Online assessment portal for students and teachers in quiz and academic

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Abstract— Education is one of the many areas that is seeing the increasing use of artificial intelligence (AI). In the field of education, AI is mostly used for tasks like as tutoring and evaluation. One of a teacher's main roles is to assess student progress in class. You may alter the sorts of quizzes in the settings. By combining product data from your business with the content of the AI quiz, suggestions will be calculated. Try to match the substance of the questions and answers with the descriptions of the products to improve the AI results. Another fantastic method to improve the precision of AI suggestions is to use free-form inquiries. In order to provide the groundwork for a continuous professional development program, this research explores the procedure of assessing instructors' performance. The use of AI-based systems opens the door to more objective and trustworthy assessments, which in turn helps pinpoint problem areas and raises the bar for education generally. As a result, research into using AI to evaluate educators has exploded in recent years. An all-encompassing AI-based approach for evaluating teachers is suggested in this study. Additionally, we provide an innovative analytical index system that is based on the key performance indicators (KPI) that are currently used by the Saudi Arabian Ministry of Education, as well as an overall algorithm. The purpose of this research is to assess the effectiveness of educators via the use of artificial intelligence. A knowledge graph manager, an LMS quiz plug-in, a quiz generator, and a quiz content developer make up the quiz system. It is possible to directly reuse algorithmic elements of these components; however, in order to operate in a new unique application domain, it is necessary to update individual learners' learning data and domain knowledge.

Keywords— Online Assessment, Quiz, AI, and Teachers and Students, and Performance Assessment

I. INTRODUCTION

Research indicates that classroom instruction is the most often employed method of instruction. The nationwide closure of schools was a direct result of the unprecedented coronavirus infection 2019 (COVID-19) epidemic. Online learning had to be pursued to keep the learning process going since classroom instruction had to be abandoned to restrict the propagation of the coronavirus [1]. With 13 online engagement strategies supported by evidence and grounded in the principles of inclusive design for learning, the Commencing Student Success Program aims to increase learner engagement and retention in their first year of college (Sasson et al., 2021). The program's success has resulted in its adoption as the pedagogical hallmark of the University's School of Education. A large number of students, including those from rural areas, older generations, or those who are the first in their families to attend college, attend classes remotely thanks to the university's ideal location. By including these strategic features into the design of online courses, students might feel more connected to their peers and less alone while they pursue their studies [2]. After the COVID-19 epidemic forced the university to quickly transition to distance learning and see rapid development in its digital environment, students, as a stakeholder group, are in a prime position to assess the success of this change. In assessing their experiences with professors and administration, students are left to wonder, "How do students perceive the emergence of the digital university?" in light of the findings [3]. Educational and technological innovations in the previous decade have brought about several shifts in the way students learn and teachers approach their work at universities. These developments have been affecting instructional design and delivery, student advising, and assessment. In an effort to build a new learning environment that maximizes learning flexibility, enhances learning efficacy, and enriches the learning experience, several promising methods have arisen to combine conventional learning with novel ways. Some examples of these linkages are blended learning, online learning, and customized learning [4]. Summative evaluation items have been widely used by instructors to gauge student progress and inform pedagogical choices. But since they don't track students' online habits over time, they could not provide enough proof of the learning process, especially in virtual classrooms [5]. Over the last several years, there has been a gradual shift in educational practices and policies toward equipping students with the 21st century skills and fundamental competencies necessary for success in the workforce. This necessitates a change in emphasis from a curriculum focused on information to one based on competencies, which encourage the growth of traits like independence, accountability, self-awareness, and critical thinking. Likewise, technology is anticipated to take on a hitherto unseen role in classrooms as a result of the rapid digital transition. Learning evaluation methods must change to include these interconnected elements. Students' education and cognitive development are supposedly aided by the recent change in assessment culture toward more student participation [6]. For decades, students of orthodontics have relied on static images like photos and plaster models to help them understand the subject. However, these methods aren't ideal for teaching 3D concepts, such as the various planes that influence the final

positions of teeth, and the lengthy treatment times—anywhere from twelve months for simple cases to thirty-six months for complex ones—only add to the difficulty. Teaching methods of orthodontics may be enhanced in 2024 with the addition of a number of platforms, including films, 3D animations, and interactive facial and tooth alterations. Adding a fourth dimension, orthodontic motions may make it hard to recognize changes, especially in developing youngsters. Provided expertise in developing online teaching modules, praising its adaptability, simplicity, on-demand accessibility, and worldwide reach, both at UQ (Naser-ud-Din, 2015) and abroad (Bridges, 2015) [7].

