AI-Enhanced Learning Hub: Lesson Planning with Student Quizzes

Shravani G Kamath
Student, Dept. of Computer Science and Engineering
AMC Engineering College
Bengaluru, India
kshravani.125@gmail.com

Suchit Karnam
Student, Dept. of Computer Science and Engineering
AMC Engineering College
Bengaluru, India
suchitkarnam@gmail.com

Sushil Kumar
Student, Dept. of Computer Science and Engineering
AMC Engineering College
Bengaluru, India
sushildudhani@gmail.com

Umesh Jadhav
Student, Dept. of Computer Science and Engineering
AMC Engineering College
Bengaluru, India
umeshjadhav7402@gmail.com

Dr.Nirmala S
Professor, Dept. of Computer Science and Engineering
AMC Engineering College
Bengaluru, India
drnirmala.sundaram@amceducation.in

*Abstract--*The KnowBridge project is a cutting-edge AI-driven educational platform designed to enhance instructor-student connections through technological automation of key aspects of the teaching and learning process. This system also to support syllabus management, test item bank creation and performance tracking during the process it also creates an integrated academic system. The core of the functionality is teachers uploading the syllabus into the image format. Using contemporary Optical Character Recognition (OCR) technology, the system extracts and classifies the text into a hierarchical taxonomy of how topics will be covered for the semester. This organised syllabus ensures synchronisation between teacher and student and between both, on the other, which in turn offers clarity and consistency.

The moment a topic is wrapped up, the teacher confirms the topic as "completed" in the interface, and subsequently the AI generates a bespoke quiz on topics discussed. Quizzes assess the knowledge and feedback of students in real time, and the outcome is stored in a common database. Teachers are also furnished with the performant data, which enables them to further monitor the student's performance and to determine where the students need more attention. This automated evaluation system has the potential to accelerate the evaluation process besides supporting the decision-making through data-informed inputs to help develop more successful teaching strategies.

Assignments generation for syllabus units in KnowBridge are in order to facilitate teaching with particular goals. Tasks automated via grading of objective questions reduce workload for teachers and offer timely feedback to students. KnowBridge, which by means of automation and analysis, builds an open, efficient, and participatory environment of learning. It allows teachers, who have access, ways to more effectively prepare and supervise the instruction, while also retaining the attention and interest of the students. At last, this site can facilitate teachers and students alike to focus their attention on the achievement of academic success.

Keywords- Artificial Intelligence, OCR, MCQ Generation, Test Item Bank Creation

I. INTRODUCTION

As technology for teaching application becomes increasing in demand, there is a push for teaching and learning improvement. The amount of time and effort required to structure successful classes, construct engaging test questions, and provide timely, customized feedback on students' performance is common to teachers. These problems can lead to problems for teaching processes and lead to a poorer quality learning. AI-Enhanced Learning Hub's main potential to overcome these limitations in a novel way lies in the proposal of a high-end, AI-enabled platform,

which aims at supporting teachers and transforming the classrooms.

Through the power of artificial intelligence, this platform automates critical tasks involved in assessment planning and lesson preparation. The adoption of, by, teachers of pre-designed templates and tools can reduce significantly a teacher time available, which can subsequently be used to foster a teaching and learning style adapted to each student, with greater or lesser responsibility and autonomy on the part of the student. The platform further includes fast feedback schemes, which can be put to use to provide educators with inputs for a real practical improvement on the teaching of the course. That is, the teacher can adjust on an ad hoc basis the teaching strategy to offer the best support to each student in order to have success.

Besides administrative efficiency, the AI-Enhanced Learning Hub is also packed with features that promote students-teachers interaction. Interactive tools foster activity and working together, hence creating a dynamic classroom. In addition, the instrument also capitalizes on its ability to utilize data-driven strategies to identify patterns in student performance, so that the educator can close such educational gaps appropriately. Based on these capabilities, the experience of teaching is not only lighter but also more profound teaching effect.

The blending of artificial intelligence in teaching and learning represents a fusion of the old with the new. Respecting traditional teaching modes, the AI-Enhanced Learning Hub puts modern technologies at the heart of teaching and learning experiences for students. The platform assures that pedagogues can maintain a high standard of teaching practices, while also capitalizing upon the capabilities of automation and digital tools.

Last but not least, it is to enjoy the process of learning while feeling that it has purpose and value. Teaching and technology will work together in the future to provide highly enhanced learning environments, but equipping instructors with cutting-edge tools also makes it possible for teaching and technology to work in tandem rather than against one another. AI in education is reflected in the AI-Enabled Learning Hub, which offers a chance to make the world a more promising and equitable place for educators and students alike.

