CHAPTER 1

THE PROJECT AND ITS BACKGROUND

Introduction

Education was the state's pillar since ancient times, where its shaped societies along visible progressive lines of advancement in human development. The most prominent societies, Mesopotamia and Egypt, trained their scribes and leaders to preserve knowledge and thus, nurture the foundations of structured learning (Finkel, 2019). Later, the Greeks and Romans would make education somewhat formal, with philosophy and rhetoric-i.e. foundations of what could be seen today in the practice of teaching (Fernández, 2022). Ever since the dawn of time education just became a requirement for humanity to strive to what we are now.

These days, the advancement of education has come about due to recent innovations in technology that have allowed new ways of teaching and learning solutions. AI has changed traditional teaching into making it more interactive and engaging, as well as responsive through different systems like computers, smartphones, and other interactive devices with AI components (Luckin et al., 2016). They are actually very helpful to overcome some of the old limitations that early appraisal methods had, including end-term surveys, rare teacher reviews, and so on. These evaluation systems often do not result in timely and usable insights for improving the instructional content (Siemens, 2013). Modern education, however, rests just on the brink of new technological approaches that

cannot complement but would entirely redefine knowledge delivery and assessment.

This change in technology further points out the greatest need for real time evaluation and enhancement of educational resources, which are indeed the thrust of the research. In this area, AI helps a great deal because in institutions like Laguna State Polytechnic University's College of Computer Studies, where certain learning materials like syllabi contribute to student success, there should be an AI-based system. Such a system can ensure continuous monitoring of educational materials against feedback and content to ensure such materials remain lucid, useful, and synchronized with ever-changing educational objectives. The study of how technology can improve learning materials becomes the background against which contemporary issues affecting higher education, especially for computer studies, can then be tackled. One major innovation of technology in education today is the optimization of learning materials. The digital age has greatly changed how we teach. With the rise of computers and the internet, we can now use digital tools like interactive programs, online classes, and videos, so did learning modules and syllabus could be view in digital form or other platforms like google classroom (Kunwar, Shrestha, Adhikari, 2025). This shift the focus of this study into syllabus which is a document outlining the content, structure, and requirements of a course, especially in an academic setting. It's a summary of the curriculum, including topics to be covered, assessments, and policies. It is noticed that digitization and automation or the new trend artificial

intelligence has not been innovated in this area even of its importance in a learning matter of a student.

Project Context

At the Laguna State Polytechnic University San Pablo City (LSPU SPC), the College of Computer Studies (CCS) serves as the main educator of the students in the areas of computer science and information technology. With its commitment to quality academic performance, the institution implements the Outcomes Based Education (OBE) model, thus ensuring that course syllabi not only align with the national academic standards but also promotes learning in an effective manner.

At the beginning of a semester, CCS faculty members prepare and distribute different types of learning materials like course syllabi, lecture, PowerPoint, and multimedia presentations. These documents are meant to be living documents that cover course goals, activities, assessments, and overall teaching philosophies. Currently most syllabi and leaning materials are static or pre-constructed with basis on the institutional guidelines. One of the most common complaints among students is that syllabi are too overloaded with information yet lack clear direction (Johnson, 2020). This could limit the room for customization or student input and also could overlook the diverse learning styles, and personal preferences on how student want that certain topic to be taught.

Another key challenge this study wants to look on is the lack of a way for students to give feedback on the syllabus. As said that syllabus is a “one size fits all”, without student input, the content and structure of the syllabus might not fully

reflect how students understand or experience the course. Without interactive elements, the learning experience often becomes dull and passive, especially for students with different learning styles (Nguyen, 2020). Some students may struggle to follow the learning path or feel unsure about certain expectations.

Based on research it is said that participatory approaches in education, such as syllabus negotiation have been suggested to enhance student autonomy, engagement, and self-regulation. Syllabus negotiation demonstrates the considerable potential to enhance academic behaviors and support the development of essential lifelong learning skills. This is done by having the learners as also be the participants in shaping the course syllabus. Findings have theoretical implications for educational psychologists and applied linguists and practical consequences for teachers and learners (Liang and Bautista, 2025). By adding a system where students feedback about learning style is gathered, the syllabus will be shaped in a way that better supports different learning styles, a feature where gathering feedback every after semester to further broaden the data set that can arguably make it accurate and exclusive for the university since the data will come from them.

To address these challenges, the system presents the conception of a Learning Style-Driven Enhancement System for Course Syllabus Activities for the College of Computer Studies. This AI powered platform empowers faculty by enabling them to upload educational resources and gather systematic feedback from students. The system relies in different recent studies regarding the preferred learning styles and teaching learning activities outlined in the syllabi to generate

specific and detailed recommendation of what Learning Activities based on its course content. These recommendations will help instructors align learning activities more effectively with course content and student needs, promoting a more engaging and personalized learning experience. Recognizing that students may not be fully aware of their own learning styles at the beginning of a course, the system includes a built-in learning style survey to be conducted at the end of each semester as an expansion of data set and a foundation in changes to create a more dynamic approach in making the learning more effective to students.

Project Purpose

The main goal of the Learning Style-Driven Enhancement System for Course Syllabus Activities is to improve the quality and effectiveness of teaching by aligning course activities with students' individual learning styles. This research-driven system aims to support instructors in designing more personalized, inclusive, and impactful syllabi.

This project matters because traditional syllabi often fail to address the varied ways students learn, leading to disengagement and inconsistent academic outcomes. By using AI to analyze and recommend enhancements based on learning preferences, the system fosters more student-centered education. It will not only enhance instructional planning but also raises awareness among educators and students about the value of the course syllabus as a dynamic tool for learning not only as a schedule or learning outline. Ultimately, the project seeks to contribute to improved student engagement, deeper understanding, and more effective teaching practices in diverse learning environments.

To the Students

The system guarantees that students are provided with adequately structured and well-defined syllabi of courses, providing them what learning style approach will most likely be effective in their learning journey.

To the Faculty Members

Faculty members gain immediate insight into what changes or addition they can add to the contents of the syllabus based on what students learning styles the lean toward to. The system uses feedback from students, along with content analysis, to provide AI-driven recommendations. This reduces our reliance on manual reviews and reviews done at the end of the semester.

To Future Researchers

One feature of where every end semester feedback of student is gathered making those a foundation for more future research.

Project Objectives

General Objective

The general objective of this project is to develop Learning Style-Driven Enhancement System for Course Syllabus Activities for the College of Computer Studies.

Specific Objectives

The study specifically aims:

1. To design a Learning Style Enhancement System that will provide AI recommendations based on multiple studies and content analysis.
2. To develop the Leaning Style Enhancement System with the following features:
    a. allows faculty members to upload course syllabi (PDF, DOCX).
    b. Implement an AI Analysis to utilize text recognition algorithms to examine educational content for clarity, structural organization, and engagement factors.
    c. Provides AI-driven recommendations for enhancing syllabus teaching and learning activities.
    d. Gather student feedback every end semester as dataset expansion.
3. To test the functionality, accuracy, and usability of the system
4. To evaluate the effectiveness of the system using SUMI.

Project Scope and Limitation

The scope of Learning Style-Driven Enhancement System for Course Syllabus centers on the development of an AI-powered web-based platform designed to enhance the quality and effectiveness of digital syllabus used in the College of Computer Studies at Laguna State Polytechnic University. With a primary focus on IT-related courses such as ITST-301, the system allows faculty members to upload course syllabus in PDFs and DOCX files for AI-driven analysis. Students provide structured feedback through surveys, after every semester to gather more information about students learning style essential in improving and making the system more accurate.

To support its objectives, the system integrates several key modules. The Digital Content Analysis Module serves as the core hub for analyzing the teaching and learning matrix of a syllabus. The Learning Style Adaptation Module identifies student preferences (visual, auditory, kinesthetic) and generates personalized content suggestions to improve engagement. The Data Reporting Module aggregates and presents meaningful analytics on student interactions and content effectiveness, enabling academic staff to make informed decisions regarding syllabus refinement. Administrative users—including faculty and academic staff—can manage uploads, monitor engagement, and access reports.

The system architecture is built using modern technologies such as React.js for front-end development, Node.js for backend logic, Tailwind CSS for design, Firebase for real-time storage and authentication, and Python for integrating AI models like RoBERTa. Although currently tailored for digital

materials in IT courses, the platform is scalable for future academic applications. It requires internet connectivity and does not cover physical learning resources. By incorporating advanced analysis tools and adaptive features, this system supports a data-driven, student-centered approach to instructional design and contributes to a more dynamic and effective learning environment.

The limitations of the project are as follows:

This study has several limitations that define its scope and applicability. It does not capture traditional in-person classroom interactions or discussions, as its focus is solely on analyzing digital materials such as PDFs, videos, and syllabi, excluding physical textbooks and other non-digital resources. Additionally, the system relies on internet connectivity for real-time tracking, analytics, and adaptive recommendations, which may limit functionality in offline or low-bandwidth environments. The study is confined to ITST-301 and related IT courses within the College of Computer Studies, meaning its findings may not be generalizable to other disciplines. Furthermore, while the system tracks engagement and interaction patterns, it does not conduct cognitive assessments or measure deeper learning outcomes. The study might not be suitable for all members in the faculty particularly instructors with over the decade teaching experience who may already have established instructional methods and may not find the system necessary for their course planning. Clearly defining these limitations ensures a focused and practical approach to enhancing the quality of digital instructional materials within the College of Computer Studies.

Conceptual Model of the Project

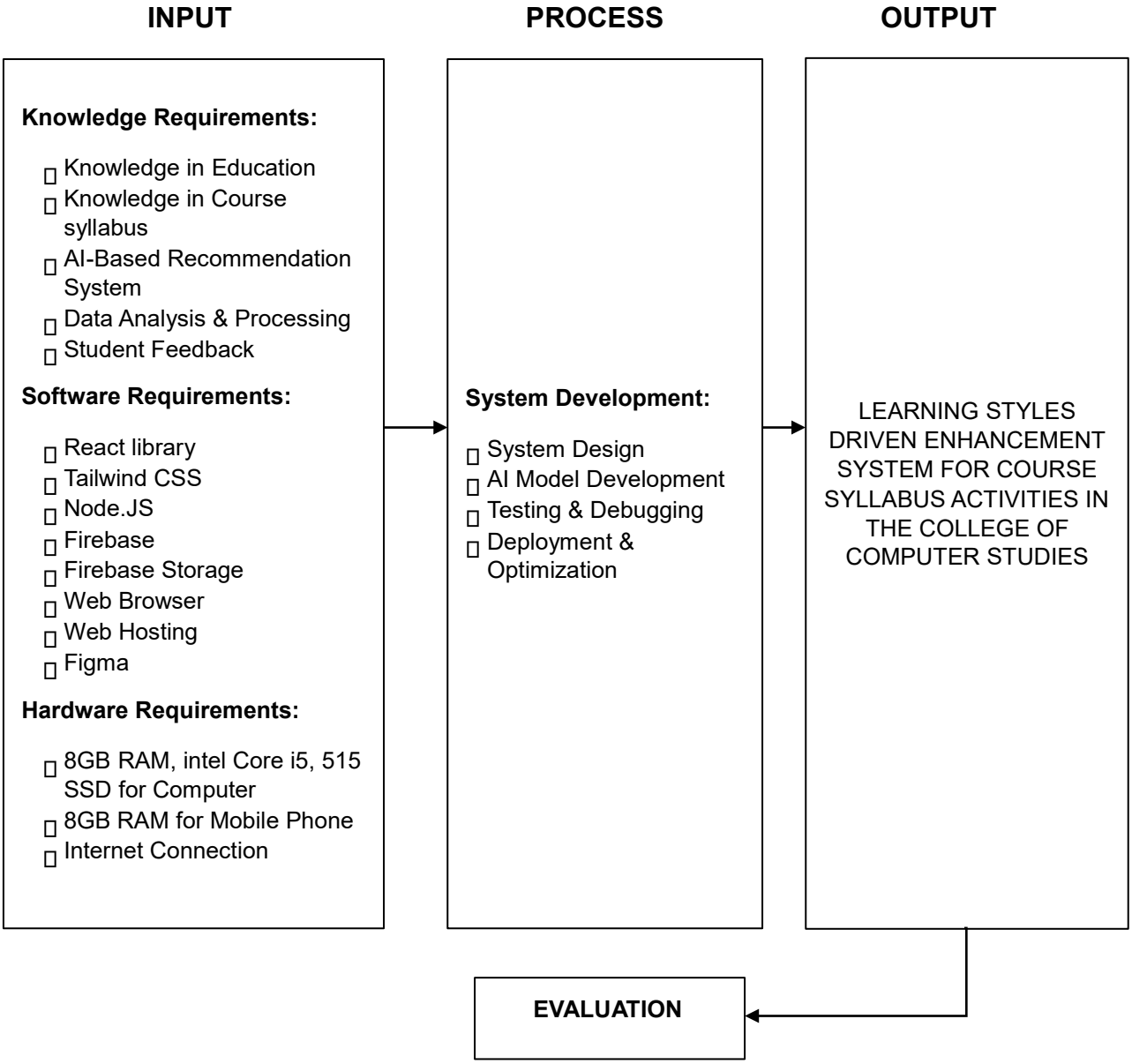


Figure 1. Conceptual Model

The conceptual model forms the basis to create Learning Style-Driven Enhancement System for Course Syllabus Activities for the College of Computer Studies. This model has three main parts: input, process, and output. The input part includes knowledge, software, and hardware needs crucial to build and roll