We posed a number of research questions at the outset of the study:

- Question 1: What would an all-encompassing, scalable, and AI-powered quiz/assessment system entail?!
- Question 2: How does it offer real-time intelligent feedback and customization?
- Question 3: How do student perceive the self-regulation learning tools? Does it inspire them to actively participate in the associated content?

Although not restricted to, this study seeks to address the research issues mentioned above. Such an assessment system, in the form of quizzes, is expected to be ready to use, intelligent, and easy to be scaled up with different machine learning (ML) models from different approaches (knowledge based or learning analysis (LA) based) as well.

II. Related Work

A browser/server architecture is the foundation of the online test system described in [8]. The system checks the input multiple choice questions and assigns grades automatically. In today's digital learning environment, the traditional paper-and-pencil test format has its limitations, notwithstanding how pleasant it is. Students of information technology are especially sensitive to these limitations because of their familiarity with online tools and services. The solution proposed here is the development of an online evaluation system tailored to IT students that is both secure and easy to use. There is no such thing as a pragmatic project. It facilitates efficiency via expedited administration and grading, gives students more agency through engaging format options, and raises the bar for assessment quality. Educators are provided with valuable data-driven insights to enhance their lesson plans. Ultimately, it embraces the digital world and employs state-of-the-art assessment methods to equip IT students for success. Researchers in [9] set out to gauge how both professors and first-year medical students felt about online education generally. Methods: The researchers used two distinct structured questionnaires—one for teachers and one for students—to administer a cross-sectional observational study. The 45-question survey sought information on respondents' demographics as well as their familiarity with and attitude toward online education, their thoughts on the feasibility of facilitating communication between instructors and their students via an online portal, and other operational and technical details. Using the Google Surveys platform, these surveys were sent to both students and teachers via email. With 386 students and 47 teachers filling out the surveys, here are the results. The training and advice for online teaching were used by over 70% of the faculty. The majority of responders (95%) expressed their appreciation for the decision to transition to online instruction during the lockdown. Online polls, questionnaires, and instructional films were used by the faculty members to enhance the engaging nature of online lectures. In addition, 72% said using interactive software was worthwhile, and 70% thought taking exams online was helpful. Nearly eighty percent of pupils felt a lack of face-to-face interaction with their teacher. Sixty percent of students reported feeling lonely and alone while taking classes online. While 63% of students were happy with the answers given in response to their questions during online lectures, 1/3 thought that teachers might get them interested in the subject. Prominent drawbacks were a lack of two-way communication possibilities (55%), technological difficulties (70%), feelings of isolation (63%), and problems with eyestrain and other health concerns (62%). The lack of access to the internet was a major issue that faculty members brought up. Using educational analytics as a metacognitive tool and developing assessment along with recognition actions for open and distance learning, the project sought to equip college instructors to create online educational settings and curricula, to respond to the needs of a digital along with networked society. The investigation team in Vytautas Magnus University's Department of Innovative Studies collaborated with international study colleagues from Spain, Portugal, and Germany. The project's research led to the production of two studies and 10 scholarly articles. The study's final stage sought to develop methods for evaluating and recognizing open and remote learning in order to meet the needs of learners in the modern, digital, and networked environment. Open learning innovations in reaction to the COVID-19 epidemic have been a major factor in the dramatic increase in the need for rigorous, objective assessments of online education over the last decade. The allotted time is also related to the growing demand for micro-credentials, which means that colleges and universities will have to be ready to award fresh digital credentials to both full-time students and adults taking individual classes. A functional and user-friendly framework for open learning evaluation and recognition is necessary to meet the growing need among all players in the labor market for rapid and regular competence renewal. Presenter [11] delves on three fundamental ideas from the project's "Basic Elements" that facilitate and improve significant relationships between students and teachers: 1. Social presence: When students feel like they belong and are actively involved in their learning, they are more likely to have positive experiences and develop philosophies of education that are based on strong relationships. Students who do all of their coursework online will find this to be especially true (Felten & Lambert, 2020). The Unit Coordinator's high-quality, asynchronous Moodle films serve as a welcome to students, while walk-through assessment screencasts offer a more in-depth explanation of the assignment objectives and facilitate student-teacher interactions via synchronous participation using Zoom. Teacher presence, or "putting a human face to the name" (Stone & Springer, 2019), helps students relate to Unit Coordinators on a personal level and forms strong relationships with them. 2. Student voice: Reilly et al. (2012) found that students' presence with others, in addition to the multimodal resources, greatly contributes to their involvement in online places. In that way, students may influence the development of their own units by offering immediate comments on each assessment work. That feedback collection is embedded in situ, rather than as a separate, unconnected procedure, when you use the feedback capabilities directly inside the LMS. The faculty may modify and adapt the lessons to better suit the requirements of the present student body. The purpose of the research reported in [12] is to learn more about the challenges and strategies used by online teachers to include authentic assessments into their courses. The application of authentic assessment and the challenges of online learning were revealed in that qualitative research via instructor observation and interviews. Teachers evaluated their students' public speaking abilities using performance assessments, according to the research. In order to conduct genuine assessment, the instructor followed a few steps: determining the standards, making real tasks, evaluating the students, and developing an evaluation rubric. Teachers' inability to direct