1.1 AIM AND OBJECTIVE

It is an educational platform driven by AI with the goal of enhancing instruction and learning. It focuses on using AI to automate processes, customize education, and give immediate feedback. For both instructors and students, this platform promises to improve education's efficacy, efficiency, and engagement. The paper's primary contributions are:

i. Teachers can upload the syllabus as an image, and the platform will automatically extract the syllabus text to generate a list of concepts for the semester.

ii. For each concept, a flag system is provided in which instructors may indicate it is "finished" or "in progress.

iii. based on the lesson progress. A concept is declared "complete" and an AI-annotated multiple choice test set (predominantly MCQ formatted) is automatically derived.

iv. Students are provided with these AI-generated exercises and are able to complete the questions in order to assess comprehension.

v. Results are archived in a database from which instructors can retrieve results to monitor student progress and achievement.

vi. Following completion of each part of the syllabus, students will be given regular problems to solve. helping them reinforce what they've learned.

1.2 PROBLEM STATEMENT

i. Teachers face challenges like time-consuming lesson planning and test creation

ii. Students struggle with a lack of timely feedback, targeted practise and progress tracking

iii. There is a problem with unified platform to simplify lesson planning and automate test generation.

iv. An AI powered educational assistant is proposed to bridge the gap, improving productivity and learning outcomes.

II. PROPOSED SOLUTION

2.1 Platform Overview:

- KnowBridge is an AI-driven platform designed to bridge the gap between teachers and students by automating core educational processes.

- It offers a structured, collaborative learning environment, supporting curriculum development, test preparation, and progress monitoring.

2.2 Teacher-Specific Features:

- Syllabus Management:
  - Teachers can upload syllabus documents in image format.
  - Optical Character Recognition (OCR) extracts and normalizes text, creating a

formal, ordered list of topics for the semester.

- Concept-Flagging Tool:
  - o Topics can be marked as "to do" or "done" for tracking progress.
  - o Facilitates better organization and clarity in teaching schedules.

- AI-Generated Assessments:
  - o Automatically creates topic-specific multiple-choice quizzes after marking a topic as "done."
  - o Provides instant feedback and stores results in a centralized database.

- Performance Analytics:
  - o Detailed insights into student strengths and weaknesses.
  - o Helps adapt teaching strategies for individualized learning.

2.3 Student-Specific Features:

- Real-Time Progress Tracking:
  - o Students can view syllabus completion status to plan their studies effectively.

- Personalized Assignments:
  - o Automatically generates tasks after each topic to reinforce learning.
  - o Supports deeper understanding and immediate knowledge application.

- Automated Grading:
  - o Students can pinpoint areas for growth with the use of immediate feedback on quantitative questions.

2.4 Collaborative and Open Learning:

- Combines automation and live performance monitoring to maintain student engagement.
- Ensures inclusivity by supporting learners at all levels.

2.5 Data-Driven Insights:

- Provides actionable insights into students' learning trajectories.

- Detects patterns and problem areas, enabling targeted teaching interventions.

2.6 Impact on Education:

- Encourages routine study methods and lifelong learning habits.
- Fosters a cooperative and effective academic environment.
- Offers a scalable solution adaptable to institutional needs and growth.

2.7 Outcomes:

- Teachers save time and effort through automation, enabling focus on effective teaching.
- Students experience a barrier-free academic path with enhanced motivation and engagement.
- Facilitates a future-ready education system emphasizing success and continuous learning.
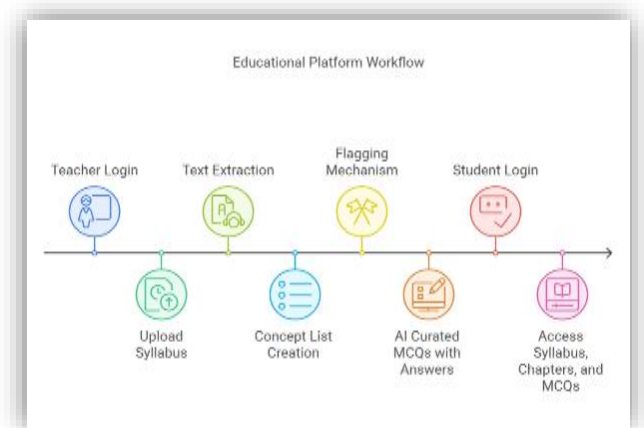
III. ARCHITECTURE

Fig 3.1 AI-Powered Learning Journey

The KnowBridge project is a web application for the easy development and implementation of quizzes. The workflow shown in the diagram comprises the following

3.1 Teacher Login and Syllabus Upload: Teachers working at the classroom level can access the platform and make the syllabus available in various publication formats (e.g., PDF, image).