out the system. The knowledge needs cover AI and machine learning ideas, AI recommendations systems, data review and handling, and student input. The software needs to involve tech like React, Tailwind CSS, Node.js, Firebase, Firebase storage, Web browser, Web hosting and Figma.

The hardware needs consist of computers, mobile phones, laptops, internet access, and servers, which help the system run and stay accessible. The process component lays out the steps to develop the system. This covers system design, AI model creation, testing and fixing bugs, and putting it into action and fine-tuning. These phases make sure the system works right, improve AI models, and boost performance to make the analysis of course syllabus more accurate and effective.

The Learning Style Analyzer represents the complete output system component. Faculty members can upload their syllabi to the system which collects student feedback through surveys and uses AI technology to analyze syllabus. Faculty members use the AI-powered system to obtain student feedback insights which help them improve the quality of their educational materials. Data visualization features produce meaningful insights which support decision making and ongoing enhancement processes.

This conceptual framework establishes a structured process for creating an AI-powered interactive Syllabus Enhancer system which enables effective assessment of educational resources to improve student learning experiences at the College of Computer Studies.

Operational Definition of Terms

Faculty - members from the College of Computer Studies handle educational resource uploads and utilize AI insights to refine their teaching content.

Feedback - System gathers student evaluations about learning materials and processes them to produce suggestions for improvements.

ML Content Insights – quantifiable information extracted from digital content (text, audio, video or image) using machine learning techniques.

Syllabus - a document that outlines essential information for college courses, including course content, assignments, and grading policies.

Students - refers to the learners who engage with the system through reviewing the learning materials and submitting feedback about their effectiveness and clarity.

CHAPTER II

REVIEW OF RELATED LITERATURE AND STUDIES

This chapter presents relevant literature and studies gathered from various sources, including research papers, and credible online publications. These studies provide valuable insights into integration of artificial intelligence (AI) in education, especially in looking at and making education resources better. The information compiled in this chapter serves as a foundation for the development of Learning Style-Driven Enhancement System for Course Syllabus Activities for the College of Computer Studies.

Artificial Intelligence in Higher Education

The integration of Artificial Intelligence (AI) within higher education has greatly changed established teaching methods, helping to create flexible study settings, customized teaching next to smart response systems. According to Chen et al. (2020) the use of artificial intelligence (AI) in education has had a major impact, including improved efficiency, global learning, customized/personalized learning, smarter content, and improved effectiveness and efficiency in education administration among others. Virtual reality (VR) and augmented reality (AR) are also being integrated with AI to create immersive learning experiences (Gudoniene & Rutkauskiene, 2019). Tokay, Agar along with Elmas (2024) observed that AI tools like chatbots, virtual guides along with automatic grading systems are now key parts of modern schools. These systems aid the improvement of course syllabi, making sure learning materials are up to date, properly organized along with consistent job field requirements.

AI in the Development of Course Syllabi

The evolution of systems for automatically generating educational content, such as syllabi and assessments, has been an area of growing interest in academic research and the application of AI technologies (Ragushanda & Saravanan, 2022). AI has become an invaluable asset in the course syllabi design and improvement process. Tokay et al. (2024) research showed us how powerful AI can be a tool for the analysis of large amounts of educational data and the generation of optimized syllabus structures. The research shows that AI is more effective than traditional syllabus development methods because it offers insights and suggestions in real time. Institutions such as the Massachusetts Institute of Technology (MIT) and Harvard University have already introduced AI into their chemistry curricula. Artificial Intelligence has been utilized for grading the course as well as maintaining its integrity and keeping the course material updated.

AI-Driven Evaluation of Learning Materials

One important role of AI in education is to look at and make better learning materials. AI powered analysis tools possess the ability to assess course syllabi and other digital resources, identifying deficiencies, redundancies, and areas for improvement. Tokay et al (2024). They argue that AI makes structured feedback on educational materials a breeze. It ensures these educational materials are always engaging and sound pedagogically. This perspective aligns with the objectives of the Interactive Learning Analyzer, which seeks to optimize learning materials through student feedback and AI generated insights. research identifies a gap in the use of AI-driven syllabus. Lu et al. (2023) highlight that although AI

can identify content gaps and enhance instructional design, most systems do not incorporate real-time student feedback. Likewise, Zawacki-Richter et al.(2019) discovered that AI use in education tends to emphasize automated grading and personalized learning but fails to address curriculum optimization. Fillimg this void, Baker and Smith (2019) recommend AI- powered tools that adjust course content dynamically to align more with learning outcomes. The Leaning Style Enhancement Systemis meant to fill this void by utilizing AI feedback and learner interactions to make educational resources more effective.

The Relationship Between Technology and Pedagogy

AI is transforming strategies in the education sector. As Tokay et al. argues (2024) that the connection between technology and pedagogy advances AI's assistance in facilitating active learning. Adaptive learning environments, intelligent tutoring systems, and AI assisted curriculum design are changing the landscape of educational opportunities and personalizing education based on the needs of the learner. AI-driven analysis dynamically adjusts curriculum content to align with specific learning objectives, ensuring materials remain relevant and effective (Holmes, Bialik, & Fadel, 2019). Continuous, low-stakes assessments powered by AI provide actionable insights, helping educators to fine-tune teaching strategies and support learning progress (Holmes, Bialik, & Fadel, 2019; Luckin et al., 2016). These modifications meet the targets defined by the Learning Material Evaluation System that aims to support teachers by providing immediate AIenabled suggestions for enhancing syllabus resource materials.

Challenges and Prospects in AI Integration

Despite its numerous advantages, the inclusion of AI in education faces challenges like faculty training, infrastructure building and ethical issues. According to Tokay et al. (2024) Implications for Practice a partnership between academia and industry is critical to ensuring that course content delivered via AI is in sync with its practical applications. Chattopadhyay et al. (2024) emphasizes that universities should desire not the immediate return on investment of AI, but rather the promise of an iteratively growing CAID system, which will require significant engagement in continuous curriculum development and AI literacy programs. One major challenge in integrating AI in education is the potential for biases to be present in AI algorithms, which can perpetuate inequalities and undermine the fairness and effectiveness of AI-driven educational systems. Biases in AI algorithms may arise from various sources, including biased training data, algorithmic design choices, and societal prejudices encoded in the data used to train AI models (Eden, Chisom, & Adeniyi, 2024). Artificial Intelligence should be structured or trained to have neutral responses avoiding further inconsistencies that could lead to weaker impact to students or less accurate information compared to traditional approach.

Artificial Intelligence in Educational Feedback

Artificial Intelligence (AI) has become one of the emerging technologies that have reshaped student feedback over the years. These systems utilizing AI provide immediate, personalized, as well as dynamic evaluations to enrich the student learning experience. According to Wongvorachan, Lai, Bulut, Tsai, & Chen

(2022), AI technologies including Natural Language Processing (NLP), Educational Data Mining (EDM), Learning Analytics (LA) are used to improve feedback processes by providing timely and actionable feedback for each student at their learning stage.

The Role of AI in Feedback Practices

Feedback is one of the most important aspects of learning, helping students to determine what they do not understand and guiding them to perform better. Traditionally, feedback has been given by educators in a manual format which can be time-consuming and inconsistent. The application of AI in education has added a level of autonomy in gaining feedback such as, NLP (Natural Language Processing) is a branch of artificial intelligence that helps computers understand and work with human language by analyzing student feedback and reviews, NLP can gauge student satisfaction and emotions, offering insights into teaching effectiveness and areas needing improvement (Shaik et al., 2023). Educational Data Mining (EDM) is using data from educational settings (like quizzes, logs, and surveys) to discover patterns that help understand how students learn. It uses data analysis techniques to improve educational outcomes and decision-making (Romero & Ventura, 2020). LA (Learning Analytics) is similar to EDM but focuses more on interpreting learning data to improve teaching and learning. It often involves tracking student progress and giving timely feedback. Learning Analytics is the process of using student data to improve teaching and learning by identifying trends, predicting outcomes, and supporting decisions in education (Long et al., 2021). According to Wongvorachan et al (2022), feedback approaches similar to

these are powered by AI, leading to greater efficiency, more accurate, and more personalized specific feedbacks.

Challenges and Ethical Considerations in AI-Based Feedback

However, the challenges of AI based feedback systems despite their benefits. Wongvorachan et al. Some (2022) report challenges which include data privacy issues, algorithm bias and the importance of faculty training. Maintaining fairness, objectivity, and contextual relevance of AI-generated feedback. According to a post by Ashoka's Civics Network, however, using AI tools in learning comes with heavy boosts of infrastructural tech and going back to continue modernizing the algorithms to be accurate and meaningful.

AI-Driven Pedagogical Strategies for Equitable Access to Science Education The role of artificial intelligence (AI) in education continues to increase, especially in addressing equity challenges in science education. AI based pedagogical practices propose creative means to transform accessibility, improve engagement, and innovate personalized learning. AI learning platforms enrich educational inclusion by accommodating diverse learning styles and providing personalized instructional content designed by Eden, Adeleye, and Adeniyi (2024), specifically, for each student's needs.

Personalized Learning Through AI

In personalizing learning, AI utilizes machine learning algorithms, natural language processing, and computer vision to evaluate student progress and adapt content to fit such assessments. In their (2024) paper, Eden et al. take note of how AI-driven platforms can change instructional materials based on student

engagement status, cognitive ability, and learning preference. By providing real time visibility into student performance, these technologies enable teachers to focus their intervention efforts and thus better learning outcomes.

AI in Learning Analytics and Real-Time Feedback

The impact of AI on learning analytics has empowered institutions to aggregate, analyze, and interpret huge amounts of educational data. With AI feedback mechanisms, students receive instant personalized responses, facilitating an interactive learning setting. AI assessments help educators pinpoint knowledge gaps while helping them to refine the pedagogy for various types of learners (Eden et al., 2024).

Addressing Educational Disparities with AI

Disparities in science education often arise from socioeconomic developments, climatic constraints, and resource limitations. AI provides an effective remedy that renders educational resources of the highest quality accessible over a distance, promoting cooperation amongst students situated in different geographical locations. Eden et al. (2024) provide insight into how AI-based educational systems attempt to fill such gaps through equitable resource sharing to counteract barriers that have existed in traditional science education.