students' work processes, students' time constraints, and students' lack of initiative were among the difficulties identified by the research. The purpose of that research was to critically assess the ways in which COVID-19 online education promoted both positive and negative consequences that may alter and reshape the academic routine process [13]. Focused group discussions as well as semi-structured interviews were utilized to gather data from individuals associated with the higher education system, including professors, associate professors, and rectors. In order to look at the data qualitatively, the interpretivism paradigm study was run. That research provides an in-depth analysis of the long-term viability of online education throughout the lockdown period. In it, they discuss the steps used to guarantee high-quality education via their online pedagogy, E-portal, technical independence, online evaluation, and quality standards. The results demonstrated that the higher education industry transformed challenges into opportunities, ensuring that students' semesters were not wasted and that they achieved academic excellence, thereby overcoming the persistent academic distortion and guaranteeing the regeneration of educational processes. The findings also revealed a plethora of difficulties encountered by both educators and administrators in providing high-quality instruction. The purpose of that research was to evaluate the digital environment at the institution and to find out how students felt about digital transformation [14]. From November 2–14, 2020, researchers at Moscow State Pedagogical University as well as Udmurt State University polled undergraduates enrolled in the second or third year of a pedagogical field of study program. The poll was filled out by 126 people. Summary and analysis. The research demonstrated that the term "digital university" had diverse meanings to various students. Consisting of a web portal, digital materials, a digital environment, and a learning format, understanding is a digital platform. When asked "Can you say about yourself that your are taking classes at an online university?" The responses were as follows: 40% declined, 33% agreed, and 27% said they were unsure. The survey found that students were largely satisfied with the force majeure transition to remote learning during the epidemic. Zoom, the school's information and analytics system, Google's Classroom, Moodle, online instructional resources from third-party platforms, etc., are among the most popular digital learning tools among students. The majority of students (60%) think that universities should upgrade their technology in order to make digital learning more engaging and effective for students, while a sizable minority (49%) think that is necessary to guarantee that instructors' digital qualifications continue to improve and to make digital learning more accessible. In the future, 85 percent of those who take the survey will say that using digital technology is an integral part of their job. That research sought to explore how players in Rajasthan's e-learning activities and the worldwide shift in education were seen in [15]. The Dungarpur district government schools were the subjects of a descriptive study that included 308 people. A whopping 89% of students in Rajasthan's online classes utilize video conferencing tools including WhatsApp, e-Raksha apps, YouTube, and public educational sites like Google. Students may need assistance with language issues while using e-learning initiative material, potentially because their native language is not available. There are e-learning programs, and teachers should be well-informed about them. Compared to traditional classroom instruction, many educators feel that digital pedagogical techniques add unnecessary complexity to lesson planning and evaluation. Even if 63% of COVID-19 parents and community people are unhappy with e-learning, 63% think their children can easily adapt to it. There should be an emphasis on in-person instruction because, according to most participants, it is superior than online courses. Videos along with live programs streamed online should be translated into local languages by the government. For online education to be successful, the department's post-service and teacher training programs should include instruction in the use of online learning resources.

III. PROPOSED WORK

An integral part of the educational system, student assessment is the bedrock of high-quality instruction. For education as a whole and for administrators, supervisors, and teachers in particular, this process is crucial and has periodic relevance. These criteria show how well students are meeting their obligations. In addition, it shows their strengths, shortcomings, talents, and progress. There are traditionally three stages to a student's performance review in a classroom setting. After students complete the T-KPI forms, assessors watch them work to gauge their progress. Consequently, evaluaters may manually review recorded classroom sessions thanks to video recording technologies. To ensure impartiality, accuracy, efficiency, and appropriateness, artificial intelligence is currently used to tackle the problems with manual analysis and assessment. Our goals, contributions, and areas of study that need more attention are detailed below.

