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Personalized Learning Platform using Artificial Intelligence

Dr.G.Vijayasekaran
Associate Professor
Department of CSE,
New Horizon College of Engineering
Bengaluru, Karnataka, India
gunavijay90@gmail.com

Mrs. Bibiana Jenifer J
Associate Professor
Department of ISE ,
New Horizon College of Engineering ,
Bengaluru, Karnataka, India
bjeniferjohn@gmail.com

Derangula Sankeerthana
CSE Student,
Department of CSE,
New Horizon College of Engineering
Bengaluru, Karnataka, India
sankeerthanakeerthana003@gmail.com

Kuruva Soumya
CSE Student
Department of CSE,
New Horizon College of Engineering
Bengaluru, Karnataka, India
C54.kuruvasowmya@gmail.com

D Hema
ISE Student
Department of ISE,
New Horizon College of Engineering
Bengaluru, Karnataka, India
hemadesai1011@gmail.com

B Kusuma
ISE Student
Department of ISE,
New Horizon College of Engineering
Bengaluru, Karnataka, India
basireddykusumareddy@gmail.com

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Abstract—This research proposes a complete framework for solving the difficulties of poor student management and high attrition rates in Massive Open Online Courses (MOOCs) through the integration of Artificial Intelligence (AI) technologies. The framework for mitigating these challenges is presented in this research study. In this study, a multi-pronged strategy is utilized and variety of methods such as discussion forums, content curation, peer to peer content and collaborative projects are investigated. The exploration of AI driven adaptive learning and evaluation methods to enhance the experience of taking massive MOOC is the primary focus of this research. The result findings indicate the efficiency of AI powered adaptive quiz production is giving significance evaluations of student performance. It also represents significance of standardized assessment method and co-effective platforms to integrate the Adaptive Educational Systems. Further, the study indicates essential aspects for improvement within existing MOOC infrastructures. The essential area aspects include personalization driven by AI, elements of gamification and enhanced interactivity. In evaluating the problem-solving skill and delivering personalized feedback, innovative evaluation methos such as Script Concordance evaluations became effective according to comparative review of MOOC platforms. This research also differentiates between general MOOC and connectivity MOOC(c-MOOC) to address the distinct issues in the process of encouraging student engagement. This study presents a unique framework using AI to provide individualized learning experience and incorporates personality test to determine the interest of learners. It also suggests the appropriate career pathways and employs a comprehensive set of evaluation metrics to examine the cognitive capacities and learning development. Through the strategic integration of AI methods such as expanded interactive features and adaptive assessment methods, this study develops multi dimensional method to enhancing the learner's ability to keep data from MOOC and achieve personalized learning outcomes.

Keywords: Massive Open Online Courses, Artificial Intelligence, Script Concordance, personalized feedback, multi-dimensional approach

1. INTRODUCTION

The rapid advancement of technology and the rise of online learning platforms have transformed the educational landscape, providing unprecedented access to knowledge and skills. However, despite the potential of Massive Open Online Courses (MOOCs), many l crops. One of the key industries that can boost a nation's economy is agriculture, but if crop yield falls short of output, it will undoubtedly have an impact on the index of food availability in that nation. The most recent forecasts for 2022–2023 state that 18.3% of the gross value added (GVA) comes from agriculture and related industries. The country's wealth is mostly attributed to the agronomic sector. A nation's agronomic industry must to be robust enough to guarantee that the food is given to every citizen of the nation. India comes up at number 111 out of all the countries in the global hunger index. To address this issue, agricultural production needs to be raised.

Educational institutions have increasingly recognized the importance of adopting adaptive learning strategies to cater to diverse learner needs. Research shows that personalized learning experiences can improve student engagement by as much as 50% and reto be produced in order to forecast the high potential of agricultural productivity. Nowadays, every field uses artificial intelligence techniques due to the rise in artificial intelligence. We employ machine learning algorithms in the agricultural arena to forecast crop yields based on the present environmental conditions.