Ethical Considerations in AI-Driven Pedagogy

Ethics in AI has been a talking point for professionals in the industry and beyond. They want to benefit from AI without compromising student data privacy and security, algorithmic bias, and access for all. As highlighted by Eden et al. (2024), proper AI governance is key to ensuring unintended bias and fairness in

education assessment. Moreover, transparency in AI guidelines and responsible AI usage would pave the way for more inclusive learning environments.

Utilizing AI Models to Enhance Blended Learning in Higher Education

Presently, blended learning is popularly contemporary as a way of combining traditional classroom teaching and learning with online learning because of the personal flexibility and personalization provided by such a mode. The act is further enabled by using artificial intelligence (AI) in that it can deliver data-driven instructional activity that enhances engagement material and student performance. As indicated by Shi, Umer, and Shi (2023), an AI-enabled blended learning model is capable of deep learning techniques that can improve blended learning effectiveness through adaptive educational systems which adapt contents for students according to their needs.

AI-Driven Blended Learning Frameworks

The frameworks that imbue a totally new dimension to blended learning environments are AI because they offer personalized learning pathways, automated assessment processes, and intelligent tutoring systems. According to Shi et al. (2023), the blended teaching integrally links deep learning models into the course, thereby boosting knowledge retention and application. With such AI frameworks, instructors can closely monitor the students' learning progress and give immediate interventions and support based on performance analytics.

The Role of AI in Adaptive Learning and Feedback

Another prominent area AI contributes to blended education is personalized feedback and adaptive learning experiences through AI mechanisms based on the

analysis of student interactions, engagement pattern, and assessment results to provide dynamic adjustments to learning materials. According to Shi et al. (2023), AI adaptive learning systems can gain insights into the knowledge gaps of students and support learners with precise suggestions, resulting in an effective, personalized learning approach.

English Language Instruction with AI

In language education, blended learning has proved an excellent way whereby AIpowered software assists students in vocabulary, grammar correction, and conversational practice. According to Shi et al. (2023), AI models use cloud computing and big-data analytics to enhance English language instruction by providing learning materials relevant to the contextual needs of learners. This working mode enhances interactivity and immersion in the learning experience toward engendering language proficiency through personalized instruction.

Challenges in Implementing AI-Optimized Blended Learning

However, AI has its own challenges towards blended learning, such as the challenge of confidentiality of data, its technological infrastructure, and resistance from educators who are not All that conversant with these AI tools. As stated by Shi et al. (2023), the utmost needs for the successful implementation of AI-driven blended learning are ensuring faculty training and the development of ethical AI governance policies.

Machine Learning in Higher Education

The increasing reliance on technology in education has led to the integration of machine learning for evaluating teaching quality and performance.

To ensure the teachers are fierce, many institutions are aiming for the data-driven approach (data of teaching mechanisms and environmental factors) that can be provided by machine learning models.

As noted by Almufarreh, Noaman, and Saeed (2023). machine learning is increasingly being utilized by higher education institutions to improve learning management systems (LMS), to analyze student participation, and to evaluate the effectiveness of instruction.

Role of Machine Learning in Performance Evaluation

Machine Learning is used to gain trustable and reliable results for providing instructors performance evaluation instead of using conventional assessment methods. Having student surveys or observations are both good, but not easily replicable or not enough standardization. On the contrary, a Machine Learning approach will use vast amounts of data to recognize performance patterns and offer more objective feedback. Almufarreh et al. Also, Wong (2023) highlights that, by taking technical evaluation metrics into account, the predictive accuracy improves, resulting in a more complete faculty evaluation.

Application of Machine Learning in Learning Management Systems

LMS (Learning Management Systems) are at the forefront of modern education providing content delivery mechanisms, student engagement tracking, and automated assessment. Almufarreh et al. P. (2023) illustrates the importance of machine learning in LMS for adaptive learning experiences, predictive analytics and up-to-the-minute performance assessment. Such innovations allow educators to develop better course materials and teaching methods, thus enhancing student

learning outcomes. Given the above necessity of maintaining a high bar in education, there are other frameworks which have been created to measure and improve teaching performance. Almufarreh et al. (2023) The QTEF (Quality Teaching and Evaluation Framework) combines the best of academic, technical and examination paradigms to devise a systematic structure to assess teachers. The framework uses machine learning models to improve efficiency, accuracy, and objectivity of assessments, by helping institutions to identify strengths and areas for improvement more accurately. Natural language processing (NLP) is a branch of artificial intelligence (AI) that enables computers to comprehend, generate, and manipulate human language. Natural language processing can interrogate the data with natural language text or voice. The impact of Natural Language Processing (NLP) has completely transformed how textual feedback is generated and analyzed. Tools powered by AI can evaluate writing tasks, identify mistakes, and offer helpful suggestions for improvements.

As Wongvorachan et al. NLP based feedback can assess grammatical accuracy, fluency, and the structure of arguments in students' essays (2022) Additionally, AI chatbots and virtual tutors use NLP to hold real time conversations with students, providing them with instant clarification and guidance on complex topics. Educational Data Mining (EDM) aims at using data on student behaviour to improve the learning experience. Using data that analyzes how students perform, AI can detect weak points in a learner and offer customized feedback. Wongvorachan et al. EDM helps in adaptive learning because it identifies the effective learning style, Cunningham et al. In this way, instructors can tailor their

approach to instruction to provide the optimal level of support to all students to be successful.

Challenges and Considerations in Machine Learning Based Evaluation

However, the use of machine learning based evaluation is fraught with problems, including issues of data veracity, bias with algorithmic assessments, and necessary infrastructure. Almufarreh et al. October [2023]: It is imperative that data collection methodologies, frequent updates, and faculty training are designed to promote fair and accurate evaluations in AI-driven systems (2023). Meeting these challenges is necessary for ensuring machine learning can be deployed practically in educational assessment.

NLP and Sentiment Analysis in Evaluating Educational Materials

Evaluating textbooks in emotional tone would thus be an additional, probably modifiable feature in the research, in this case, Natural Language Processing and sentiment analysis in students' learning said Ade (2024). First, the emotional tone is very important because it makes learners engaged, motivated, and comprehensible about what they learn. Sentiment scoring and awareness of emotion detection using text classification techniques can determine whether textbooks were applied to generate positive, negative, or neutral emotions, as well as the influence of those sentiments on learning experiences.

Shaik et al. (2023) conducted large-scale reviews emphasizing different approaches to sentiment analysis and opinion mining in education and their application in natural language processing (NLP). The survey covered various levels of sentiment analysis, namely document, sentence, entity, and aspect

levels, in addition to various techniques of sentiment annotation including lexicon and corpus-based techniques. AI was also discussed with particular emphasis on machine learning, deep learning, and transformer models such as BERT in the context of analyzing student feedback. This article outlines advantages of these research applications in enhancement of decision-making capabilities in education, teaching improvements, and automated assessment evaluations in education. It also covers challenges such as negation handling, opinion spams detection, multipolarity, and polysemous words as well as future directions for improving sentiment analysis in education.

AI-Driven Data Analysis in Educational Research

López-Meneses et al. (2025) give the most thorough account of research trends on Educational Data Mining (EDM) and Predictive Modeling (PM) in AI. The study takes us from 793 articles published between 2000 and 2024 to understand major methods and innovations. The findings indicate that AI has assisted in enhancing the prediction of student performance, individualizing learning, and early intervention. Ethical issues such as privacy, bias, and algorithm transparency are discussed in this regard. Thus, they assert that responsible AI integration in education is key to equity, effective learning, and student engagement, emphasizing the need for governance in ethics for AI consideration.

Treve (2024) investigates the role of artificial intelligence (AI) in education, how it changes student engagement, success in their academics, and transforms their creativity through tools powered by AI. Employing the mixed- methods approach, the institutional data and surveys both before and after AI's application

shall be utilized. Increases in student engagement of 20-23% points, improved GPAs of 9-14% points, and enhanced innovative thinking skills by 44- 57% were established from findings. Even considering the above benefits, data privacy, algorithmic bias, and ethics become challenges highlighted in the study. The author reiterates that longitudinal studies are required to assess the long- term impact of AI in education conclusively.

Impact of Syllabus Design on Student Motivation

Wheeler, Palmer, and Aneece (2019) investigated how students' motivation and perception of their courses were affected by syllabus structures. Their mixedmethods research involved comparing two types of syllabi: content- focused syllabi (CFS), which emphasize course policies and schedules; and learning-focused syllabi (LFS), which emphasize student engagement and learning outcomes. The results indicate that students found LFS more organized, interactive, and supportive, with the result being higher motivation and a better perception of both the course and instructor. Those who received an LFS expected a more engaging and student-centered learning experience while students exposed to a CFS expected a more traditional lecturing approach. The study illustrates the impact of syllabus design on student engagement and learning expectations.

Development Tools

Node.js

Node.js is an open-source, cross-platform runtime environment for executing JavaScript outside a browser, thus it is a powerful tool for server-side

applications. The application is developed by the V8 JavaScript engine that performs highly and is popular in designing scalable and efficient server-side applications (Osmani, 2020). Node.js comprises an asynchronous, event-driven architecture, which provides better responsiveness to the system and allows real-time data processing (Sharma & Gupta, 2020). It could certainly improve computational performance with non-blocking I/O and this fact would make it a favorite for dealing with many simultaneous requests in web applications (Chen et al., 2020). Lightweight and from a rich managed npm ecosystem, Node.js remains a top technology in the era of modern web development (Brown, 2020).

React

React (also referred to as React.js) is an open-source JavaScript library pioneered by Facebook for building dynamic and interactive user interfaces. Since its inception, React found root in community adoption because of its component-based architecture that emphasizes reusability and modularity in web development (Johnson 2020). The virtual DOM was introduced into React to enhance performance during rendering by updating only those elements that require change instead of reloading the entire user interface (Miller and Thompson 2020). The declarative nature of React makes understanding state management a breeze, thus simplifying application maintenance and scaling (Garcia et al. 2020). With benefits to an already enormous ecosystem's arsenal of third-party libraries, React remains among the top choices for front-end development (Smith 2020).

Tailwind CSS

Tailwind CSS supports a utility-based design with a lot of pre-made utility classes that simplified the styling process. Unlike component-based styling frameworks, developers can be more imaginative, applying styling directly to their HTML elements. (Otto and Thornton, 2019). Forgo custom style sheets, thus adding up the speed factor of the development process. (Smith et al., 2021).

Visual Studio Code

Developed by Microsoft, Visual Studio Code (VS Code) is a widely used open source code editor that supports several programming languages, providing advanced features such as IntelliSense for intelligent code completion, debugging, and Git integration. Han et al. (2020) state that the lightweight yet powerful UI setup of VS Code, along with the available extension marketplace for myriad resources, acts to further enhance developer productivity. As far as modern web application development is concerned, it is readily acknowledged as the most favored tool when working with JavaScript, Node.js and React.

RoBERTa

Bidirectional Encoder Representations from Transformers or BERT is an advanced deep learning model developed by Google to handle natural language processing (NLP) tasks. Devlin et al. (2019) further explained that BERT provides an improvement to contextual understanding by looking at words in a bidirectional context, and because of this, it is a strong candidate for tasks such as sentiment analysis or automated text processing. Introduced by Sanh et al. (2019), DistilBERT essentially does the same thing but in a lighter fashion, which comes

with less computational complexity while maintaining a remarkable level of accuracy. In addition, Liu et al. (2019) RoBERTa precisely refines BERT's pre-training strategy for better generalization capability. These models create a great opportunity for automating text evaluation, intelligent feedback generation, and semantic analysis within an educational context.