3.2 Text Extraction and Concept Identification: Uploaded to the server syllabus of OCR to get the text of OCR. Subsequently, major concepts and problems were derived with Natural Language Processing (NLP) techniques.

3.3 AI-Generated Quizzes: The system, using AI-based algorithms, is able to assist in the generation of open-ended format questions (such as through the use of several-choice question (MCQs) format) relating identified extracted concepts. The questions used here are designed to determine the degree of prior course content learning by the students.

3.4 Student Login and Test Taking: All students accessing the platform log in to access the corresponding quiz. They can attempt the MCQs and submit their answers.

3.5 Score Storage and Analysis: The system stores their grades (and their answers) and their scores. This information can be later used for tracking students' performance and the identification of students who need extra help.

The Knowledge Bridge project will leverage the automatic generation and scoring of quizzes (the next step toward learning platforms) to furnish, in addition to the other educational outcomes, a reduction in teaching burden and a dynamic learning space to the students.
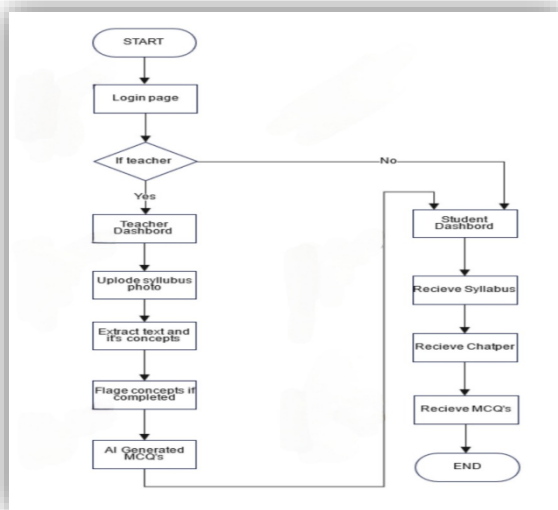
IV. FLOWCHART

Fig 4.1 FLOWCHART

The KnowBridge project is a learning platform with the goal of enhancing the learning process, and the flowchart outlines its workflow.

4.1 User Onboarding: The first step to granting access to teachers and students is user authentication, which requires registration.

4.2 Syllabus Upload and Processing: Lecturers upload their syllabus in an image format. Then the system applies OCR to recover the text from the aforementioned documents. NLP will be applied to determine which ideas and topics are mentioned in the curriculum. These depend on AI algorithms entirely. The multiple-choice questions aim to test the students on how well they understand what is being taught.

4.3 Quiz Administration and Student Interaction: Teachers can also give the students access to these pre-made exams. Students can access and complete the quizzes from the same page. Through the system, the pupils' responses and scores are monitored.

4.4 Iterative Learning: Iterative Learning After some of the curriculum has been completed, the system can provide continuing practice with repeated activities for even better learning. Continuous improvement and understanding are ensured by the iterative approach.

4.5 The Knowledge Bridge initiative generally saves professors time by automating the creation and upkeep of quizzes while providing a readily accessible "learn" environment to students.

V. IMPLEMENTATION

5.1 Fundamental Feature:

o Upload of the Syllabus: Instructors upload syllabus papers in a variety of formats pictures.

o Text Extraction and OCR: EasyOCR retrieves text from documents that have been uploaded.

o Key themes and subtopics are identified using topic extraction techniques in natural language processing.

o MCQ Generation: Using extracted themes, the Groq API creates MCQs.

o Students are given produced multiple-choice questions (MCQs) by their teachers.

o The site allows students to take quizzes.

o Evaluation of the Results: The system analyzes tests automatically and gives comments.

o Sharing of Results: Performance sheets and grades are given to teachers and students.

5.2 Application of Technology:

- The backend :

  o Django: Offers the structure for developing the web application.

  o Python: For data processing, core logic, and API communication.

  o Firebase: Holds quiz results, user information, OCR output, and syllabus.

  o EasyOCR and Groq API:Text is extracted from submitted syllabus photos using Easy OCR. MCQs are generated using the Groq API using the content of the syllabus.

  o Pillow: Manages scaling and image processing.

  o Python: Ensures that various users' time zones are handled correctly.

  o Django Messages: Shows easy-to-understand messages for a range of activities.