With the purpose of enhancing MOOC retention and developing personalized learning pathways, this study develops the possibilities of AI and adaptive technologies. The analysis of learner behavior is conducted and preferences through the utilization of machine learning algorithms to produce suggestions that are matched to course materials, test and learning methodologies they need. Techniques such as collaborative filtering and content-based filtering will be utilized to allow the optimization of course proposal considering the interest of students and their previous performance. There are lots of students who are now navigating online courses without the benefit of focused coaching and they frequently depend on their intuition or advice from outside resources. This may result in poorly aligned learning practices that may not correspond to the objective of individual or requirements. Over 60% of students have reported feeling surprised or happy when participating in MOOC, which can have negative impact on their levels of motivation and engagement. Through the utilization of analytics that are driven by AI, the objective is to offer learners data that will enable them to make well informed decision regarding their educational journeys. Additionally, adaptive assessment methods can be employed to deliver feedback in real time which enables students to recognize areas in which they could improve and modify their learning methods. It is necessary to implement this proactive method to adequately handle the issues of MOOC retention and to ensure that learners continue to be engaged and motivated. It has been developed that student who receive personalized feedback have success rate in exams that is 20% greater than students who do not receive such feedback. The objective of this research is to create a robust method that improves the experience of taking a MOOC by integrating AI method with adaptive learning methods. An online learning environment must be built which is more unique, efficient and interesting for students with increased student retention rates and enhanced educational outcomes.

II. RELATED WORKS

Recent developments in AI and adaptive leaning method have been made with the intention of addressing low interest and retention in MOOC, where traditional approaches frequently fail to meet expectations unless they are integrated to grads. The necessity for standardized and personalized learning methods has been brought to studies and AI provides some alternatives. Most personalized feedback can be provided to students through the use of methods such as quiz production, adaptive content delivery and advanced assessments such as SC tests. These methods result in increased student engagement and improved cognitive abilities. A further benefit of gamification is enhanced motivation. It has still some limitation with scalable , AI driven personalization.

Table 1: Comparison of existing methods

Reference number	Education program name	Merits	Demerits
[1]	MOOC Retention Analysis, Peer-to-Peer Interaction, Live Discussions	It Identifies factors affecting retention; suggests peer interaction and live discussions.	Less scalable method
[2]	AI-based personalized content, adaptive learning	This AI system uses personality tests and adaptive learning paths to increase engagement from the start	High dropout rates, lack of motivation and interactivity
[3]	AI-driven adaptive feedback and personalized learning paths	Up to 90% dropout rate	It is not practical in real world
[4]	AI-based dynamic quizzes, SC tests, scenario-based learning	One of the efficient method	Difficulty in providing personalized feedback at scale
[5]	LinUCB-based learning resource recommendation algorithm	This method can not only control the difficulty degree of learning resources within the student's ability but also encourage their potential by providing suitable learning resources.	Less accuracy is obtaied
[6]	Massive open online course	This method is suitable video fragments recommendations for learners,	The designs are complicated
[7]	GenAI-based (Generative	. Automating the analysis of	Low quality outcomes

	Artificial Intelligence) tool	educational data and delivering personalized guidance to learners will also facilitate instructors in making data-driven decisions.	
[8]	AI assistant learning	The learners solve more tasks, build broader (transfer) knowledge, and retain it	No improvements in group tests
[9]	Online study program	This method construct the optimal choices of learning paths in the system	Less accuracy is obtained
[10]	EDUBOT program	Ehnhace the education system	Less scalable method

3. PROPOSED SYSTEM

3.1. Student Login and Profile Creation

Students will first log in to the platform, creating profiles where initial data is gathered about their educational background, preferences, and goals. This user data will be critical for the AI system to begin personalizing the learning experience. Data cleaning steps ensures the missing values and noise handling in the phase of data preparation and storage.