CHATGPT

An integration of artificial intelligence (AI) into educational practices within different institutions. Tools such as ChatGPT are casting shadows for future access and interaction between learners and knowledge. Yang, Xiao Zhe, et al. (2023). Conducted a comprehensive evaluation on the scope of the use of ChatGPT as one educational possible assistant to learning in almost all academic disciplines. It would point out ChatGPT's pillars in the composing of precise and specific articulation for disciplines wherein language, science, and humanities reside. And it further strengthens the capacity of ChatGPT as an engine towards the generation of practice questions, provision of feedback, and support personalized learning experiences. Even as the researchers delve into ChatGPT's technical capacity, they also reflect on the apparent limitations it has, such as factual inaccuracies and shallow reasoning in complicated issues. Notwithstanding the limitations, the participants seem to benefit from the reinforcement of notions, collaborative understanding, and around-the-clock access, which is not always readily available in traditional classroom settings. As well, the document examined that with the right use and incorporation, ChatGPT could be a full alternative to self-study and formal learning contexts. The study by

Yang et al. adds to the growing pool of literature on responsible use of AI in education. It directs for further development relative to accuracy in AI, ethical use, and formulation of best practices on maximizing the educational value of such technologies. These insights underline the necessity of aligning AI tools such as ChatGPT with pedagogical goals to enhance rather than entirely replace human-led instruction.

Firebase

It is a comprehensive backend-as-a-service by Google that has been used widely in mobile and web applications. It has various features to ease backend operation such as a real-time database, cloud storage, and authentication. The most important thing about Firebase is that the data gets synced in real time, so all devices can receive the updates instantly without requiring manual refreshing. This proves to be extremely useful for applications that need the live updates, like messaging apps or teamwork platforms. Firebase Authentication, meanwhile, secures an easy way for users to log in to an application with any number of providers, such as using email, Google, or Facebook accounts. Cloud Firestore, in essence, is a NoSQL cloud database that supports flexible and scalable data storage that can further support the simplified access and management of application data by developers. All these amazing benefits will keep the enjoyable collection of work reduced and allow the application to enjoy the best performance and scalability (Abugan et al., 2021).

CHAPTER III

METHODOLOGY

This chapter presents the project design, project development, testing, and evaluation procedures implemented in developing the Interactive Learning Material Analyzing System for the College of Computer Studies.

Project Design

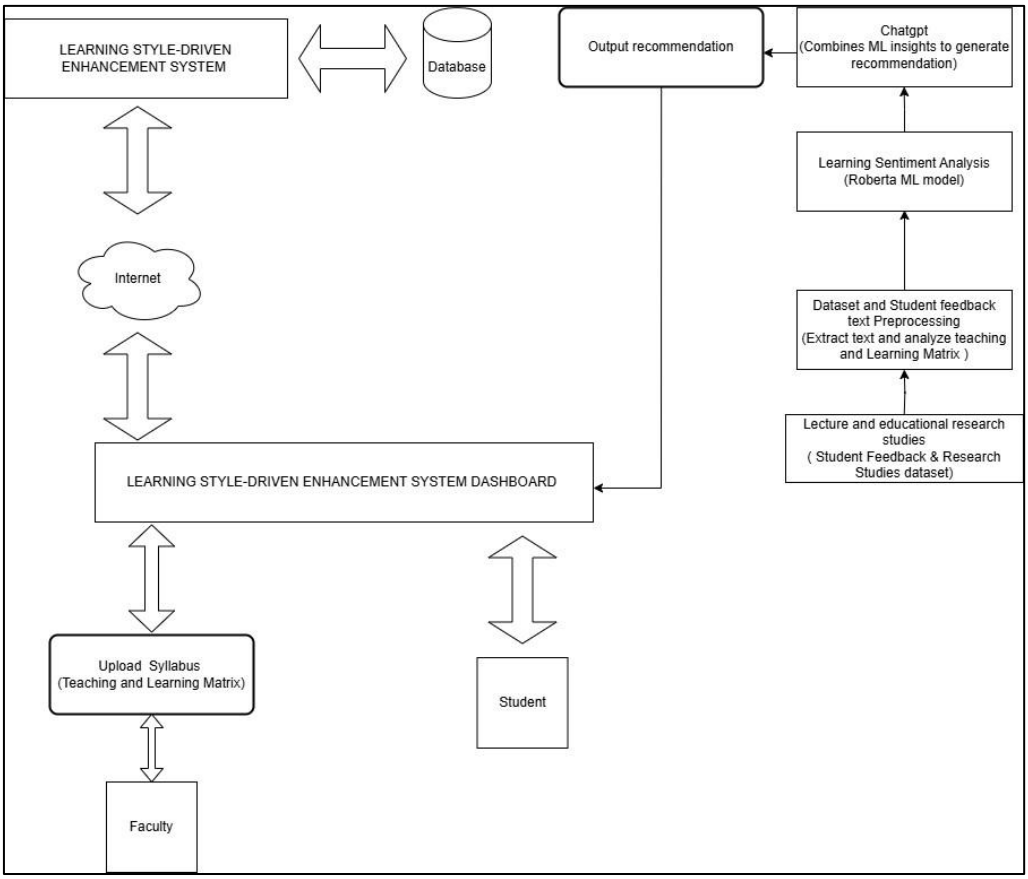


Figure 2. Project Design

Figure 2 shows the project design for the Learning Style Syllabus Enhancer system constitutes the main center of the design as the platform for providing and managing learning materials, collecting feedback from students, and making

recommendations based on AI. It connected with a database that secures the storage of learning materials, user, student feedback, and analytical reports. It is a web-based application, employing internet connectivity for faculty and students' access. Faculty upload learning materials, see student feedback, and annotate the suggestions generated by the AI for improvement of the content. Finally, students have their interface only for submitting feedback on the learning materials' effectiveness. The mechanism basically allows valuable information to go back to faculty members for enhancing their instructional content. Thus, employing AI and Machine learning for analysis focuses on improving the evaluation mechanism in ways that provide recommendations for refinement and optimization of educational materials.

Data Flow Diagram

Figure 3. Context Diagram

This context diagram illustrates how the Interactive Leaning Style Enhancement System interacts with external entities like students and faculty members. The diagram highlights how students are the principal users in the system since they provide feedback regarding learning materials uploaded into the system. Their involvement consists only of providing evaluation and insight related to their learning experience. As for faculty members, they upload their syllabi for

analysis using the machine learning models developed on a given data that includes feedback from students and other related factors. The system then takes this input information, processes it, and generates AI Recommendation toward improving the quality and effectiveness of their instructional content. The input and output must be clearly defined, according to the diagram, to keep the data flow structured and enable seamless information exchange between the users and the system whilst separating input feedback and syllabus uploads and output AI recommendations. Having this framework in place facilitates a way toward the data driven enhancement of educational materials and supports improving the overall experience for both students and faculty.

Data Flow Diagram

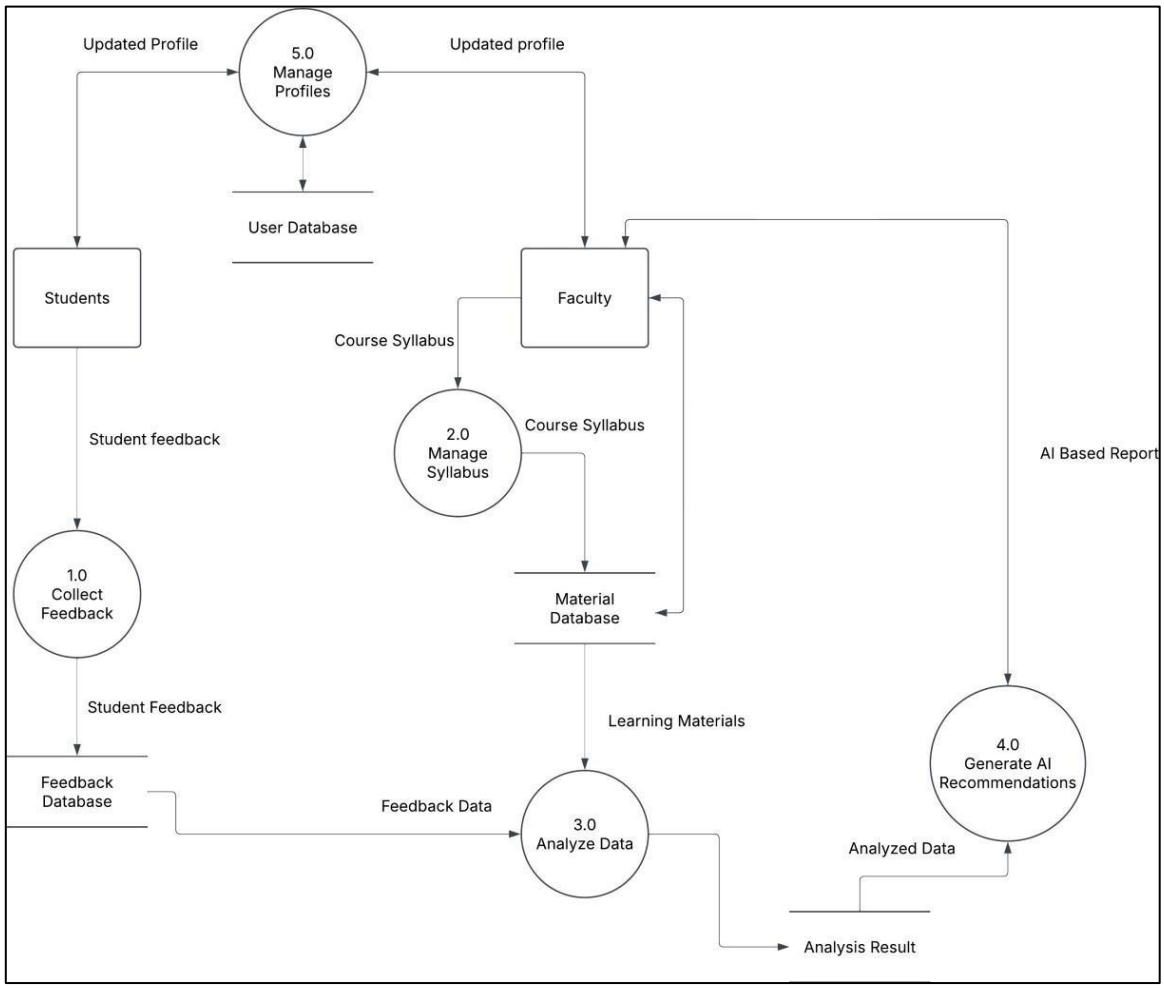


Figure 4. Level 1 Data Flow Diagram

The Level 1 DFD interprets the Interactive Learning Materials Analyzer System, which works on inputs from Students and Faculty and gives out recommendations towards learning resources through AI feedback comes from Students, while course syllabi and user profiles are maintained by Faculty acting as the external entities of the system. Key processes include feedback collection and storage; management of syllabi; evaluation of learning materials effectiveness through data analysis; generation of AI-based recommendations; and management of user profiles. These interact with data stores, such as the

Feedback Database, Material Database, and User Database, where relevant information is stored. The diagram shows: the flow of data: collecting, analyzing feedback and syllabi, and converting into actionable insights, which Faculty can use as input to improve learning materials-and, thus, complete the purpose of the system enhancing education triggered by AI-analysis.