This project introduces an innovative online assessment portal designed to provide a dynamic platform for both teachers and students. The key features of the portal are outlined below:

- **Classroom Management:** Teachers can create and manage classrooms that can be either public (open enrollment) or private (requiring a unique classroom code).
- **Quiz and Test Creation:** Teachers can design quizzes or online coding tests, enabling customized assessment experiences.
- **Student Performance Tracking:** Teachers can view student marks, access a detailed dashboard, and compare student performance to gain insights.
- **Student Dashboard and Profiles:** Students can view their own dashboard, as well as peer profiles and dashboards, fostering a collaborative learning environment.

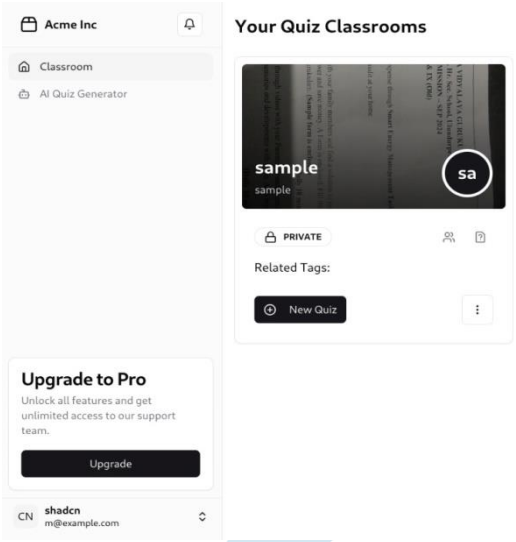

Fig.1. Quiz Online Portal Sample Upload by Teachers

Premium AI-Driven Quiz Generation:

Now we will get into the quiz system itself. We will start by giving a quick overview of it and how its four parts work together. Then, we will discuss each part in depth. There are four main parts to the iQS architecture as a whole:

- Part A: the quiz generator (QG) instantaneously gives students knowledge-based comments or suggestions in response to their answers and creates new questions in real-time using a collection of customized quiz filters.
- The knowledge graph manager (KGM) oversees all domain knowledge (DM), creates and updates learners' personal knowledge graphs (pKG) in order to track their learning processes and results. The creative quiz creator (QC) is accountable for semi-automatically creating the building blocks of quiz questions, such as the question bodies and options. The LMS quiz plug-in (QP) allows iQS to be seamlessly established into concrete educational platforms. Fig. 1 illustrates the working process (following the blue lines) from the students' point of view:

Estimated, multiple choice, numerical, short-answer, while true/false questions are just a few of the many types of questions that a lecturer may create and generate using this quiz module. Nevertheless, this research just used three question types: matching, multiple choice, and short response. The educational management system stores these questions in a question bank, so you may utilize them for another quiz. In this quiz module, you may be able to try again. Instantaneous feedback and correct answers will be provided by the professor, and all attempts will be instantly graded.

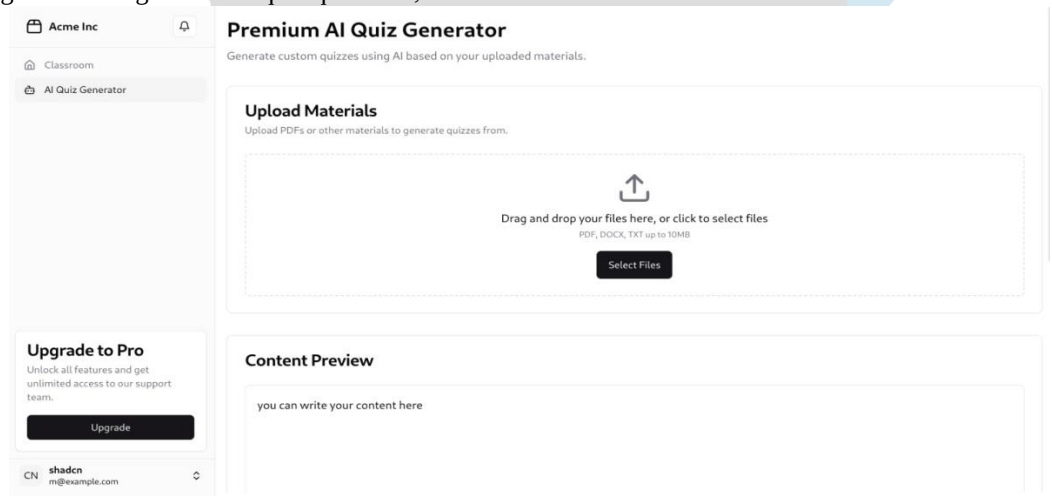

Fig.2. AI Quiz Generator

- Students have the option to use the system-suggested filter variables as is or modify them to suit their needs (e.g., to focus on particular areas of knowledge or previous mistakes; refer to the quiz filter in Fig. 2)
- Concrete questions are created for individuals by taking their filters as input, delivering queries to the question and option pools, while applying the defined algorithm for quiz question generation (?);
- the personalized quizzes are presented to students inside the quiz plug-in. The underlying core idea of iQS is, at this moment, to understand who exactly learns what or does not, and at what competence mastery level.

