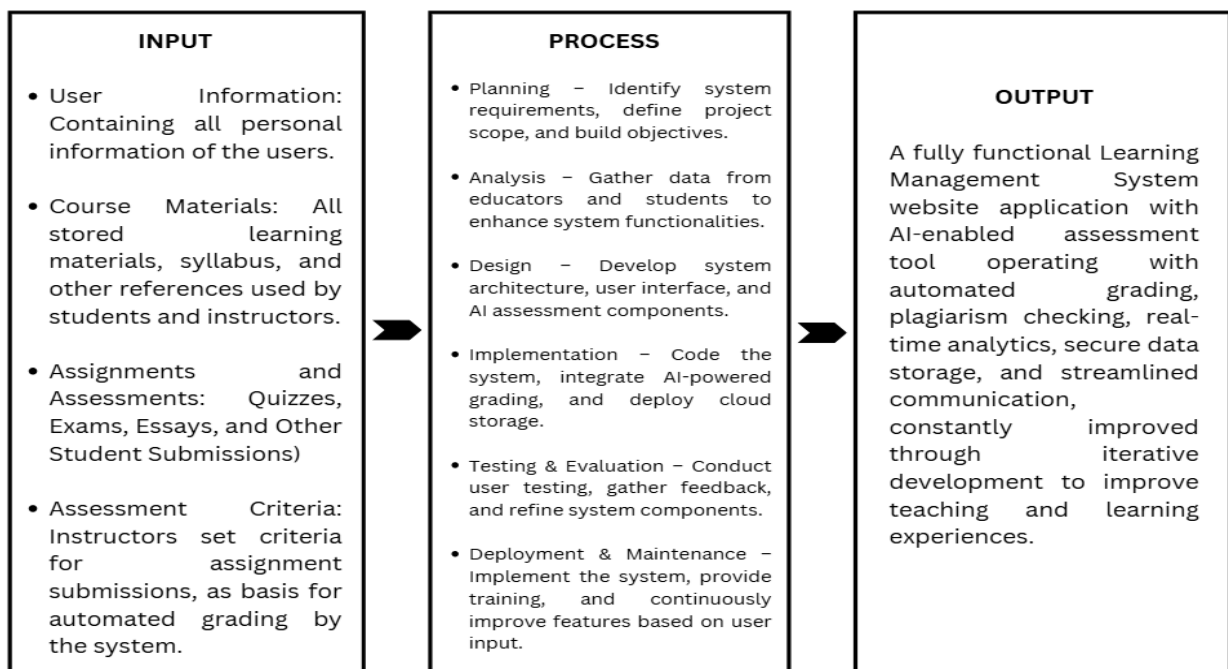


CHAPTER 3

METHODOLOGY

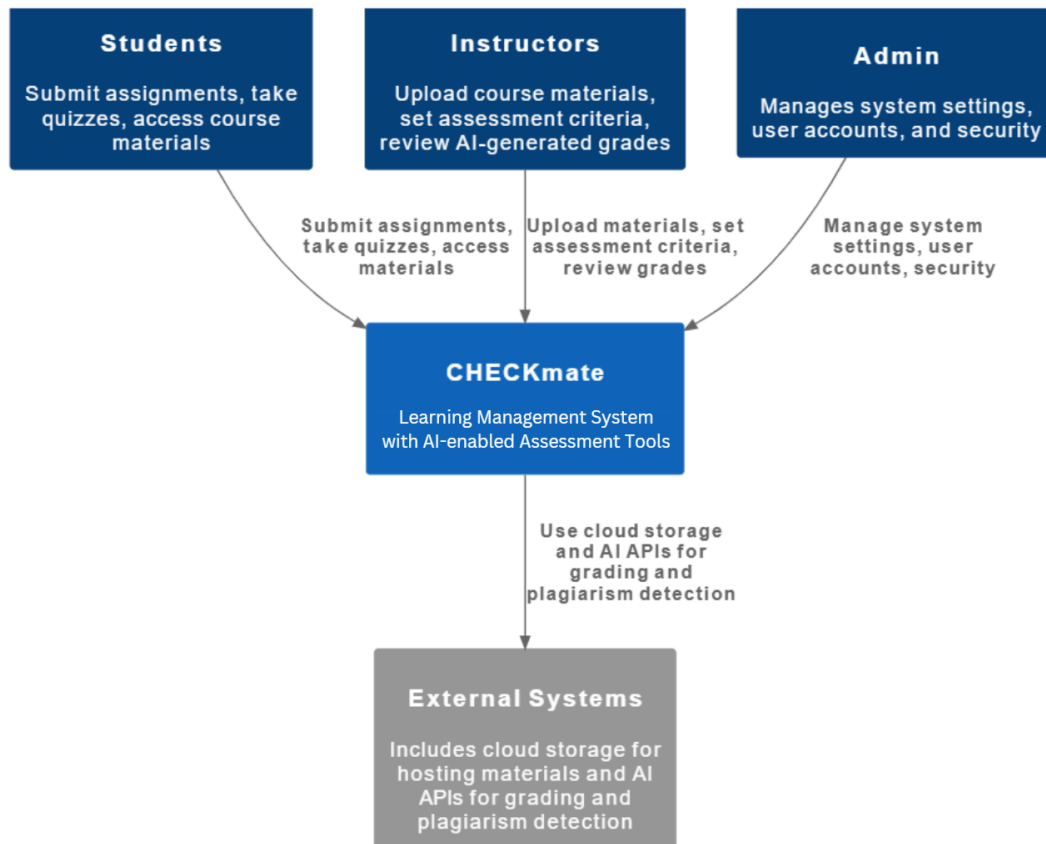
In this chapter, the method taken to develop CHECKmate; a Learning Management System (LMS) with AI-enabled assessment tools is explained. This includes research design, procedures, frameworks, and employing System Development Life Cycle (SDLC) that will be used as guidelines in developing the project.