Wireframes

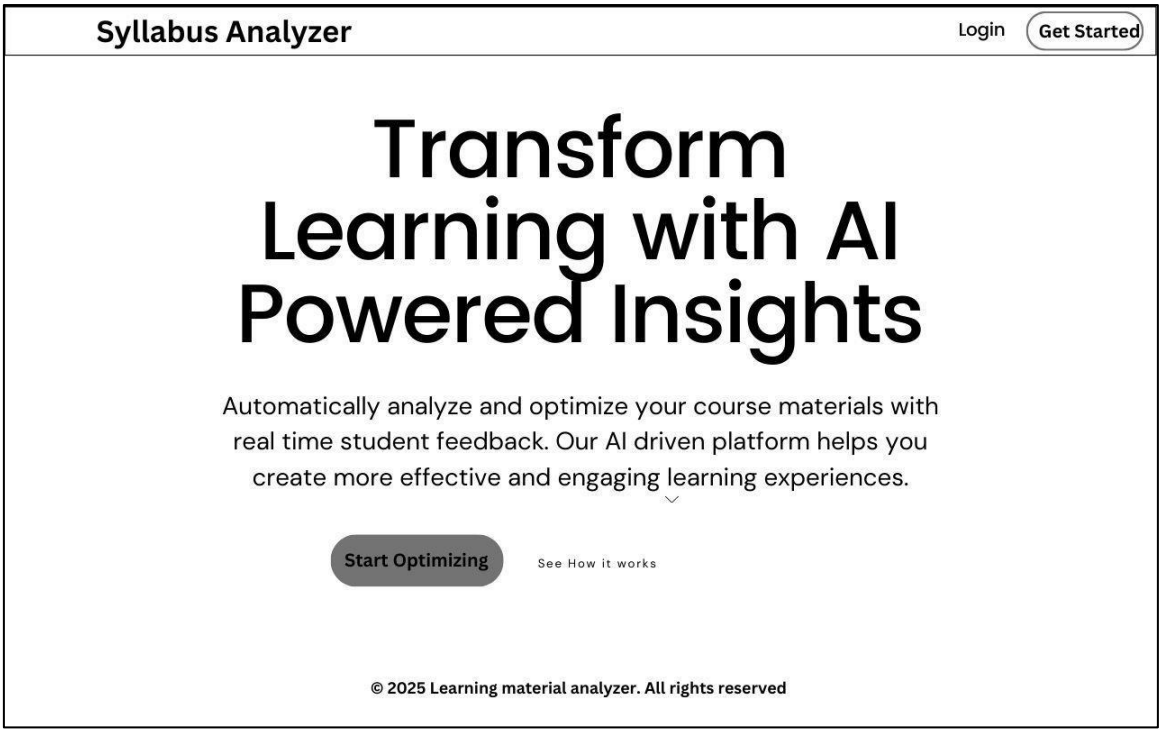


Figure 5. Homepage

The wireframe design for the Leaning Style Enhancement system's homepage is depicted in Figure 5. The wireframe shows the primary user interface of the system and highlights the software's primary function: AI based analysis and optimization of course materials. The layout consists of the most prominent CTA for users to start optimizing their learning content and buttons to login and Get

Started. The design is kept simple to enhance the user experience while making a professional statement.

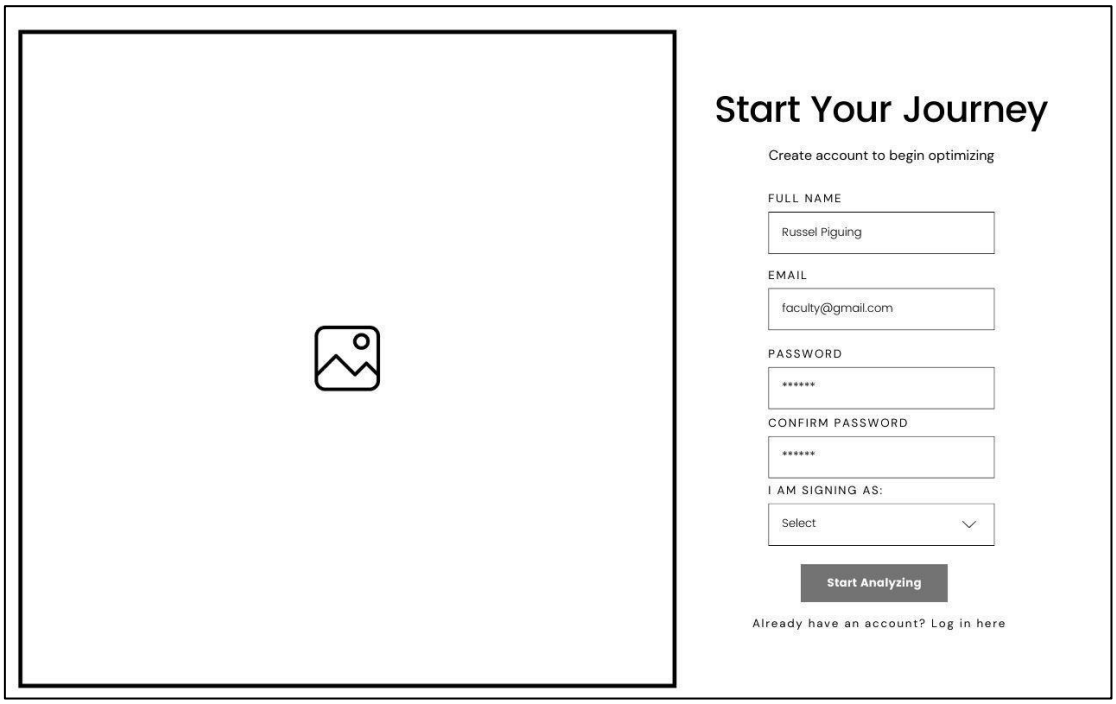


Figure 6. Sign up Page

Figure 6 demonstrates the Sign-up Page of the Interactive Leaning Style Enhancement system. The page provides a complete registration form that enables users to create an account by entering their full name, email, password, confirming the password, and selecting their role. It adopts a clean, split-layout design contrasting the illustration on the left and the form on the right, plus there is the Start Analyzing button to complete registration.

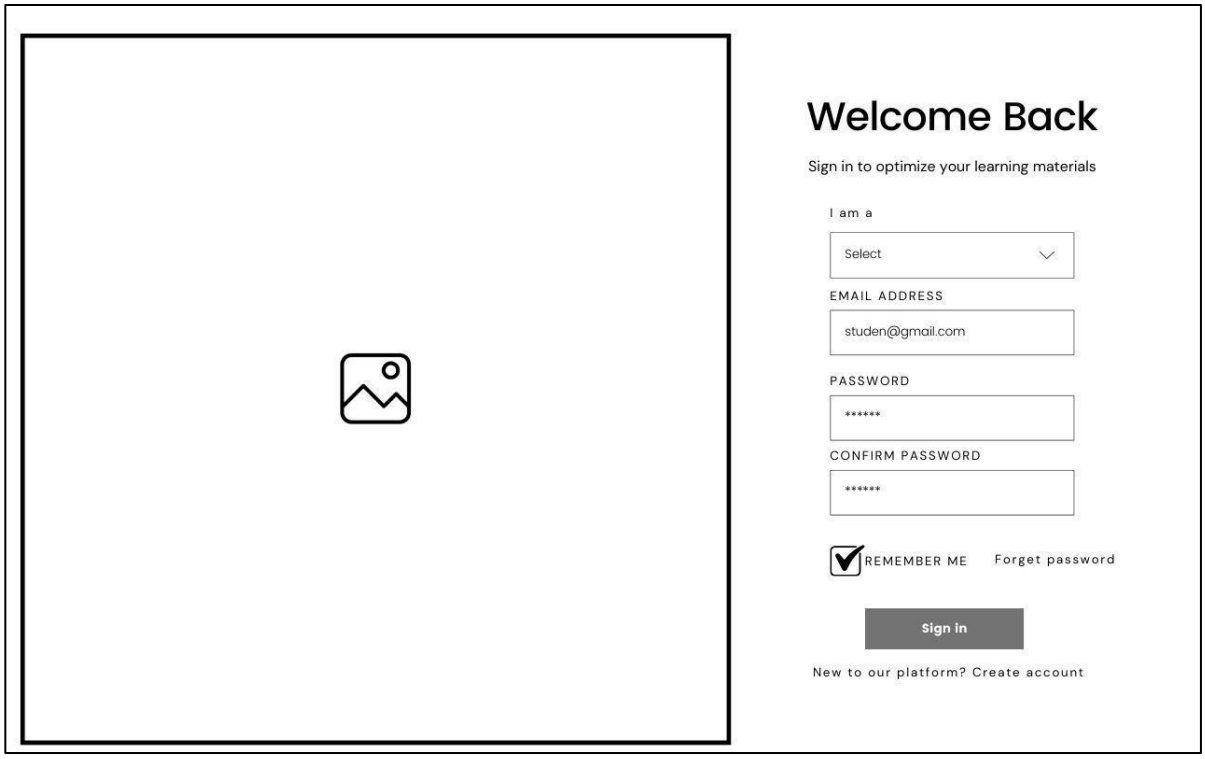


Figure 7. Login Page

The login page for the Leaning Style Enhancement system is illustrated in Figure 7. This page has a form for the user to sign in by selecting his/her respective role, (i.e. a faculty or a student), entering the email and password, and with an optional "Remember Me" check. The way it is designed is in a split layout whereby the left side has an illustration, and the right side has the login form. Meanwhile a "Forgot Password" link and "Create an Account" for new users have also been provided.

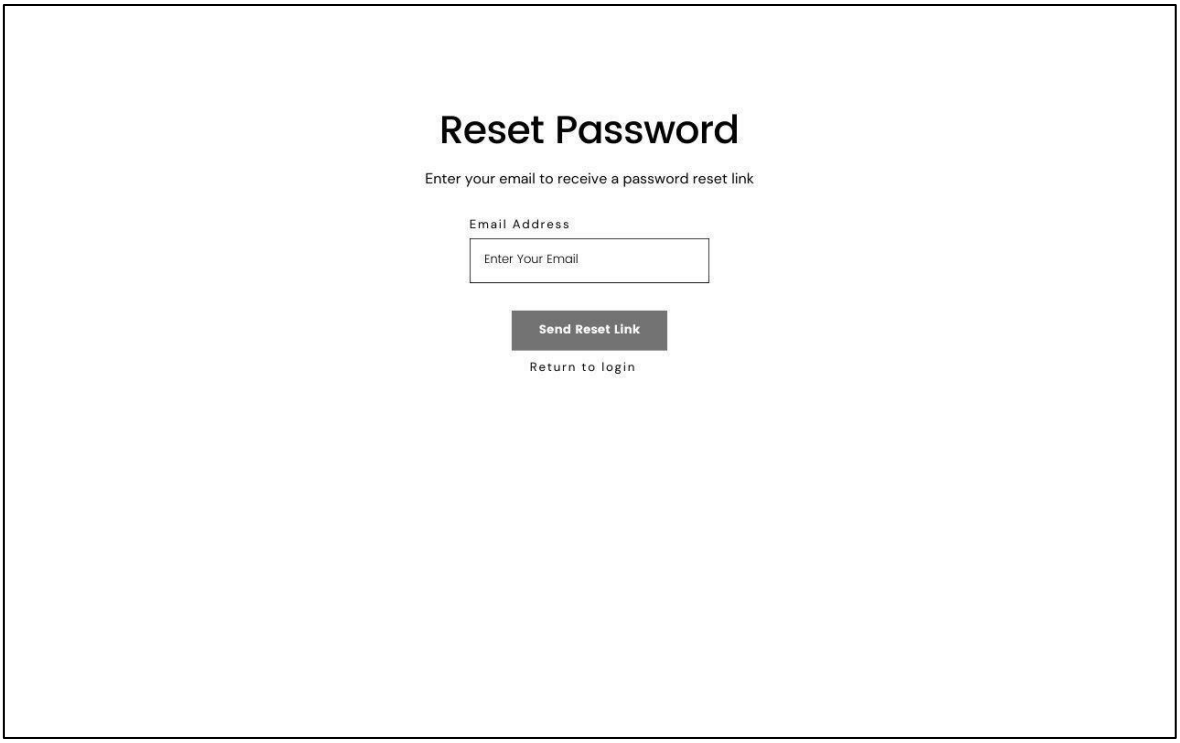


Figure 8. Reset Password

Reset Password can be seen in Figure 8. The Leaning Style Enhancement system provides for a very simple interface allowing its users to type in the registered email address in order to receive a password reset link. The design is truly minimalistic, showing the largest "Reset Password" label possible, with the input field for the user's email address, and of course, the button says, "Send Reset Link." Beneath this button is a "Return to login" option, which allows navigation back to the login page.