More frequently iQS is used, the smarter and more accurate the initial filter becomes since iQS is always monitoring and analyzing students' progress and outcomes in learning. After then, it may go deeper to learn more, such who does what and when in order to reach certain degrees of expertise.

Earlier I said that the first three parts that are being considered for the sequel were already produced. For the sake of completeness and to provide a new perspective, we briefly describe them here in this article.

- Teachers can upload PDFs or books, and the AI generates quizzes specifically from the uploaded content.
- Each teacher's quizzes are tailored to their specific uploads (e.g., an English teacher's quiz will be based only on their English book upload, while a Tamil

teacher's quiz will be based on their Tamil book upload).

- The feature is powered by Retrieval-Augmented Generation (RAG) for accurate and efficient question generation.

Vector Database Integration:

- Efficient storage and retrieval of resources and past interactions.
- Teachers can refer to past conversations and resources for better continuity.

Working Principle

The study's overarching goal was to improve the assessment model's reference, accuracy, dependability, and realism by identifying the relative importance of each particular evaluation aspect. In addition, it helps decision-makers better grasp the evaluated criteria, which ultimately leads to a better choice. The evaluators' views, experiences, and actual practices are taken into account by the extracted weights when assessing instructors' performance. In particular, field expert meetings and a thorough examination of the standards handbook for evaluating teachers' performance informed the inclusion of the comprehensive assessment components.

Live Classes

Live online lessons may be conducted with the help of Learn Magica. You may take advantage of online courses via any of these providers: WizIQ, Blue Jeans (airtel), or Zoom.

Evaluation and annotations by teachers

You may put in your responses or submit images of your replies to theory-style questions on Learn Magica. Reviewing and commenting on theory-based questions is a breeze for educators. In fact, instructors have the option to add comments on student-submitted images of their replies. Afterwards, the remarks made by the instructor will be visible to the students.

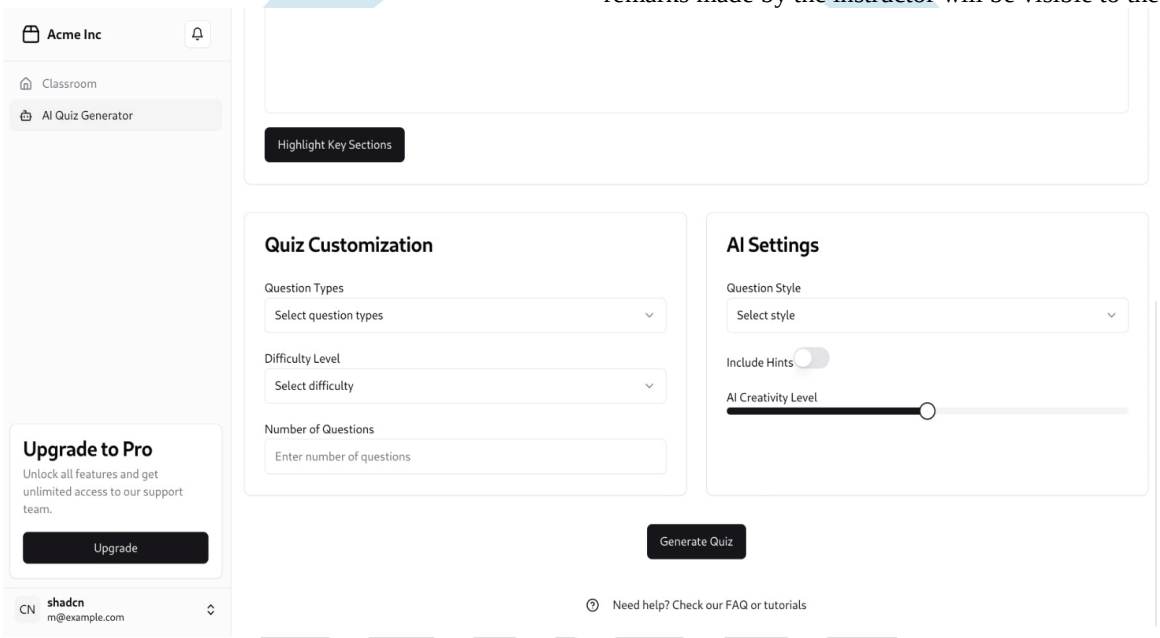

Fig.3. Quiz Customization

Question Bank

A hierarchical structure is used to hold the question bank, with levels corresponding to class, subject, chapter, board, and themes. You may build your own question bank via manually adding questions. An easy-to-use Word document importer is also available.