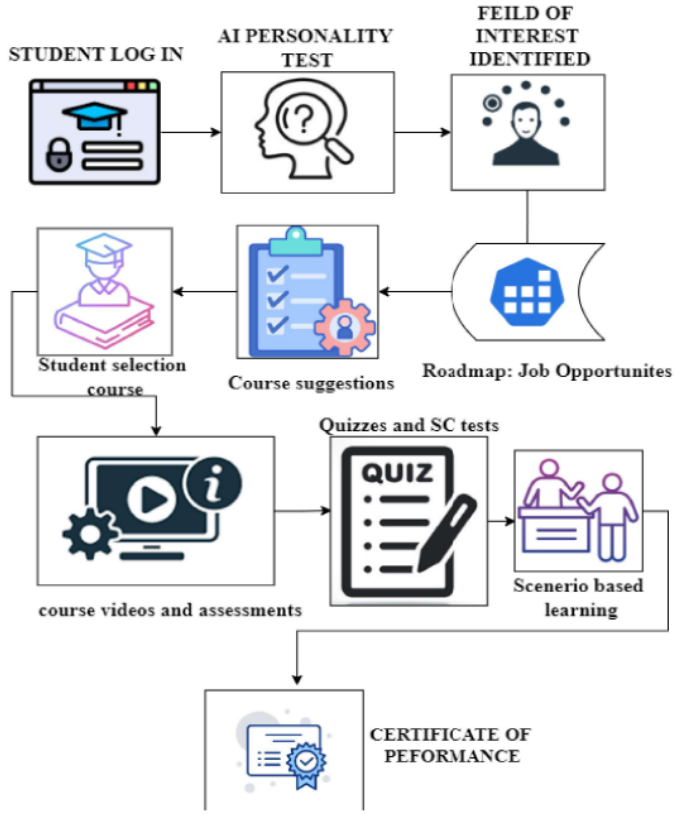

Figure 1: Proposed framework

3.2 AI Personality Test to Analyze Field of Interest

Natural language processing (NLP) and Machine learning (ML) are used in the AI personality test to analyses the response of students and recognize patterns in their hobbies and interests. The following are integral parts:

- In the field of NLP methods such as BERT and GPT are utilized to evaluate open ended responses in order to determine learning styles, subject interest and hobbies.
- Cluster analysis is method that groups students according to their preferences. Clustering methods such as K-Means are utilized.
- The AI allocated students to personality clusters that are connected to various jobs by integrating frameworks such as big five and personality traits.

Students are given psychometric test, AI and knowledge graphs to compare the outcomes of the test with career database and trends in the labor market. It then proposed potential jobs that are matched with demand of sector and the improvements in technology.

3.3 Course Recommendation Based on Interest

After the personality test, AI uses Collaborative Filtering and Content-Based Filtering to suggest following courses:

- Collaborative Filtering: This is a recommendation system technique that suggests courses by finding patterns in similar users' course selections and performance.

- Content-Based Filtering: Here, the AI recommends courses by analyzing course descriptions and matching them with the student's areas of interest using TF-IDF (Term Frequency-Inverse Document Frequency) or Word2Vec models.

a. AI analyzes the student's interests and career aspirations, then matches these with available course content.
b. Courses with the highest relevance to the student's preferences are recommended, including online courses, certifications, or degrees that best fit their career goals.

3.4. Student Course Selection and Learning Path

Following the recommendation of suitable classes by the AI, the student chooses one to begin with. The platform monitors the progress of students and provides adaptive learning routes that are based on real time assessments. These paths facilitate the progression of student through the course in a manner that is structured.

3.5 AI-Driven Student Performance Evaluation

An artificial intelligence driven student performance evaluation makes use of continuous assessment processes to adapt to the learning path of each individual student. It is possible for AI to construct the dynamic quizzes and knowledges test that adjust in difficulty based on student's past response. Bayesian Knowledge Tracing (BKT) is a method that monitors the probability of student having learning a concept after every quiz. Script Concordance (SC) test evaluate student's capacity to make decisions by presenting them with difficult, real-world scenarios.

Case based reasoning is used to evaluate student's approaches to problem solving in the scenario-based learning which involves students applying their knowledge through the use of case studies or simulations of real-world situations. Additionally, AI methods imitate expert judgements by employing supervised learning algorithms such as support vector machine and random forest. These methods provide detailed evaluations of the decision-making methods that students engaged for themselves. Measuring scales assessments are used to quantify the level of students' level of confidence and comprehension after every method. This enables AI to personalize and modify the level of difficult of further phases, so providing a learning experience that is both continuous and individualized.

3.6 Career Development and Job Opportunities

The system will send a digital certificate to the student once they have successfully completed the course. The process of certification is automated through the utilization of blockchain technology, which guarantees the certification authenticity and safety. The performance of the student is evaluated by AI over entire course considering quizzes, comments and SBL courses. This system provides a report that details the student strength next steps for career growth and improved area on the basis of performance. By analyzing the performance of student and matching them with relevant career possibilities in industry, AI provides the ongoing support. This is accomplished by use of career market analysis which is enabled by AI driven employment platforms. Methods such as reinforcement learning might be utilized to continuously modify the recommendations in response to the ever-changing nature of the labor market. This would ensure that students obtain career guidance that is both current and applicable.