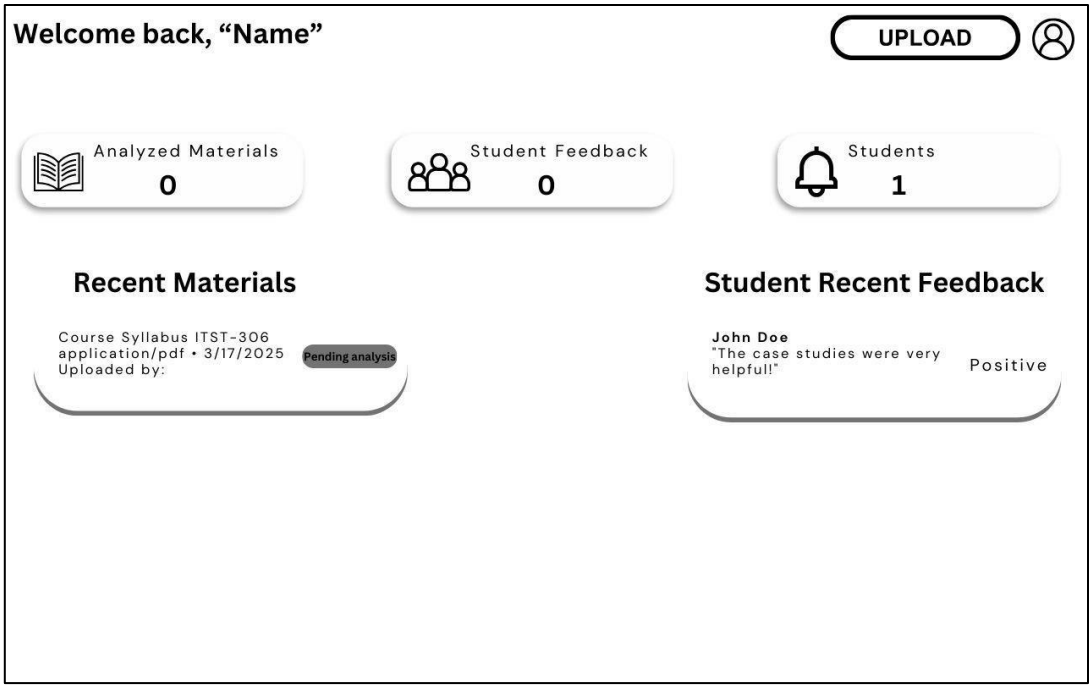


Figure 9. Faculty Dashboard Page

Figure 9 represents the Faculty Dashboard of the Leaning Style Enhancement system. It shows an overview of uploaded materials, student feedback, and user engagement. The topmost area welcomes the faculty member to the system; below the welcome message are three key metrics that show the number of analyzed materials, student feedback received, and the total number of students using the system. Below the metrics are the "Recent Materials" section containing the latest uploaded learning resources complete with file type, upload date, and status, which indicates whether the material is still pending analysis. Next on the right, the "Student Recent Feedback" section showcases all student comments regarding the learning materials with sentiment analysis labels such as "Positive." An "Upload" button at the top right also lets the faculty member add materials. The user profile icon offers quick access to account settings. It is about managing profile settings.

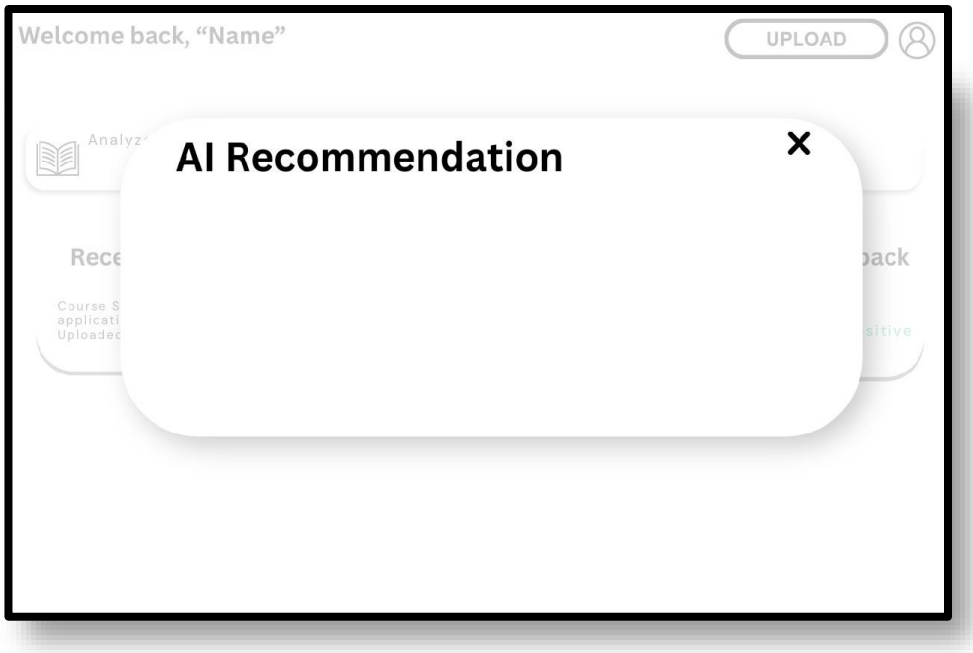


Figure 10. Faculty AI Recommendation Modal

The Faculty AI Recommendation modal, as depicted in Figure 10, provides insights into improving uploaded learning material through the faculty members. This modal is presented in a pop-up window with quite a simple and neat design and a bold title, "AI Recommendation," at the top. The close button is available in the upper right corner for the user quickly to exit when desired. However, the background elements of the Faculty Dashboard still show but seem faded, ensuring that the modal is the focal point. The AI Recommendation modal aids faculty in refining materials based on student feedback and AI's analysis toward an ever- improving learning experience.

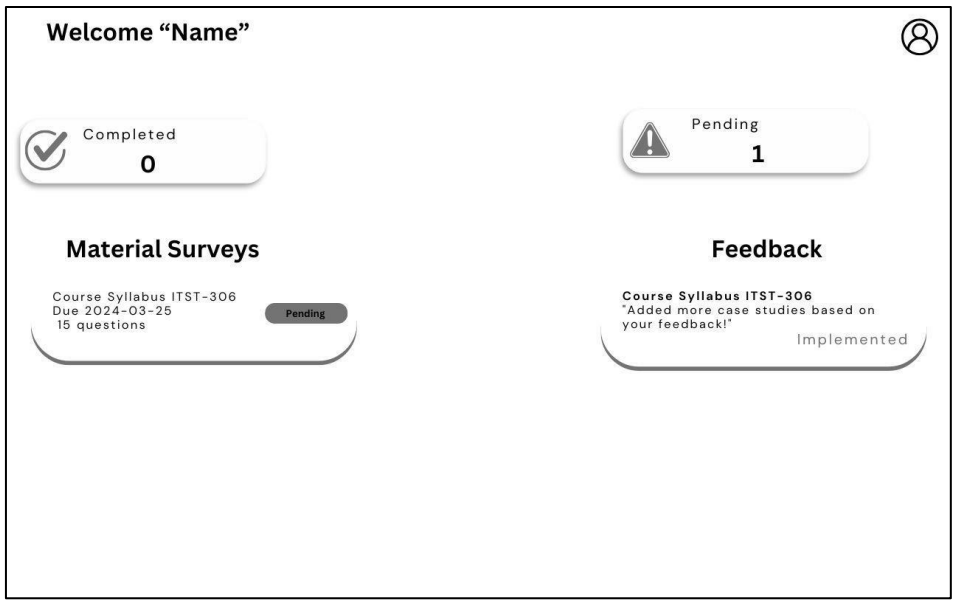


Figure 11. Student Dashboard Page

As seen in Figure 11, the Student Dashboard Page provides an overview of the students in surveys and the feedback status for a particular section. The dashboard is classified into two parts: Material Surveys and Feedback. In the Material Surveys part, there are finished and unfinished surveys that students have yet to do, like the survey for the Course Syllabus ITST-306 due on and with 15 questions, marked with a yellow "Pending" label. The Feedback part mentions how faculty members may have taken up student recommendations based on the feedback for the same course, tagged "Implemented" in green. In addition, at the top of the page is an overview panel that shows the number completed and pending, while a user profile icon provides quick access to account settings.

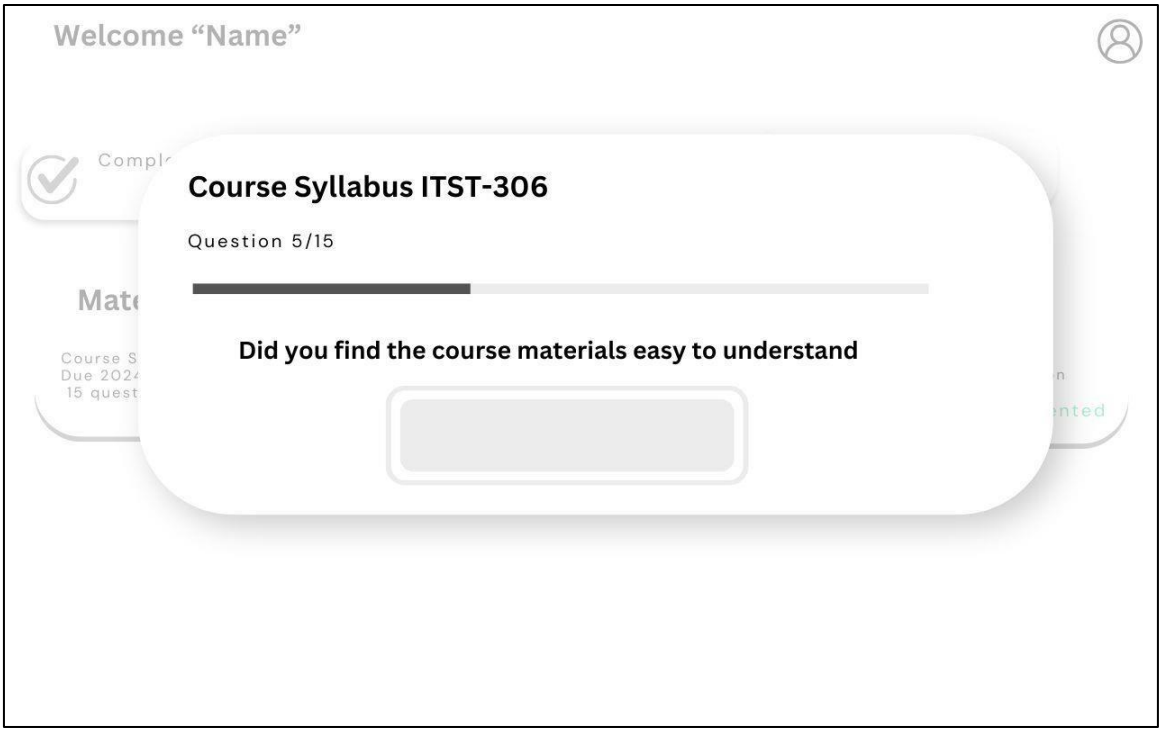


Figure 12. Student Survey Modal

The Student Survey Modal appears in Figure 12. It presents an active survey question that resides in the system. The modal is meant for student feedback regarding a certain learning material, i.e., the Course Syllabus ITST-306. This modal indicates that someone is currently on Question 5 out of a total of 15 questions, typographically accompanied with a progress bar that creates an image in the mind regarding completion status. The question "Did you find the course materials easy to understand?" is that question whose aim is to determine the clarity and effect of course content. Following the above question is a response input field.