Conceptual Framework





Context Diagram



Actors:

1. **Students** – Submit assignments, take quizzes, and access course materials.
2. **Instructors** – Upload course materials, set assessment criteria, and review AI-generated grades.
3. **Admin** – Manages system settings, user accounts, and security.



4. **External Systems** – Includes cloud storage for hosting materials and AI APIs for grading and plagiarism detection.

Process Flow:

1. **Course Material Management**

- Instructors upload learning resources.
- Students access and download materials.

2. **Assignment & Assessment Submission**

- Students submit assignments and take assessments.
- The system processes submissions using AI-enabled assessment tools.

3. **Grading & Feedback**

- AI evaluates submissions based on predefined criteria.
- Instructors review grades.
- Feedback is provided to students instantly.

4. **Plagiarism Detection**

- AI scans assignments for originality.
- Reports are generated for instructor review.

5. **Notifications & Reports**

- Performance reports help track student progress.



Current System

Traditional Learning Management Systems (LMS) have some drawbacks, such as manual grading, which is time-consuming and provides inconsistent feedback. Most are not AI-integrated, which is more time consuming in assessment and grading, which could affect productivity and efficiency. Also, some LMS are highly-costing to maintain and produce, making it inaccessible to smaller institutions. It also does not have any automatic plagiarism checking, instructors have to check it manually just to maintain academic integrity. Furthermore, student-teacher interaction is also limited, as real-time notification and customized feedback features do not exist in most systems. These inefficiencies led to the development of a smart, automated, and low-cost solution to enhance the digital learning and teaching experience.

Proposed System

CHECKmate overcomes such limitations by incorporating AI-enabled assessment tools. Through automating the grading and feedback process, it reduces workloads, provides faster accessibility, and ensures a consistent and efficient assessment. The system also provides real-time communication and a cost-effective solution for effective digital learning and teaching. Below are the following key features of the system:



- Automated Grading & Feedback: Assess student submission and provide precise scores and feedback according to predefined rubrics.
- Enhanced Plagiarism Detection: AI-enabled detection to maintain academic integrity and authenticity.
- Cross-Platform Availability: Will be designed for desktop and mobile devices, ensuring accessibility.
- Real-Time Notifications & Alerts: Notifies students and instructors of assignment submissions and deadlines.
- Cost-Effective Development: Affordable solution for high-cost tradition LMS, all with AI-integrated features.

AI Configuration and Assessment Rubric Design

AI Parameters

The CHECKmate system integrates a Large Language Model (LLM) such as GPT-based architecture to perform automated assessment. The AI component is configured with the following operational parameters to ensure consistent, reliable, and contextual evaluations:



- Model Type: Large Language Model (LLM) such as GPT (OpenAI), fine-tuned for academic writing and rubric-based grading.
- Input Type: Text-based assignments (essays, reports, reflections).
- Prompt Engineering: Dynamic prompt templates including grading criteria, instructions, and sample outputs to guide LLM response.
- Token Limit: Up to 2,048 tokens per submission (adjustable based on model capacity).
- Temperature: 0.3 (to prioritize accuracy and reduce randomness in responses).
- Top-p (nucleus sampling): 0.9 for balanced diversity.
- Plagiarism Detection Integration: Uses external API (e.g., Copyleaks, Turnitin) for originality checking, then combines results with LLM feedback.
- Review Loop: AI-generated scores are presented to instructors with an option for human override to maintain fairness and transparency.