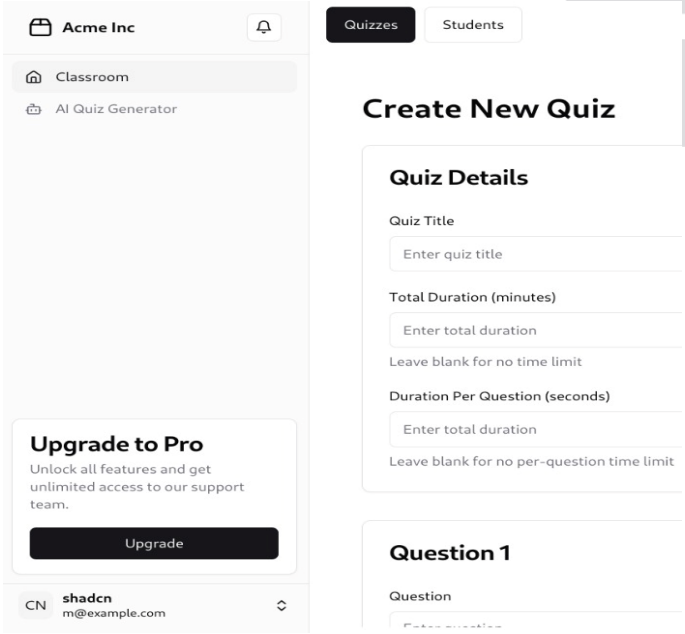

Fig.4. Question Bank Model for New Quiz

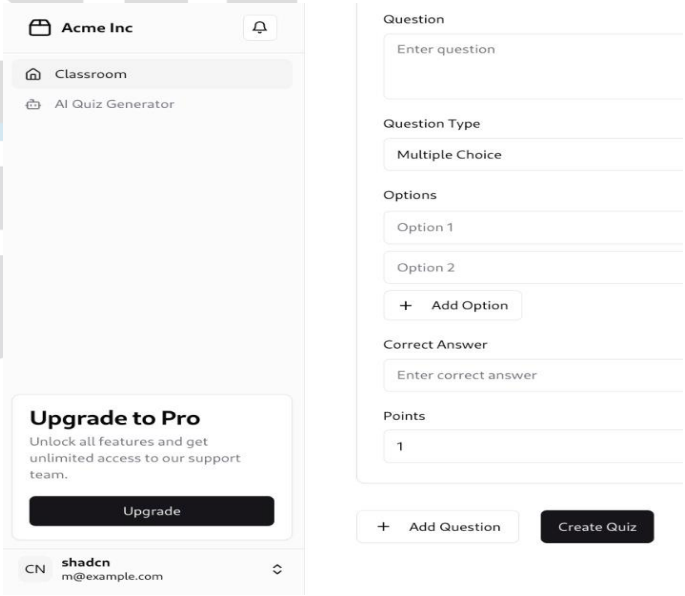

Fig.5. Quiz Update

Test analysis

Students may see detailed exam analyses to determine where they excelled and where they needed improvement. Comprehensive analysis of topic, chapter, difficulty level, and question duration is included in the report.

Using AI generated quizzes as a template

- Quizzes can be swapped between logic types at any point - while saving progress on the previous logic option.
- Quizzes created with AI will start as AI quizzes by default but can also be swapped to:
- Custom: great for full control over quiz result design & product logic.
- Dynamic: great for filtering customers to products with tags, collections & individual product choices.
- Even if you're not switching quiz types, refining an AI generated quiz by making sure the content is on-brand and relevant to your products is recommended.

IV. RESULTS & DISCUSSION

According to the AI statistics report, there was a very high level of student involvement throughout all three tests in this class. Every student had a total amount of quiz attempts averaged out throughout all of their courses. In considering the more negative comments made, some potential considerations to consider are: (1) at this point in time, the system is more concerned with providing functionality than with ensuring good usability; (2) more details on the system's use, such as more user-system designer communication, user documentation, and tutorials, have not been implemented. All of these areas might need some work.