Use case diagram

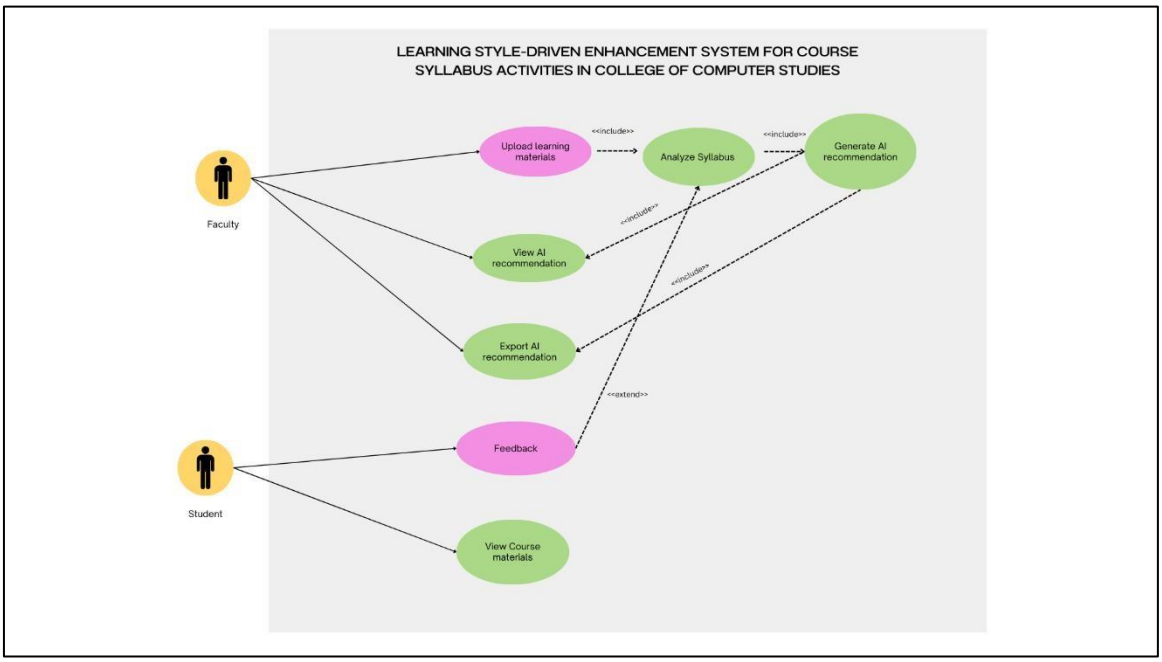
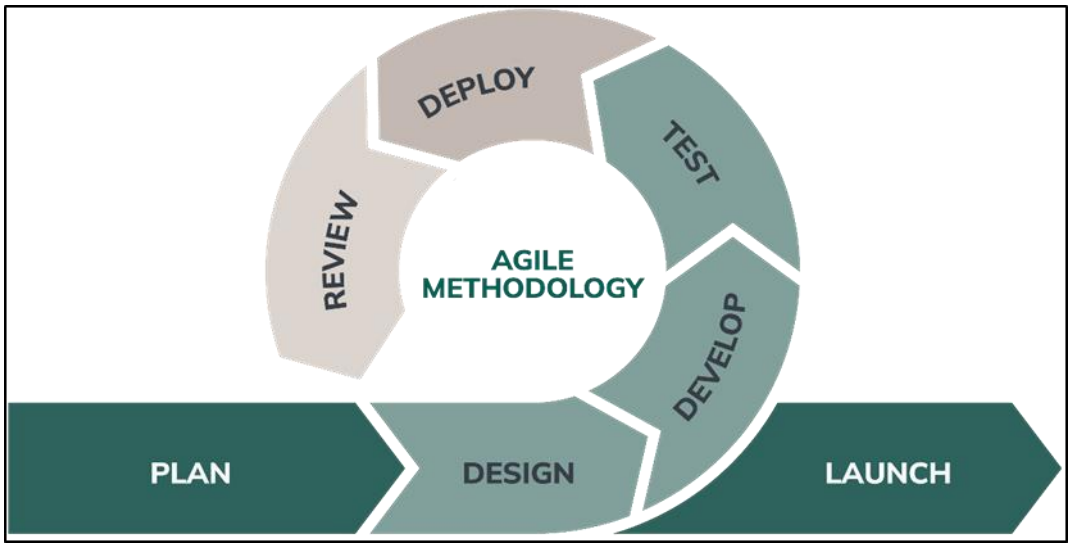


Figure 13. Use case diagram

The different actors (Faculty and Student) and various functionalities of the system are modeled using standard UML notation in Figure 13 showing the system use case diagram for Learning Style-Driven Enhancement System, developed for the College of Computer Studies to improve course syllabus through AI-assisted analysis. The faculty actor initiates the process by invoking the "Upload learning materials" use case, depicted in pink and highlighted with a solid line indicating direct interaction. This use case has a dashed extension notated as «extend» to the "Analyze learning materials effectiveness" use case indicating that analysis is optional after the upload. Analysis consists of a further three use cases: "Generate AI recommendation", "View AI recommendation", and "Export AI recommendation", all colored green and linked with dashed «include» lines, indicating that they are part of the analysis process. The student actor interacts

with the system via the "View Course materials" use case and "Feedback" both related by solid lines, with feedback extending to the analysis of learning materials effectiveness in the evaluation process. The solid lines denote direct interactions between actors and the system, while the dashed lines imply extend and include relationships. This gives a clear picture of the system's design in a more comprehensive way, highlighting how actors in the system interact for the improvement of learning outcomes.

Project development



Source: https://www.nexapp.ca/en/blog/agile-software-development

Figure 14. Agile Model

The project was developed using the Agile model, an iterative and flexible methodology that accommodates the continuous enhancement and adaptability of the project throughout the development lifecycle. As such, every feedback received is incorporated at every stage of the Agile process, maximizing efficiency and responsiveness to user demands.

Phase 1: Requirements

Interviewing and surveying students at the College of Computer Studies at Laguna State Polytechnic University were necessary to get vital data in developing the Learning Style-Driven Enhancement System for Course Syllabus Activities. Among these discussions were problems in evaluating learning materials, important consideration for improvement of the system, and the development of functionalities of the system. Furthermore, the data collected helped to set the goals for the objectives of the system, which were, therefore, that it would appropriately collect student feedback, analyze learning materials, and provide recommendations on enhancing the content with the help of AI.

Phase 2: Design

In this phase, the development team created a comprehensive system blueprint to ensure a more manageable and structured way of developing the system. System architecture was planned in detail to show how different components would interact with each other to guarantee good scalability and efficiency. An appropriate data flow diagram was developed to give a visualization of how information flows in the system, allowing developers to visualize key processes. Along with this, a use case diagram was developed to contrast user actions with the expectations of various stakeholders. Wireframes were, importantly, also designed for visual representation of the user interface to make for better usability.

Phase 3: Development

The development phase was where actual coding and implementation took place, using modern technologies to afford a robust and efficient platform. The front end was develop using React.js and Tailwind CSS, accentuating a responsive and aesthetically appealing user interface. The backend processing was handled by Node.js for the efficient management of user authentication, API request execution, and data handling. Firebase was integrated as the primary database and authentication mechanism, thus permitting secure real time storage and retrieval of data. Furthermore, Python was used in conjunction with AI and machine learning applications to allow processing and analysis of student feedback with preexisting faculty datasets to generate AI-driven recommendations for enhancement of learning materials. Among the core functionalities developed in this phase are syllabus uploads, structured feedback collecting, AI-based analysis, and user authentication to support system objectives.

Phase 4: Testing

In this phase various testing methods will be use, functions testing, browser testing, accuracy testing, will be applied along with SUMI for performance evaluation of the system, during this phase of the software development life cycle. Essential testing will also be done such as unit testing for individual parts (buttons, input forms), Integration testing if front end and backend work together, user acceptance testing for the target users of the system and security testing since exclusive data from the university will be used by it. Further bugs and error will be fix if it happens during the testing phase.

Phase 5: Deployment

Once testing is complete, the system will be deployed to a web-hosted cloud based for access and scaling purposes. Best approach is by subscribing in a hosting site called Hostinger due to its advanced functions and fast updates. Furthermore, training sessions were included for faculty members to understand the operation of this system-including its AI-powered analytics.

Phase 6: Reviews

The evaluation of the system after deployment, which sought to solicit user feedback and evaluate the impact of the system on learning material effectiveness, has taken place. A regular updating and improving schedule would be prepared based on the findings, keeping the system effective and normal to new educational requirements.

Project Testing and Evaluation Procedure

This section discusses the testing and evaluation methods to determine whether the "Learning Style-Driven Enhancement System for Course Syllabus" system has met its functional, usability, and quality objectives. The testing system follows the iterative approach of Agile methodology, which makes it available at any time for improvements based on the feedback gathered and results obtained during this period. Multiple testing methods such as functionality testing assessments, browser testing assessments, accuracy testing assessment and usability assessments through the Software Usability Measurement Inventory (SUMI).

These activities are geared toward affirming that the system aids faculty in enhancing learning materials while providing students with a clear and appealing

educational experience at the College of Computer Studies at Laguna State Polytechnic University.

Functionality Testing

Functionality testing verifies that each core feature of the system operates as intended, the testing focuses on key functionalities such as user authentication, syllabus uploads, student feedback submission, AI-driven analysis, and recommendation generation.

Table 1. Functionality Testing

Feature	Description	Input	Output	Status
User Registration	Test sign-up process for faculty and students.	Full name, email, password, role	Account created confirmation message	
User Login	Verify login functionality for both roles.	Email, password, role	Redirect to respective dashboard	
Password Reset	Test password reset functionality.	Registere d email	Reset link sent, password updated	
Syllabus Upload	Test uploading syllabi in supported formats (PDF, DOCX, PPT).	Sample syllabus file	File uploaded, stored in Firebase	

Student Feedback Submission	Test submission of structured feedback via surveys.	Survey response s	Feedback stored, visible to faculty	
AI Analysis	Verify AI processes feedback and content using RoBERTa algorithms.	Uploaded syllabus, student feedback	AI-generated recommendations displayed	
Recommendation Display	Test display of AI recommendations on Faculty Dashboard.	AI analysis output	Recommendation s in modal, clear and concise	

Table 1 explains the flow of Functionality Testing, which helps the developers put up an organized approach for verifying the mainstream operations of the system. Each test case points to a feature of the system, for example, user account registration, AI analysis, among others. The inputs and outputs are determined. The status requirements ensure that you meet the expected feature requirements, for example, successful uploads into Firebase or matching AI outputs via RoBERTa. This is the documentation that developers will use through all the Agile sprints for manual and automated testing, for example with Jest and Mocha, helping to refine the system in an iterative fashion.

Browser Testing

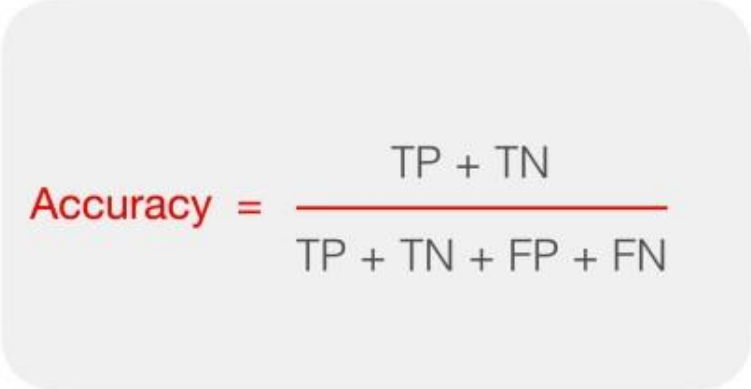
The developers will use this test instrument on browsers to assess if the system displays correctly and if all functions of the system operate correctly on various browsers. It will also be used to verify if the designs, implemented with Tailwind CSS, stay intact and undistorted when viewed under a selected browser. Table 2 shows the Browser Testing Plan that the developers will use for testing compatibility and design integrity across the various platforms.