Rubric Type and Design

CHECKmate uses an analytic rubric to enable precise grading and detailed, criterion-based feedback. This rubric structure is optimal for LLM evaluation, as it allows the model to analyze and score each dimension of an assignment separately.



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Sample Analytic Rubric for Essay-Type Assignment:

Criteria	5 (Excellent)	4 (Good)	3 (Fair)	1-2 (Needs Improvement)
Content Relevance	Fully addresses topic and instructions	Mostly relevant, minor gaps	Partially relevant, some off-topic	Lacks relevance or unclear purpose
Organization	Clear intro, body, and conclusion	Logical structure, minor issues	Somewhat disorganized or abrupt	Disorganized, lacks cohesion
Grammar & Mechanics	No errors in grammar or punctuation	Few minor errors	Multiple errors, but meaning intact	Frequent errors affecting readability
Originality	Ideas are fresh and unique	Some original insights	Limited originality	Heavily derivative or copied
Clarity & Style	Very clear, appropriate academic tone	Generally clear, mostly appropriate	Some unclear or inconsistent tone	Difficult to understand or off-tone



Rubric Variants for Other Assignments:

1. Reflection Paper Rubric

Criteria	5	4	3	1-2
Depth of Insight	Demonstrates deep reflection and critical thinking	Generally thoughtful, some depth	Basic reflection, lacks depth	Superficial or minimal reflection Personal Connection
Personal Connection	Strong connection to personal experience	Clear but limited connection	Some connection, not well developed	Lacks personal relevance Clarity & Expression



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Clarity & Expression	Clear and expressive writing	Mostly clear with minor issues	Some confusing parts	Difficult to follow
Grammar & Structure	Well-written, no errors	Minor grammatical issues	Noticeable errors	Frequent, distracting errors

2. Project Proposal Rubric

Criteria	5	4	3	1-2
Problem Definition	Clearly and thoroughly defined	Mostly clear with minor gaps	Somewhat vague	Poorly defined



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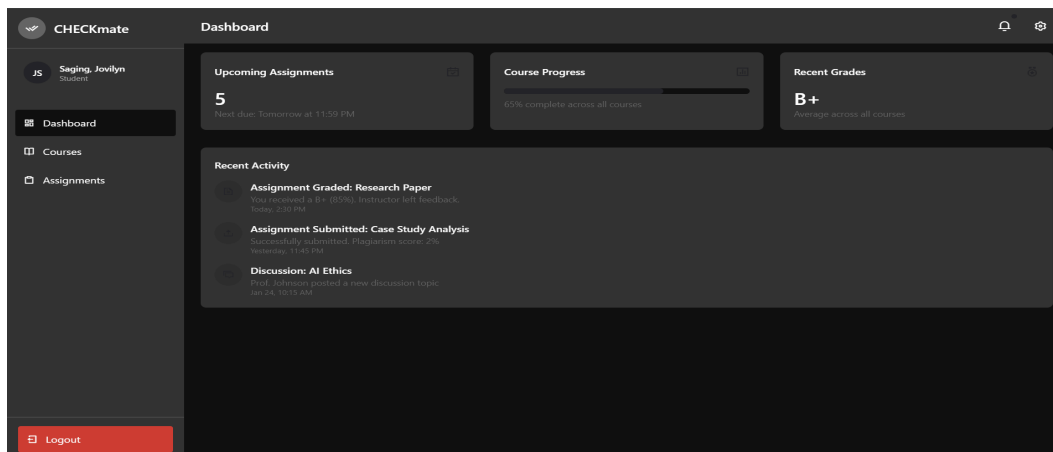
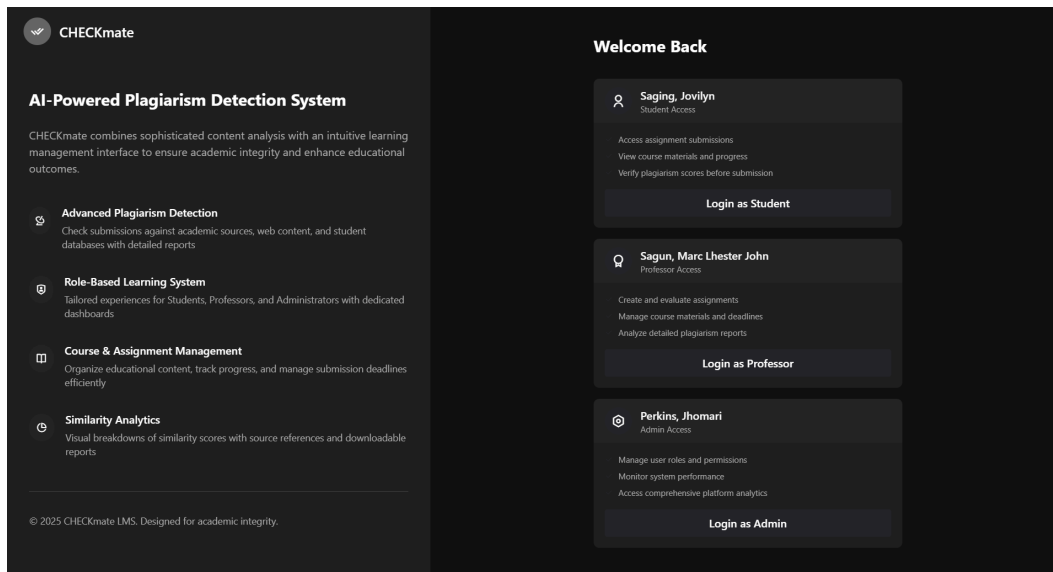
Feasibility	Highly feasible and well planned	Reasonably feasible	Some issues in feasibility	Unfeasible or unclear plan
Innovation	Original and creative	Somewhat innovative	Minimal originality	Lacks innovation
Organization	Well-structured and logical	Mostly clear and logical	Basic structure	Disorganized