- Frontend:

  o Teachers' and students' user interfaces are made with HTML, CSS, and JavaScript.

  o The program will function flawlessly across a range of devices thanks to responsive design.

5.3 Workflow:

  o Uploading Syllabus: Instructors provide syllabus materials.

  o OCR and Text Extraction: Firebase stores the text that EasyOCR extracts.

  o Topic Extraction: Important topics are found using NLP approaches.

  o MCQ Generation: Using subjects as a basis, the Groq API creates MCQs.

  o Quiz Assignment: Students are given quizzes by their teachers.

  o Students take quizzes and turn in their answers.

  o Evaluation of the Outcome: The system rates and assesses responses.

  o Sharing of Results: Teachers and students receive access to grades and performances.

  o By utilizing these technologies, the Knowledge Bridge platform seeks to improve student and teacher effectiveness, give the student a learning experience tailored to their needs
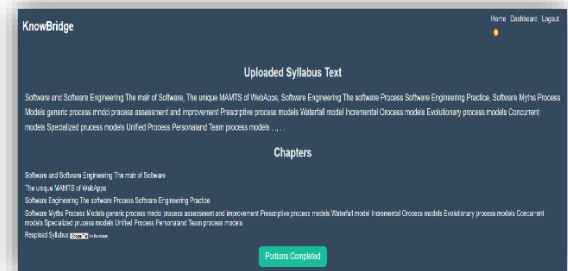
VI. RESULTS

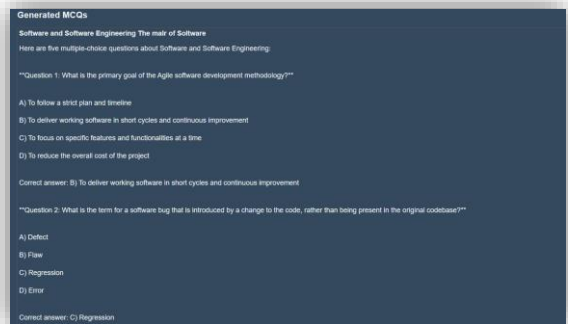Figure 6.1 Syllabus Extraction and Chapter List

Figure 6.2 MCQ generation using AI

VII. CONCLUSION

7.1 CONCLUSION

The Knowledge Bridge project uses artificial intelligence to enhance teaching and learning, offering a possible answer to today's educational problems. One of its advantages is that it greatly lessens the workload for teachers by automating time-consuming processes like grading, quiz creation, and syllabus administration. By integrating cutting-edge technology such as Natural Language Processing (NLP) and Optical Character Recognition (OCR), the platform effectively detects important themes and simplifies syllabus organization. Personalized quizzes and assignments are made possible by AI technologies like the Groq API, which give students individualized learning experiences and let professors implement performance-based interventions. The software also encourages teacher-student cooperation and engagement through gamified evaluations, real-time feedback, and clear progress monitoring. These characteristics foster a welcoming classroom where students

However, for it to be implemented effectively, a few issues must be resolved. The over-reliance on technology may make it more difficult for teachers who are not tech-savvy, requiring a great deal of assistance and training. Concerns about privacy and security are also raised by using cloud storage for student data, necessitating strong security measures. Furthermore, the automation of the system might not be able to handle special instructional materials or non-traditional teaching techniques. Notwithstanding these obstacles, the Knowledge Bridge has the power to revolutionize education by incorporating advanced analytics, inclusion, and efficiency into conventional learning paradigms.

7.2 FUTURE ENHANCEMENT

I. We can also provide engineering students access to a digital platform on campus. By uploading and showcasing their work, they create a really inspiring space where others can interact and share knowledge.

II. Initiatives might It is easily navigable by kind or category and is organized into categories. It also has interactive features like graphics and thorough documentation, which make for an interesting experience.

III. The platform would also allow students to re-establish a strong sense of community that fosters innovation and re-connect with project holders for mentorship or cooperation.

IV. Create spaces for students to discuss topics and collaborate with peers.

   o Peer Review: Create a system whereby students appraise and comment on work done by other students.

   o Badges and Rewards: Using points, badges, and other incentives to motivate students.

   o Leaderboards: Create a sense of accomplishment and competitiveness

   o Accessibility Features: Use tools such as text-to-speech and screen reader compatibility to support a range of learners.

   o Multilingual Support: Expand the number of languages the platform supports.

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