Table 2. Browser Testing

Web Browsers	Status/Result	Actual Result	Recommended
Google Chrome			
Mozilla Firefox			
Microsoft Edge			
Safari			
Chrome (Mobile)			

As per Table 2, the following Browser Testing is to be used by developers during assessment on the performance of the system in different web browser activities. The Web Browsers column says the tested platforms while Status/Result declares whether the system passed fully, partially, or failed. Actual Result gives the results recorded and Recommended indicates the actions for these findings.

Accuracy Testing



Accuracy is used by the researchers to evaluate the performance of the AI recommendation engine in correctly classifying syllabus improvements based on students' learning styles. It provides a simple yet effective measure of how often the system's recommendations align with actual student feedback. A high accuracy rate means that the system correctly understands and applies the appropriate enhancements (e.g., learning activities for visual, auditory, or kinesthetic learners), making it a reliable tool for faculty members. This helps ensure the recommendations are both relevant and beneficial before deploying the system widely in academic environments.

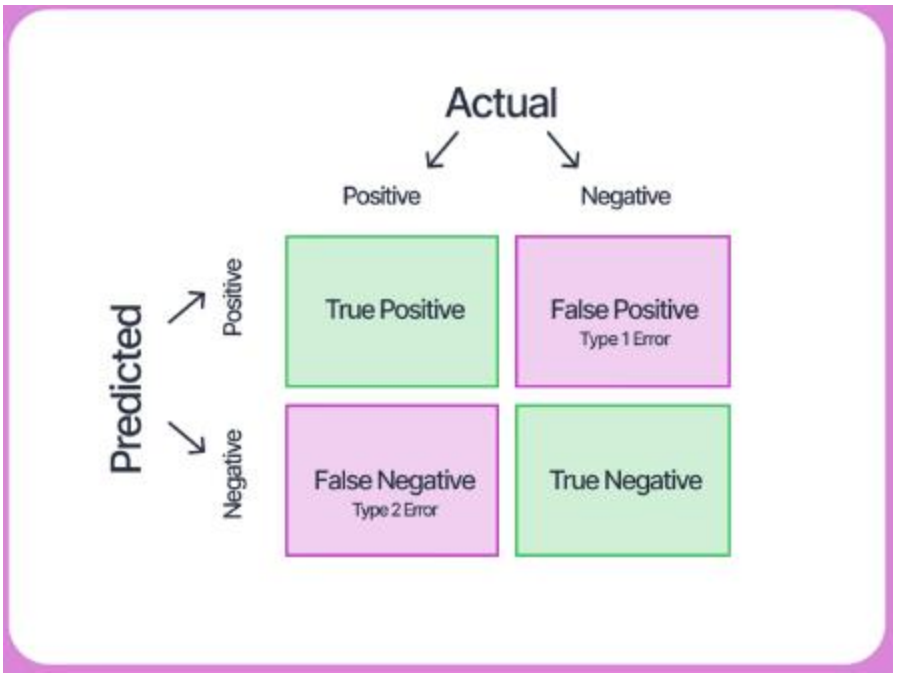


Figure 15. Confusion Matrix

The confusion matrix shown in the image is a tool used to evaluate the performance of a classification model by comparing the predicted results to the actual outcomes. It consists of four key components: true positives, true negatives, false positives, and false negatives. In the context of the project "Learning Style-Driven Enhancement System for Course Syllabus Activities," this matrix can help assess how accurately the system predicts students' learning styles.

- TP (True Positive) – Correctly recommended enhancements (e.g., a visual activity suggested and validated as helpful by visual learners)
- TN (True Negative) – Correctly rejected irrelevant enhancements (e.g., auditory strategies not recommended and found unnecessary)
- FP (False Positive) – Incorrectly recommended enhancements (e.g., suggesting a kinesthetic activity for a student who didn't benefit)

- FN (False Negative) – Relevant enhancements missed by the system (e.g., not recommending a visual aid that was actually needed)

Project Evaluation Procedure

To evaluate the usability, effectiveness, and user satisfaction of the Learning Style-Driven Enhancement System for Course Syllabus Activities using the SUMI (Software Usability Measurement Inventory) framework. This will help assess the user experience and identify areas for improvement. The system will be evaluated by the following participants:

- Ten (10) faculty members from the College of Computer Studies.
- Ten (10) students enrolled in IT-related courses.
- Five (5) usability experts or educational technologists.

Key Dimensions Measured by SUMI:

- Efficiency – How quickly and easily users can navigate and complete tasks.
- Affect – The emotional satisfaction and enjoyment users experience while using the system.
- Helpfulness – The system's ability to support and guide users.
- Control – How much control users feel they have over their interactions with the system.
- Learnability – How easy it is for users to understand and master the system.

Table 3. SUMI Example Questions

Dimension	Example Questions
Efficiency	1. The system helps me complete tasks quickly. 2. Navigating through the system is straightforward.
Affect	1. I enjoy using the system. 2. The system makes my learning activities more engaging.
Helpfulness	1. The system provides enough guidance to complete tasks. 2. The system suggests useful learning activities based on my style.
Control	1. I feel in control when interacting with the system. 2. I can easily modify my syllabus activities as needed.
Learnability	1. It is easy to learn how to use the system. 2. I quickly understood how the system adapts to my learning style.

Table 3 presents two sample questions for each dimension of the SUMI framework, which the developers will use to evaluate the system's usability.

Table 4. SUMI Rating Scale

Numerical Scale	Interpretation
5	Strongly Agree
4	Agree
3	Neutral
2	Disagree
1	Strongly Disagree

Table 4 presents the 5-point numerical scale used for the evaluation. A rating of 5 corresponds to "Strongly Agree", indicating a highly positive user experience, while a rating of 1 corresponds to "Strongly Disagree", reflecting a poor or unsatisfactory user experience. The scale helps determine user perceptions across key usability dimensions by averaging responses per item and interpreting the overall sentiment.

How to Calculate SUMI score:

1. Assign scores to each response using the 1-5 scale above.
2. Compute dimension scores by adding the scores of all items for each dimension and average it (e.g., Efficiency = 4.0, Affect = 3.8, Helpfulness = 3.2, etc.).
3. Calculate overall usability by averaging the scores for all five dimensions.
4. Convert the average score to a 100-point scale:
    - Final SUMI Score = (Average Dimension Score) × 20 (Example only with 20 question in total)

Table 5. Interpreting SUMI Scores

Score Range	Interpretation
85 – 100	Excellent
70 – 84	Good
50 – 69	Acceptable / Moderate
Below 50	Poor usability (needs improvement)

Table 5 shows the numerical scale used in SUS. 85-100 is interpreted as "Excellent", 70-84 is interpreted as "Good", 50-69 is interpreted as "Acceptable/Moderate", and below 50 is interpreted as "Poor Usability (improvement)".

Bibliography

Tokay, I., Agar, S., & Elmas, M. (2024). The significance of artificial intelligence in university education system and course syllabuses. Creative Education, 15(5), 739-749. Scientific Research Publishing. https://www.scirp.org/journal/paperinformation?paperid=133299

Almufarreh, A., Noaman, A., & Saeed, F. (2023). Quality teaching and evaluation framework: Leveraging machine learning for assessing higher education performance. Applied Sciences, 13(5), 3121. https://www.mdpi.com/2076-3417/13/5/3121?trk=public_post-text

Wongvorachan, T., Lai, C., Bulut, O., Tsai, C.-C., & Chen, G. (2022). Artificial intelligence-driven feedback in education: The role of natural language processing, educational data mining, and learning analytics. Journal of Educational Computing Research, 60(8), 2005–2030. https://jattjournal.net/index.php/atp/article/view/170387/116818

Eden, A. O., Adeleye, B. M., & Adeniyi, O. I. (2024). AI-driven pedagogical strategies for equitable access to science education. International Journal of Educational Research and Innovation, 18(2), 45-67. https://magnascientiapub.com/journals/msarr/content/review-ai-driven-pedagogical-strategies-equitable-access-science-educationhttps://magnascientiapub.com/journals/msarr/sites/default/files/MSARR-2024-0043.pdf

Shi, Y., Umer, R., & Shi, L. (2023). Utilizing AI models to optimize blended teaching effectiveness in college-level English education. Applied Sciences, 13(6), 3121. https://www.tandfonline.com/doi/full/10.1080/2331186X.2023.2282804#d1e189https://www.tandfonline.com/doi/epdf/10.1080/2331186X.2023.2282804?needAccess=true

R. Ragasudha and M. Saravanan, ‘‘Secure automatic question paper generation with the subjective answer evaluation system,’’ in Proc. Int. Conf. Smart Technol. Syst. Next Gener. Comput. (ICSTSN), Mar. 2022, pp. 1–5, doi: 10.1109/ICSTSN53084.2022.9761323. https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10758621

Baker, T., & Smith, L. (2019). Educ-AI-tion rebooted? The future of AI in schools and colleges. Nesta. https://media.nesta.org.uk/documents/Future_of_AI_and_education_v5_WEB.pdf

Lu, X., Wang, J., & Zhang, Y. (2023). AI-assisted syllabus analysis: Improving course design through machine learning. *Journal of Educational Technology*, *40*(3), 215-230. https://www.researchgate.net/publication/351470728_A_Review_on_Artificial_Int elligence_in_Education

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, *16*(1), 1-27. https://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239- 019-0171-0

Ade, M. (2024). Sentiment analysis of textbooks: Evaluating emotional tone and its impact on learning. Journal of Educational Technology, 18(2), 45-67. https://www.researchgate.net/publication/383235726_Sentiment_Analysis_of_T extbooks_Evaluating_Emotional_Tone_and_Its_Impact_on_Learning

Shaik, T., Tao, X., Dann, C., Xie, H., Li, Y., & Galligan, L. (2023). Sentiment analysis and opinion mining on educational data: A survey. Natural Language Processing Journal, 2(100003). https://www.sciencedirect.com/science/article/pii/S2949719122000036

Treve, M. (2024). Integrating artificial intelligence in education: Impacts on student learning and innovation. International Journal of Vocational Education and Training Research, 10(2), 61-69. https://sciencepublishinggroup.com/article/10.11648/j.ijvetr.20241002.14

López-Meneses, E., Mellado-Moreno, P. C., Gallardo Herrerías, C., & Pelícano-Piris, N. (2025). Educational data mining and predictive modeling in the age of artificial intelligence: An in-depth analysis of research dynamics. Computers, 14(68). https://www.mdpi.com/2073-431X/14/2/68

Wheeler, L. B., Palmer, M., & Aneece, I. (2019). Students' perceptions of course syllabi: The role of syllabi in motivating students. International Journal for the Scholarship of Teaching and Learning, 13(3). https://digitalcommons.georgiasouthern.edu/ij-sotl/vol13/iss3/7/

Eden, C. A., Chisom, O. N., & Adeniyi, I. S. (Year). *Integrating AI in education: Opportunities, challenges, and ethical considerations*. https://text2fa.ir/wp-content/uploads/Text2fa.ir-Integrating-AI-in-education-Opportunities-challenges-and.pdf

Kunwar, R., Shrestha, S. K., & Adhikari, S. (2025). The innovative evolution of teaching materials: Trends and future prospects. *Journal of Research in Instruction*, *5*(1), 142–152. https://doi.org/10.30862/jri.v5i1.600142

Brown, H., & Taylor, L. (2022). *Engaging today's learners: A study on academic motivation*. Journal of Higher Education Innovation, 18(3), 45–60. https://www.researchgate.net/publication/380734414_The_Impact_of_Digital_Tools_and_Online_Learning_Platforms_on_Higher_Education_Learning_Outcomes

Martinez, A., & Lee, S. (2019). *Simplifying complexity: Redesigning the academic syllabus*. Academic Strategies Journal, 6(1), 10–20. https://files.eric.ed.gov/fulltext/EJ1375397.pdf