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System Sketch





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CHECKmate

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Courses

Assignments

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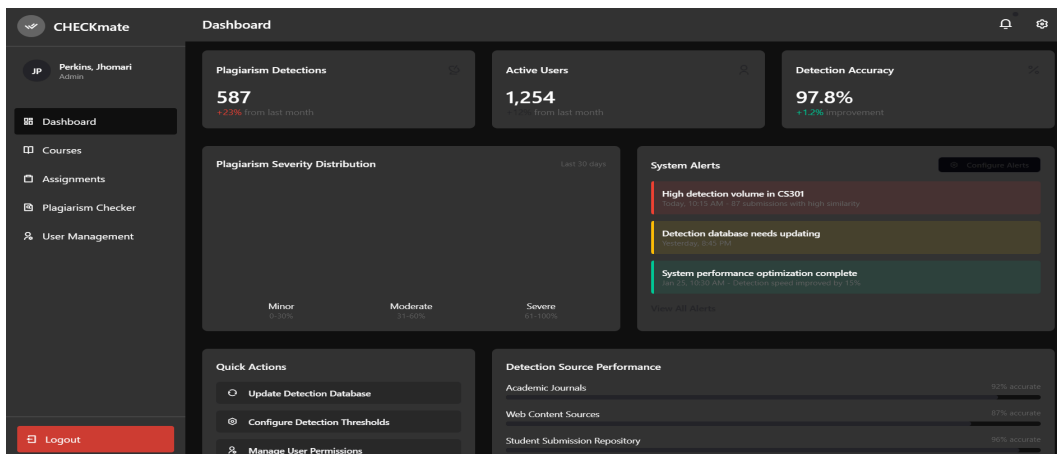
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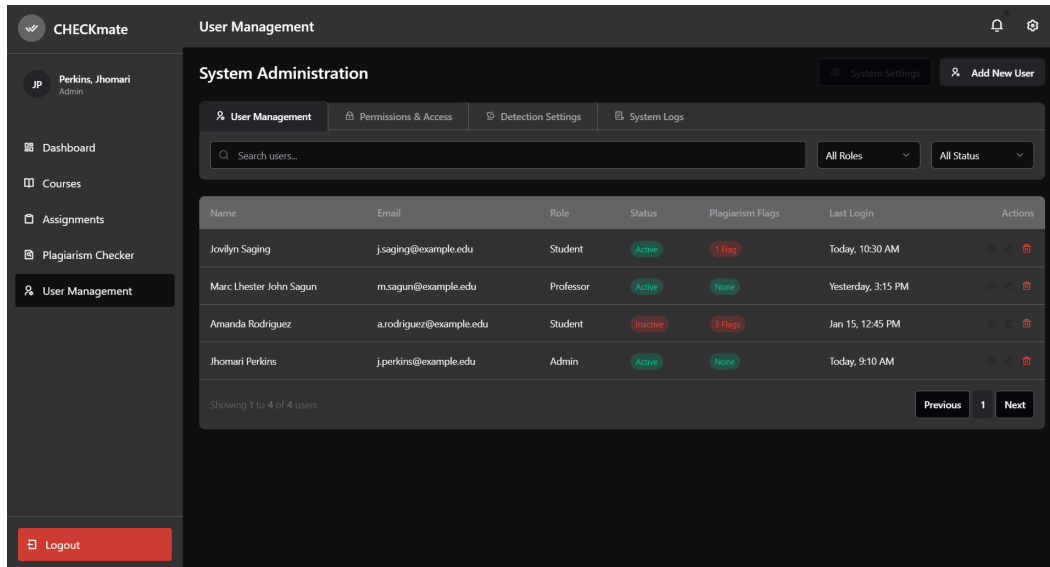
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System Features and Services