4.IMPLEMENTATION

4.1 System Design and Architecture

When the student has successfully completed the course, the system will email them a digital certificate to acknowledge their accomplishment. The utilization of blockchain technology allows for the automation of the certification process which ensures the legitimacy and safety of the certification simultaneously. An AI system evaluates the student's performance over the entire courses considering quizzes, comments and SBL courses. Based on the performance of student, this system generated a report that gives data about strength of the student and next advancement steps in the field. The continuous support is provided by AI which does this by analyzing the performance of students and pairing them with suitable employment opportunities in industry. Career market analysis using employment platforms driven by AI is utilized to achieve this goal. The reinforcement learning method is used to the recommendations to accommodate the consistently shifting nature of labor market. This would guarantee that students receive career counsel which is not relevant but also based on most recent trends.

4.2 AI-Based Personalization and Recommendation

In order to increase the student engagement and retention, the personalization component of IntelliGrade uses AI and ML methods. The AI personality test analyses student response by utilizing NLP and algorithms such as decision trees and random forests. The objective of this analysis is to match students with appropriate career choices. In real time, student preferences are processed and AI algorithms are used to classify the interest into several job areas. The course recommendation engine uses collaborative filtering to make suggestions for individual classes and it updates these suggestion as students continue through the course. Script Concordance (SC) analysis are used to asses a ability of person to make decision where the scenario based learning is used to predict critical thinking by applying theoretical knowledge to issue that occur in real world. Through the use of quizzes, SC exams and assessments, personalized certificates are issued on accomplishment of students and performance is monitored. Students will be able to maintain their progress towards their educational objectives due to easy to use interface and real time updates.

The login page as shown in figure 3 provides a simple, secure interface for students to access their accounts. Students can sign in using their credentials or through social media platforms for convenience. The page includes options for password recovery and account registration for new users. With a clean and

responsive design, the login page ensures a smooth experience across all devices, including mobile. The interface also highlights key features of the system, enticing students to explore personalized learning opportunities.

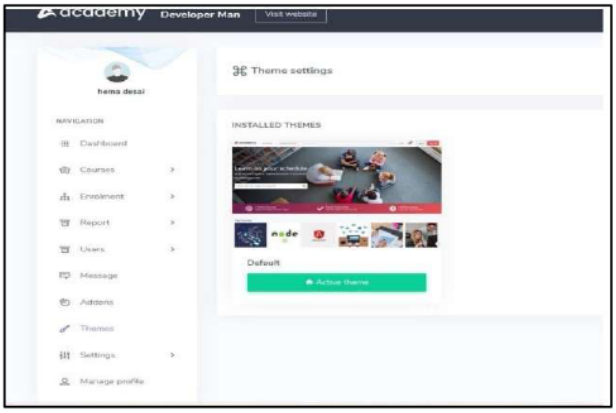

Figure 2: Dashboard

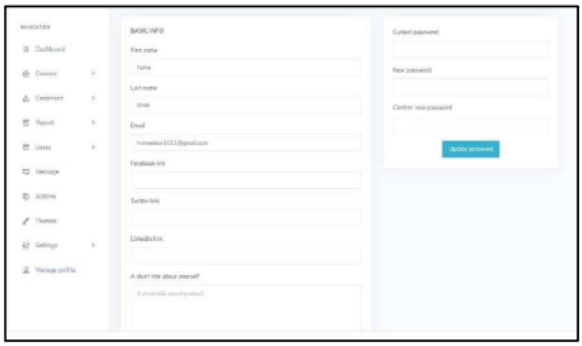

Figure 3: Login Page

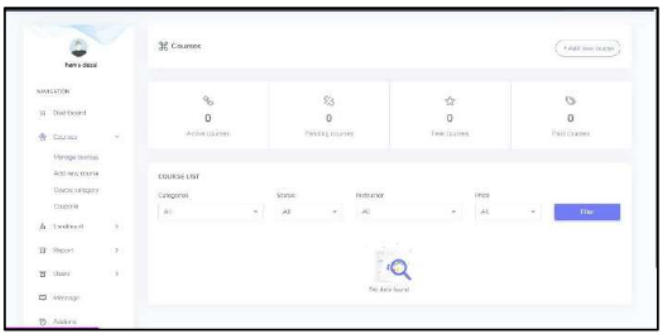

Figure 4: Courses

A selected list of recommended courses are suited to the interest of student and professional aspirations is shown on the course page. Figure 4 shows the course page. Because each course is labelled with important data, such as level of difficulty, the objectives are anticipated, length of time and it is simple for students to select the correct option. An effective search experience is ensured by the presence of filters on the page that allows user to sort courses regarding their skill level, topics and their popularity. Students are able to make more educated choices with assistance of interactive aspects such as reviews and course ratings. Students have the ability to browse the course syllabus, quizzes, and assesements that are available once they have chosen a course.