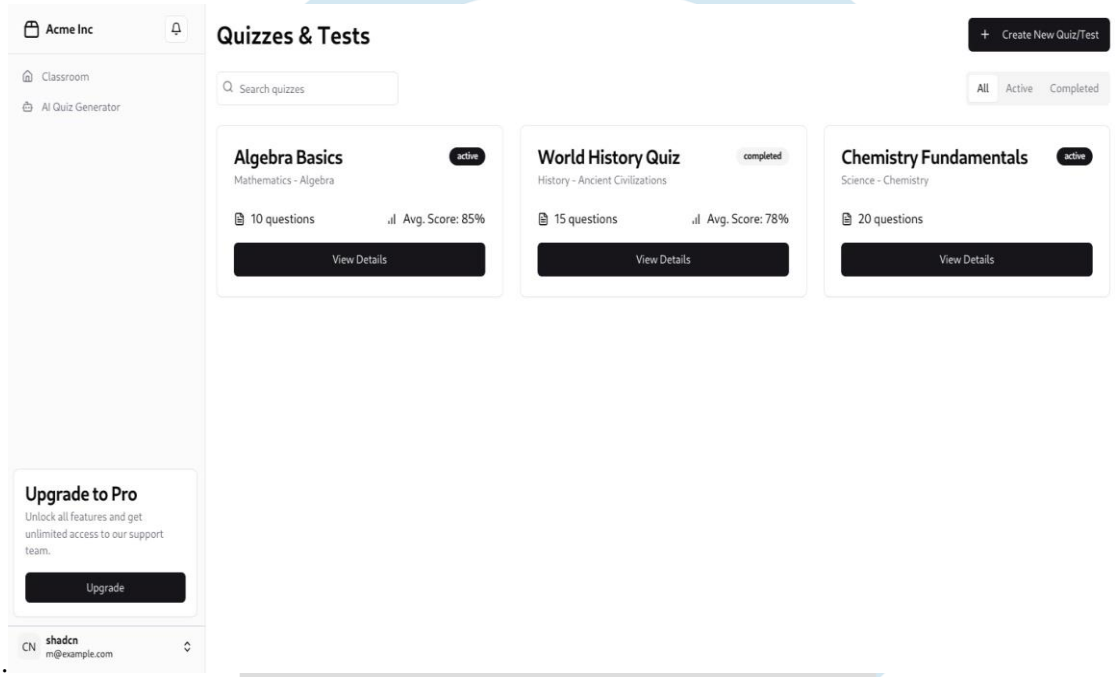

Fig.6. Quiz and Test Analysis

In order to determine whether there were statistically significant differences among the means of each quiz, this research employs an average amount of paired t-test analyses for each quiz.

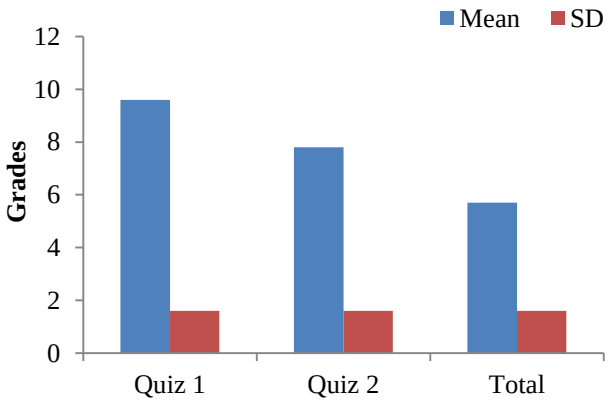

Fig.7. Grades Analysis

In most cases, a p-value less than 0.05 is deemed statistically significant, while a p-value of 0.05 or above suggests that there is no difference between the categories. Results from a paired t-test on the first quiz (MS=8.50, sd=1.94, for=0.17) and the final exam (M=7.93, sd=1.73, se=0.15) showed a statistically significant relationship (p=0.00676) in terms of grades. This online learning environment is built on artificial intelligence, so students can see right away whether they've succeeded or failed. As a result of the system's automated corrections, the student's grade was automatically generated. These findings corroborate those of other studies who have shown that providing students with constructive criticism is crucial to raising their academic performance to a high level. At the moment of quiz submission, the system shows how many students got each exercise right and how long it took each student to complete the question. All quizzes showed an improvement in performance from the first try to the second try, according to Moodle statistics. Students had to put in their answers for the short-answer questions on the quiz. For that reason, there have been instances when answers were misspelled. The multiple-choice questions included four options, and the pupils had to choose one. Instantaneous access to feedback on correct answers became accessible once the first quiz was submitted. The overall results showed that, particularly for first tries at the quiz, matching and multiple-choice questions had a greater proportion of right answers than short-answer questions. The time spent on quiz distribution is the subject of another intriguing investigation. According to the statistics, more than 75 per cent of participants start taking the quiz just before it ends. In this specific class, the goal of the quizzes is to cover the fundamentals and prevent questions from being too similar to one another in the final exam. So, to get the most out of this approach, it's crucial to remind students throughout the semester to start taking the tests early.