CHECKmate offers several helpful features to improve learning:

- AI-powered assessments - Automatic grading and feedback.
- Personalized learning - Tailored content and evaluations based on student performance.
- Data-driven insight - Reports on student progress and areas needing improvement.

System Architecture/Design

System Architecture/Design

System architecture defines how CHECKmate works and how different parts connect to make it function smoothly.



- User Interface (UI) - The simple design where users interact with the platform.
- AI Engine - The part that automatically grades assignments and provides feedback.
- Database - Stores student data, assignments, grades, and feedback.
- Assessment Tool - Handles grading and gives personalized feedback.
- Reports - Shows progress and areas for improvement through easy-to-read reports.

This architecture helps CHECKmate run smoothly with automatic grading, personalized learning, and insightful reports.

Implementation Plan

The implementation plan will follow an iterative approach.

1. Design: Build the system structure (LMS and AI tools).
2. Develop: Create features like grading and feedback automation.



3. Test: Evaluate system performance and gather feedback.
4. Refine: Update and improve based on feedback.

Advantages Over Current Systems

CHECKmate offers several advantages compared to traditional systems:

- Faster grading- AI speeds up the process of providing grades and feedback.
- Personalized experience- Each student gets feedback and resources suited to their learning needs.
- Efficient for teachers- Reduces teachers' workload by automating grading.

Expected Results

By implementing CHECKmate, we expect the following outcomes:

- Improved learning experience: Students will receive faster and more personalized feedback, helping them understand their progress and areas for improvement.
- Reduced teacher workload: Teachers will save time by automating grading and assessments, allowing them to focus more on teaching and less on administrative tasks.



- Enhanced student performance: The system will help students identify where they need to improve.

System Dev Life Cycle (Iterative)

The System Development Life Cycle (SDLC) is the process we follow to create and improve CHECKmate. We use an iterative approach, which means we develop the system step by step, making improvements along the way. Here's how it works:

- Planning & Analysis -We first gather the needs and goals of CHECKmate by talking to teachers, students, and other users to understand what features are important.
- Design - We plan the system's layout and how it will work, making sure it includes AI-powered assessments and personalized learning.
- Development/Implementation - In this step, we build the system, adding the features like automated grading and feedback.
- Testing - After development, we test the system to check if everything works properly and if AI assessments are accurate.
- Deployment - Once testing is complete, we make the system available to students and teachers to use.



- Maintenance & Updates - We keep improving the system based on feedback from users, fixing any issues, and adding new features.

Theoretical Framework

According to Holmes et al. (2019), the AI-Enhanced Learning Analytics framework emphasizes the use of artificial intelligence to provide real-time, data-driven insights into student performance and learning processes. This framework is particularly relevant to CHECKmate: A Learning Management System with AI-Enabled Assessment Tool using Large Language Model (LLM), as it highlights how AI can transform traditional educational tools into intelligent systems that support personalized and adaptive learning. In CHECKmate, the LLM-enabled assessment tool serves as a core component, allowing educators to automate grading, generate detailed feedback, and adapt learning paths based on individual student needs. This creates a more efficient and effective learning environment that caters to diverse learners.

The inter-relationship between the Large Language Models (LLM), the learning management system, and the assessment tool is one of system interdependence, where each component relies on the others to deliver a cohesive and seamless educational experience. For example, the LLM



processes student responses and generates feedback, the learning management system organizes and delivers content, and the assessment tool evaluates and tracks progress. This interdependence strengthens the principle of emergence, where the combined system functions more effectively than its individual parts, providing users with a comprehensive, intelligent, and adaptive learning solution.

Holmes et al. (2019) also highlight the importance of fairness, transparency, and ethical AI use in education. CHECKmate follows these principles by ensuring unbiased grading, secure data handling, and equal learning opportunities for all students.



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