5. RESULTS AND DISCUSSION

This section discusses several evaluation metrics in terms of educational impact, system performance, and adaptive learning. These evaluation metrics commonly used in AI-driven educational platforms.

5.1 Accuracy of Adaptive Assessments

The accuracy of personalized assessments can be calculated by comparing predicted outcomes (e.g., quiz results, course recommendations) with actual student performance.

$$Accuracy = \frac{Number\ of\ corrected\ predictions}{Total\ number\ of\ predictions} * 100 \quad (1)$$

Table 2: Accuracy analysis

Methods	Accuracy
GenAI-based (Generative Artificial Intelligence) tool [7]	87.25%
AI assistant learning [8]	89.74%
Online study program [9]	90.62%
EDUBOT program [10]	91.25%
Proposed	92.33%

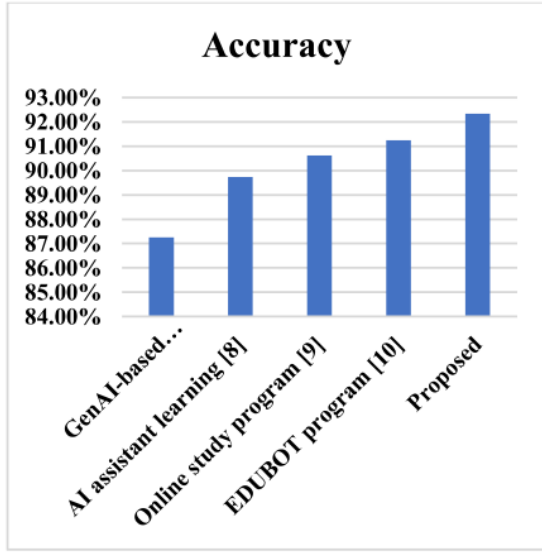

Figure 5: Accuracy analysis

Figure 5 indicates analysis carried by several AI systems in process of creating personalized evaluation of MOOC instructors. The proposed method achieves best accuracy of

92.33% which exceeding the existing methods. The results demonstrate how well the adaptive assessments provided by system are aligned with real performance of students which ensure high accurate evaluation of progress of students in learning.

5.2 Engagement Rate

Engagement measures student interaction with course materials and AI-driven content. This can be tracked based on actions like forum participation, quiz completion, and time spent on the platform.

$$Engagement\ rate = \frac{Number\ of\ engaged\ actions\ (quizzes, discussion)}{Total\ number\ of\ actions\ possible} * 100 \quad (2)$$

Table 3: Engagement rate analysis

Methods	Engagement rate
GenAI-based (Generative Artificial Intelligence) tool [7]	92.76%
AI assistant learning [8]	95.21%
Online study program [9]	97.45%
EDUBOT program [10]	98.4%
Proposed	99.14%

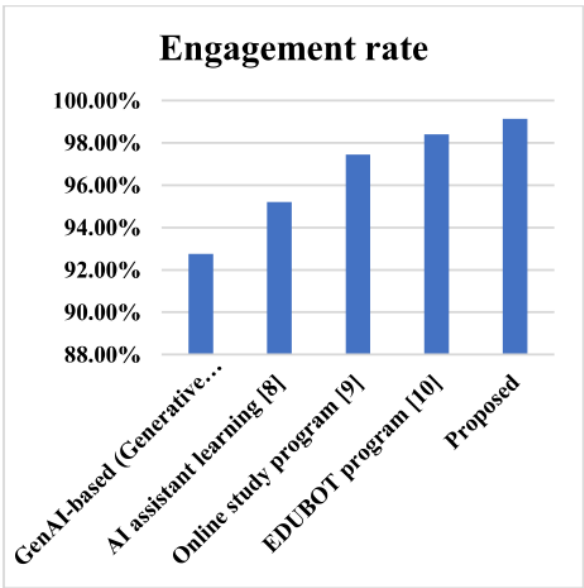

Figure 6: Engagement rate

Figure 6 illustrates the engagement rate of students across various AI-based learning systems. The proposed system demonstrates a significantly higher engagement rate (99.14%) compared to existing methods like the GenAI-based tool (92.76%) and AI assistant learning (95.21%). This engagement rate measures the extent to which students interact with course materials, participate in quizzes, and engage in discussions. The higher engagement rate indicates that the proposed system provides more interactive and personalized content, motivating students to stay engaged with the learning process.