V. CONCLUSION

An innovative quiz system that utilizes artificial intelligence was explained in depth; its purpose is to help students self-regulate their learning via the use of customized tests. The goal is to create an AI-powered evaluation system that can be utilized across many areas and is scalable. University students and faculty members examined and assessed the AI system as a first implementation, providing a first batch of extremely objective input. A number of students expressed contentment and thought that AI may inspire them to pay closer attention in class. At the present, professionals' acceptability is lower than that of students.

REFERENCES

[1] Kaliisa, R., Mørch, A.I., & Kluge, A. (2019). Exploring Social Learning Analytics to Support Teaching and Learning Decisions in Online Learning Environments. European Conference on Technology Enhanced Learning.

[2] Maryniv, I.V., Solyannik, K., & Demura, M.I. (2022). TRANSFORMATION OF THE EDUCATIONAL PROCESS IN THE CONVENIENCE OF THE COVID-19 PANDEMIC: CASE OF YAROSLAV MUDRYI NATIONAL LAW UNIVERSITY. Scientific Notes of Junior Academy of Sciences of Ukraine.

[3] Magambo, L., Dida, M.A., & Kaijage, S.F. (2020). Towards an Online Portal for Locating Students' Private Rental Accommodation in Tanzania. Journal of Information Systems Engineering and Management.

[4] Dudhane, P. (2024). ExamMate-Online Examination Portal. INTERANTIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT.

[5] McGreevy, P.D., Fawcett, A., Johnson, J., Freire, R., Collins, T., Degeling, C., Fisher, A.D., Hazel, S.J., Hood, J., Lloyd, J.K., Phillips, C.J., Stafford, K.J., Hyde, M., Wilson, B.J., & Tzioumis, V. (2020). Review of the Online One Welfare Portal: Shared Curriculum Resources for Veterinary Undergraduate Learning and Teaching in Animal Welfare and Ethics. Animals : an Open Access Journal from MDPI, 10.

[6] Loureiro, P., & Gomes, M.J. (2022). THE IMPACT OF ONLINE PEER ASSESSMENT ON STUDENT LEARNING IN HIGHER EDUCATION: A SYSTEMATIC REVIEW OF LITERATURE. EDULEARN Proceedings.

[7] Naser ud Din, S. (2024). Time Efficient & Cost Effective Online teaching tool with iConcepts in Orthodontics for DDS students @ UoM. ASCILITE Publications.

[8] Kumar, U., Rekha, C., Siri, K.A., Lokesh, G., & Keerthan, A. (2024). Online Exam Portal. International Journal of Advanced Research in Science, Communication and Technology.

[9] Maheshwari, N., Kalra, B.S., & Roy, V. (2022). Perception of Medical Faculty and Students about Online Teaching during the COVID-19 Pandemic in a Tertiary Care Teaching Institute. MAMC Journal of Medical Sciences, 8, 93 - 99.

[10] Trepule, E., Volungevičienė, A., Teresevicienė, M., Dauksienė, E., Greenspon, R., Tamoliūnė, G., Šadauskas, M., & Vaitonytė, G. (2021). Guidelines for open and online learning assessment and recognition with reference to the National and European qualification framework: micro-credentials as a proposal for tuning and transparency.

[11] Grono, S., O'Neill, K., Harrington, I., & Volpe, C.E. (2022). Building Relationships Through Learning Design as Signature Pedagogy: Re-connecting Mature-aged Online Students with Educators. ASCILITE Publications.

[12] Furqobi-and, M., Hariri, A., Achmad, R., & Darmawan, A. (2024). HYBRID LEARNING AUTHENTIC ASSESSMENT: TEACHER PRACTICE AND CHALLENGE. Journal of English Language Teaching and Islamic Integration.

[13] Rafiq, M., Naz, S., & Maqbool, S. (2022). Linking Online Business Education and Academic Excellence: Outbreak of COVID-19 Pandemic. Business Review.

[14] Neborsky, E.V., Boguslavsky, M.V., Ladyzhets, N.S., & Naumova, T.A. (2021). Studying the attitude of students of pedagogical areas of preparation for digital transformation in a university. Perspectives of Science and Education.

[15] Gure, G.S., & Bhatt, M. (2024). Stakeholders' perception: E-Learning initiatives in school education of Rajasthan state in the course of COVID-19. Journal of Applied and Advanced Research.