5.3 Student Retention Rate

This metric evaluates how well the system retains students over the duration of a course.

$$Student\ retentation\ rate = \frac{Number\ of\ students\ completing\ the\ course}{Total\ number\ of\ students\ enrolled} * 100 \quad (3)$$

Table 4: Student retention rate analysis

Methods	Student Retention rate
GenAI-based (Generative Artificial Intelligence) tool [7]	85.56%
AI assistant learning [8]	86.32%
Online study program [9]	87.15%
EDUBOT program [10]	91.6%
Proposed	92.17%

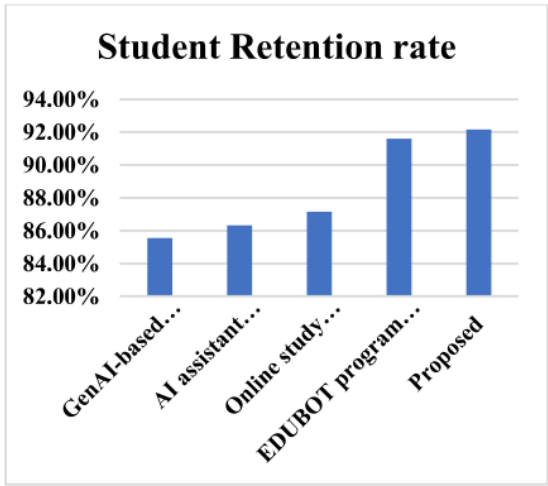

Figure 7: Student retention rate

Figure 7 shows a comparison of student retention rates across various AI-driven learning systems. The retention rate of the proposed system is 92.17%, which is the highest among the evaluated systems. The retention rate measures the percentage of students who complete the course after enrolling. Higher retention suggests that students are more likely to complete courses due to personalized learning paths, adaptive quizzes, and scenario-based assessments that keep them motivated throughout the course.

5.4 Learn path optimization

It evaluates how effectively the system recommends learning paths that result in successful course completion.

$$Learning\ path\ success\ rate = \frac{No.of\ students\ completing\ course\ based\ on\ AI\ recommendations}{Total\ number\ of\ students\ receving\ AI\ recommendations} * 100 \quad (4)$$

Table 4: Learn path optimization rate analysis

Methods	Learning path success rate
GenAI-based (Generative Artificial Intelligence) tool [7]	75.56%
AI assistant learning [8]	76.12%
Online study program [9]	77.25%
EDUBOT program [10]	81.46%
Proposed	85.77%

Figure 8: Learning path success rate

Figure 8 presents the success rate of learning paths recommended by different systems. The proposed system achieves the highest learning path success rate (85.77%) compared to other methods, such as the GenAI-based tool (75.56%) and AI assistant learning (76.12%). The learning path success rate indicates how effectively the system's recommendations help students complete their courses. The higher rate in the proposed system suggests that personalized course recommendations, aligned with students' interests and goals, lead to successful course completion.

5.5 Discussion

With the increasing student engagement and retention, the system was able to effectively solve fundamental difficulties with online learning. A personality test is powered by AI provides personalized learning paths which connect data with interest of students and increase motivation. Students were paired with suitable courses through the use of course recommendation engine using collaborative filtering. Hence, it results in enhancement in completion rates. Both the tracking of progress and the encouragement of critical thinking were improved through the real time feedback and adaptive tests. On other side, there were constraints such as high computational demands and reliance on huge dataset, which made it difficult for smaller institutions to obtain the data. Moreover, the efficiency of the method was limited upon the precision of that data that was provided by the students.

6. CONCLUSION AND FUTURE WORK

A successful demonstration of how AI and adaptive technology can enhance online learning is provided by the suggested system. This system offers personalized test, course recommendations and real time feedback to students with goal of enhancing student engagement, retention and performance. The system matches learning paths with individual student interest by means of AI driven personality evaluations and dynamic course recommendations. This result in higher completion rates and better outcomes for the students. The utilization of adaptive assessments which include SC examinations and quizzes, contributes to the enhancement of the learning process by providing individualized evaluations and permitting the tracking of progress. Nevertheless, there are still difficulties associated with the quality of data the computational demands and the scalability.

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